another agency was organized to study among other things, ways and means of inducing the Mexicans to reduce their birth rates. This project was never put into effect. The improvement in public health and greater food production has not permitted an increase in living standards because of population pressure.

Mexico's population increased from less than 20 million in 1940 to more than 27 million by the end of 1952. During the past ten years, beginning in 1943 when the agricultural program was initiated, the population increased about 30 per cent. As a result the advances in agriculture have been absorbed by rapid population growth and the diet of the common man has shown little improvement. Although 200,000 tons of food were imported in 1952, the local agriculture failed to meet minimum quotas by about 25 per cent.

The same problem also confronts Panama and the countries of Central America. Some are more fortunate than others in natural resources, but none can long support a population resulting from an uncontrolled birth rate and a controlled death rate. Unless birth rates can be reduced rapidly, any increase in agricultural production will result only in larger populations living in poverty, and will make even more difficult any possible escape from population pressure in the future.

THE TRIBES AND GENERA OF CENTRAL AMERICAN SCROPHULARIACEAE

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AS A PRELIMINARY to a planned, detailed account of the Central American members of the Scrophulariaceae this paper is presented. In it are incorporated the pertinent

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taxonomic data which have accumulated since Hemsley's treatment of the family in *Biologia Centrali-Americana* (1882), a tribal and generic revision of the Scrophulariaceae in Central America, and an indication of the problems still to be solved in the attainment of a logical systematic presentation of the family in this area.

The earliest revision of Central American Scrophulariaceae is that of Bentham and Oersted (1854) whose treatment was based upon the masterful study of world Scrophulariaceae by Bentham (1846) and includes 12 genera and 24 species. Twenty-eight years later, Hemsley (1882) accounted for all the then known Central American members of the family in *Biologia Centrali-Americana,* listing 22 genera and about 47 species. His arrangement of genera follows that of the generic revision of the Scrophulariaceae by Bentham and Hooker (1876). Since Hemsley's work no account of the family in Central America has appeared. The present paper includes 39 genera, comprising an estimated 112 species.

The treatment of the Scrophulariaceae which is generally accepted today is that of Wettstein (1891). This, in turn, is based on the earlier revisions of Bentham and Hooker (1876) and Bentham (1846). The work of Bentham is the latest one to give an account of all the species of the family. This revision, now 107 years old, takes little or no account, of course, of the phylogeny of the family. The two subsequent revisions (each on a tribal and generic basis) left Bentham's work basically unchanged. Consequently, most treatments of the family or portions of it in print today are merely reiterations of a pre-evolutionary, century old system. Since Wettstein's revision, several workers have attempted to reclassify the Scrophulariaceae but each has failed to review all the genera of the family or to give a critical outline of his system of classification. It is apparent that our knowledge of the estimated 200 genera and 3000 species of the Figwort Family is in a state that is far from satisfactory.

There can be no doubt that the most significant and profound contributions to a phylogenetic classification of the Scrophulariaceae are those made by Pennell and summarized in the masterful introduction to his *Scrophular-*

iaceae of Eastern Temperate North America (1935). There is no need to repeat these conclusions in the present paper. It is sufficient to say that most of them are accepted here.

Many of the genera of Scrophulariaceae represented in Central America are in dire need of critical monographic study. Among these may be mentioned *Castilleja, Angelonia, Alonsoa, Buchnera, Russelia, Bacopa, Mecardonia,* and *Sibthorpia.*

The keys in the present paper are based entirely upon Central American material. In extra-limital areas the contrasts given in the keys may not be applicable. The listings of generic synonynis include only those names which have appeared in works dealing specifically with Central American flora or that of contiguous areas. The references cited are to pertinent monographic or other taxonomic papers.

KEY TO THE TRIBES

1. Corolla with posterior lobes external in aestivation (Antirrhinoideae).
   2. Capsule densely packed with hairs; flowers usually red, in cymes.

      III. RUSSELIEAE

   2. Capsule not densely packed with hairs.
      3. Stigmas distinct (except in *Limosella, Scoparia,* and several species of *Bacopa);* seeds wingless, mostly simply reticulate *(Bacopa* and *Lindernia* types), spirally furrowed (*Schistophragma* type), longitudinally furrowed, or pitted *(Torenia* type).

         I. GRATIOLEAE

      3. Stigmas united (except in *Uroskinnera);* seed sometimes winged, not of *Bacopa, Lindernia, Schistophragma,* or *Torenia* types, longitudinally furrowed only in *Calceolaria* and *Alonsoa.*
         4. Filaments 5, the posterior antherless, sometimes much reduced; inflorescence of bracteolate cymes or racemes.

            II. CHELONEAE

         4. Filaments 5 or fewer, all antheriferous; inflorescence cymose only in *Calceolaria* wherein filaments are but 2.
            5. Capsule septicidal or loculicidal by a simple median split; corolla not calcarate at base.

6. Corolla only slightly zygomorphic, the tube well developed; stamens 5 or 2; leaves all alternate.
   7. Corolla rotate, its lobes longer than the tube; stamens 5; inflorescence racemose or spicate; herbs.

      V. LEUCOUPHYLLEAE

   7. Corolla tubular-campanulate, its lobes shorter than the tube; stamens 2; flowers solitary in the leaf axils; shrubs.

      V. LEUCOPHYLLEAE

6. Corolla strongly zygomorphic; tube scarcely developed; stamens 4 or 2; leaves all or partly opposite.
   8. Staments 4; corolla orange— or salmon-red, blue, or violet, its lips not concave-saccate (throat saccate anteriorly in *Angelonia*); corolla lobes evident; inflorescence racemose.

      VI. HEMIMERIDEAE

   8. Stamens 2; corolla usually yellow, its lips concave-saccate; corolla lobes scarcely or not evident; inflorescence cymose.

      VII. CALCEOLARIEAE

5. Capsule loculicidal by means of distal ruptures or pores; corolla saccate or calcarate at base, its orifice open or closed by the up-arching palate.

   VIII. ANTIRRHINEAE

1. Corolla with anterior lobes external in aestivation (Rhinanthoideae).
   9. Upper lobes of corolla flattened or widely arched, often spreading; anthers all distinct.
      10. Stigmas distinct; capsule primarily septicidal; sepals 5, distinct, ovate, 10-18 mm long; corolla 40-75 mm long, campanulate, the lobes but slightly distinguished; flowers in long, one-sided racemes.

          IX. DIGITALEAE

      10. Stigmas united; capsule loculicdal; sepals united, or, if distinct, only 4 and less than 10 mm in length.
          11. Corolla subrotate, its tube very short; capsule turgid to strongly flattened contrary to the septum, often bilobed, as broad as or broader than long; testa not obviously reticulate, seeds not linear.

              X. VERONICEAE

11. Corolla salverform or campanulate; capsule neither strongly flattened contrary to the septum nor bilobed, as long as or longer than broad; testa reticulate or seeds linear.

XI. GERARDIEAE

9. Upper lobes of corolla narrowly arched forming a galea that encloses the anthers; anthers frequently cohering; usually root parasites.

XII. EUPHRASIEAE

TRIBE I. GRATIOLEAE

As outlined by Bentham (1846) as Gratioleae, subtribe Eugratioleae, and by Bentham and Hooker (1876) and Wettstein (1891) in its presently accepted circumscription, this taxon includes a large number of manifestly related genera with the exception of *Monttea* and *Melosperma* which are surely out of place here. To the tribe as delimited by Wettstein should be added (1) *Leucocarpus, Berendtiella,* and *Hemichaena* from the Cheloneae *(sensu* Wettstein), three genera which possess a combination of floral characteristics indicating their close alliance with *Mimulus,* and (2) *Capraria* and *Scoparia* from the Digitaleae *(sensu* Wettstein), two genera possessing the reticulate seeds, capsules, and typical glands characteristic of many Gratioleae. *Capraria* and *Scoparia* were originally placed in the Digitaleae by Bentham (1846) although the exterior position of the posterior corolla lobes in the bud excludes these genera from the Rhinanthoideae.

KEY TO GENERA

1. Leaves alternate; stamens 4 or 5; corolla mostly essentially actinomorphic.

4. *Capraria*

1. Leaves opposite or verticillate; at least the posterior stamen lost or variously reduced; corolla more or less zygomorphic.

2. Anther cells wholly confluent; plant acaulescent.

15. *Limosella*

2. Anther cells distinct; plants caulescent.

3. Leaves pinnatifid; capsule linear-attenuate; seeds spirally ridged.

16. *Schistophragma*

3. Leaves not pinnatifid (rarely palmatifid with pinnatifid segments); capsule broader, globose to lanceolate; seed not spirally ridged except in certain species of *Stemodia*.

4. Anther cells stiped.

5. Pedicels bibracteolate at base; corolla xanthic or white; capsule septicidal; herbage with tendency to blacken in drying.

5. *Mecardonia*

5. Pedicels bibracteolate at apex (just beneath calyx) or ebracteolate; corolla cyanic or white; capsule septicidal and usually also loculicidal; herbage not blackening in drying.

6. *Stemodia*

4. Anther cells sessile.

6. Fruit a loculicidal capsule or a berry; inflorescence racemose with ebracteolate pedicels or of bracteolate cymes.

7. Inflorescence of bracteolate cymes.

8. Fruit baccate.

7. *Leucocarpus*

8. Fruit capsular.
red or orange-red.

9. Calyx tubular-campanulate, 5-dentate; corolla

8. *Berendtiella*

9. Calyx campanulate, 5-lobate; corolla yellow.

9. *Hemichaena*

7. Inflorescence racemose, pedicels ebracteolate.

10. Calyx tube 5-angled, longer than the teeth; flowers in axils of opposite leaves.

10. *Mimulus*

10. Calys tube not angled, shorter than the teeth; flowers alternate in a terminal raceme.

11. *Mazus*

6. Fruit a septicidal, or both septicidal and loculicidal, capsule; inflorescence racemose with bracteolate or ebracteolate pedicels.

11. Corolla rotate, hirsute within over bases of all lobes; corolla lobes and stamens 4.

3. *Scoparia*

11. Corolla neither rotate nor hirsute within over bases of all lobes; corolla lobes 3, 4, or 5; stamens 2 to 4.

12. Anther cells parallel; pedicels bibracteolate or ebracteolate; anterior filaments without projecting knob-like processes.

13. Corolla xanthic, tubular-funnelform; sepals narrow, subequal; connective expanded, wider than the anther cells; filaments 4, anterior pair antherless (rarely filaments only 2); corolla lobes 5; pedicels bracteolate; leaves linear to ovate, entire or denticulate.

2. *Gratiola*

13. Corolla cyanic or white, not tubular-funnelform; sepals slightly or strongly dissimilar; connective not expanded; filaments 4, 3, or 2 (when 2, the posterior pair disappearing); corolla lobes 5 to 3; bracteoles present or absent; leaves entire, serrate, crenate, or rarely palmatifid.

1. *Bacopa*

12. Anther cells divergent; pedicels ebracteolate; anterior filaments often with projecting, knob-like processes.

14. Sepals united over ¾ their length, equaling or slightly longer than the lanceolate to elliptic, acute capsule; calyx often winged; stamens with anthers 4.

14. *Torenia*

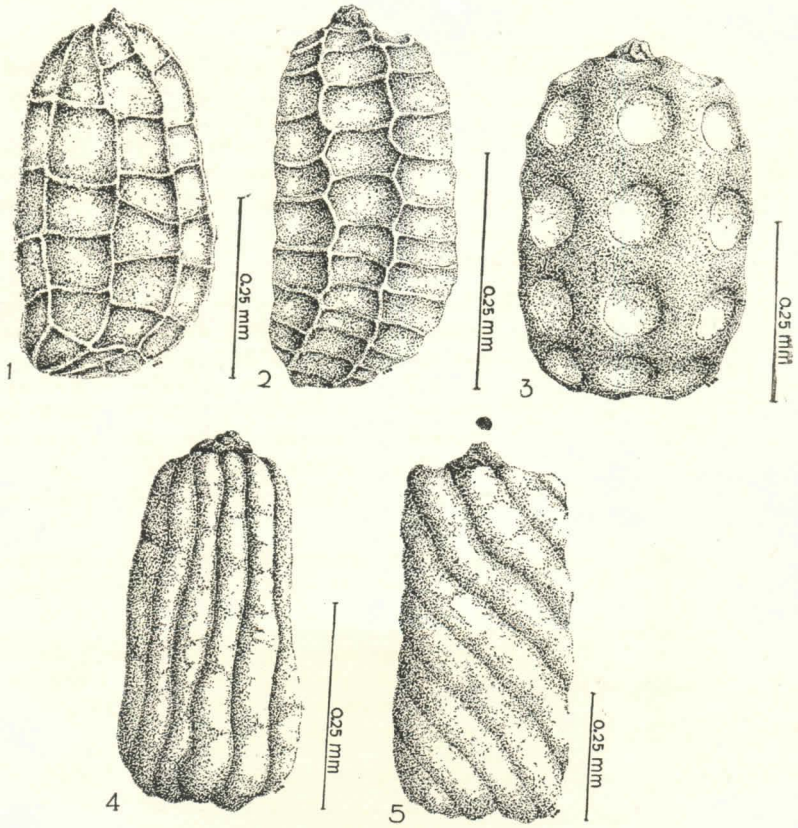
14. Sepals nearly or quite free to the base or united only about ½ their length, in the latter case the capsule either much longer than the calyx or oval with rounded apex; calyx not winged; stamens with anthers 2 or 4.

15. Corolla 5-lobed with narrow posterior lip much shorter than the widely spreading anterior lip; sepals 5; filaments 4.

12. *Lindernia*

15. Corolla 4-lobed, the three posterior lobes about equal, the anterior longer; sepals 4; filaments 2.

13. *Micranthemum*



SEED TYPES IN THE GRATIOLEAE. 1. reticulate-**Bacopa** type (B. Monnieri). 2. reticulate-**Lindernia** type **L. anagallidea.** 3. pitted-**Torenia** type (T. Fournieri). 4. longitudinally furrowed **(Stemodia verticillata).** 5. spirally furrowed-**Schistophragma** type **(S. pusilla).**— DRAWINGS BY SAMUEL H. GROVE, JR.

1. BACOPA Aubl., Hist. Pl. Guiane Franc. 1: 128. 1775. *(Moniera* Juss.; *Bramia* Lam.; *Herpestis* Gaertn.; *Hydranthelium* HBK.; *Caconapea* Cham.; *Monocardia* Penn.).

   About 60 species, mostly in the New World tropics; about a dozen species in Central America. Type species, *B. aquatica* Aubl. Reference: Pennell (1946).

2. GRATIOLA L., Sp. Pl. 17. 1753.

   About 20 species of wide distribution, mostly in temperate zones; one species in Guatemala. Type species *G. officinalis* L.

3. SCOPARIA L., Sp. Pl. 116. 1753.

   About 20 species of tropical and subtropical America; two are found in Central America. Type species, *S. dulcis* L. Reference: Fries (1907), Chodat (1907-08).

4. CAPRARIA L., Sp. Pl. 628. 1753. *(Pogostoma* Schrad.).

   About five species of tropical and subtropical America, one naturalized in parts of the Old World; in Central America occur three species. Type species, *C. biflora* L. Reference: Sprague (1921).

5. MECARDONIA R. & P., Fl. Peruv. et Chil. Prod. 95. 1794. *(Pagesia* Raf.).

   Species about 15, of North and South America, ranging from Maryland, Missouri, and Baja California to Argentina; two species occur in Central America. Type species, *M. ovata* R. & P. Reference: Pennell (1946).

6. STEMODIA L., Syst. Nat. ed. 10. 1118. 1759. *(Lendneria* Minod).

   About 40 species in Asia, Africa, Australia, and the Americas. Minod, the monographer of the New World representatives, lists 31 species, 5 of which occur in Central America. Two additional Central American species have been described since Minod's paper appeared. Type species, *S. maritima* L.

   The various segregates of *Stemodia* which have been proposed by Minod and Pennell after studies of New World representatives await verification of their

generic status which can come only after a study of all members of *Stemodia.* It may be, as in the case of *Bacopa,* that by keeping the segregates together in one genus, a more lucid picture of their relationships may be obtained. Reference: Minod (1918).

7. LEUCOCARPUS D. Don, in Sweet, Brit. Flow. Gard. II. pl. 124. 1831.

Probably monotypic, ranging from southern Mexico to Bolivia. Type species, *Conobea alata* Graham.

8. BERENDTIELLA Wettst. & Harms, in Engl. & Prantl, Pflanzenf. Register 459. 1899.
(Berendtia A. Gray).

Four species of Mexico and Central America; one in Guatemala. Type species, *Berendtia Ghiesbrechtii.* A. Gray.

9. HEMICHAENA Benth., Pl. Hartw. 78. 1841.

Monotypic genus of southern Mexico, Guatemala, and Costa Rica. Type species, *Hemichaena fructicosa* Benth.

10. MIMULUS L., Sp. Pl. 634. 1753.

About 150 species, most numerous in the western United States, but also in South Africa, eastern Asia, Australia, New Zealand, and western South America; two species are known in Guatemala. Type species, *M. ringens* L. Reference: Grant (1924).

11. MAZUS Lour., Fl. Cochinch. 385. 1790.

About 20 species, chiefly Indo-Malayan and Australasian; one species adventive in Costa Rica. Type species, *M. rugosus* Lour.

12. LINDERNIA All., Misc. Taurin. 3: 178. 1766.
(Vandellia L.; *Ilysanthes* Raf.).

Species about 70, in tropical and temperate regions of both hemispheres; five species in Central America. Type species, *L. pyxidaria* All. Reference: Pennell (1935); Mukerjee (1945).

13. MICRANTHEMUM Michx., Fl. Bor. Amer. 1: 10. t. 2. 1803.
(Globifera J. F. Gmel.).

Two species, of eastern North and South America and Cuba; one species in Central America. Type species, *Anonymos umbrosa* Walt.

14. TORENIA L., Sp. Pl. 619. 1753.

Species about 70, found in Asia, tropical Africa, and tropical America; two species occur in Central America, one an escape from cultivation, the other probably adventive from the Old World tropics. Type species, *T. asiatica* L.

15. LIMOSELLA L., Sp. Pl. 631. 1753.

Species about 15, nearly cosmopolitan; one known in Guatemala. Type species, *L. aquatica* L. Reference: Glück (1934).

16. SCHISTOPHRAGMA Benth., in DC. Prod. 10: 392. 1846.

Two species, ranging from southern New Mexico and Arizona to Colombia; one species in Central America. Type species, *S. pusilla* Benth.

LIMNOPHILA R. Br., a genus previously known only from Asia, Africa, and Australia, was reported by Suessenguth (1942) to be represented in Costa Rica by *L. costaricensis* Suesseng.

CONOBEA *scoparioides* (C. & S.) Benth., a plant widespread through eastern lowland South America, was reported by Hemsley (1882) from southern Mexico. Perhaps it will eventually be found in Central America.

TRIBE II. CHELONEAE

As presented by Bentham (1846) and enlarged by Bentham and Hooker (1876) and Wettstein (1891), the Cheloneae are an assemblage of genera whose principal common characteristic is the cymose disposition of the flowers. As the result of the use of this chracteristic as the principal one defining the Cheloneae, including herein all Scrophulariaceae (except Calceolarieae) with such inflorescences, this tribe possess a heterogeneity equalled in the family only by the Digitaleae *sensu* Wettstein. Certain steps, briefly summarized here, have been taken in the redefinition of the Cheloneae: *Collinsia* and *Tonella* were removed by Bellini (1907) to the new tribe Collinsieae; the tribe Russelieae was established by Pennell (1920) for the genus *Russelia; Synapsis* has been transferred to the Bignoniaceae

(Urban, 1926); and as indicated in the present paper, *Leucocarpus, Hemichaena,* and *Berendtiella* should stand near *Mimulus* in the Gratioleae. Even with these taxa removed, the Cheloneae as now constituted are an obviously artificial tribe, the relationships of whose genera should be based on characteristics other than the cymose inflorescences. The genera retained in the Cheloneae in the present paper and those retained in this tribe by Pennell (1935) are characterized by the persistence of the anantherous posterior filament.

To the Cheloneae have been referred several genera which seem somewhat anomalous in the Scrophulariaceae, including *Paulownia, Wightia, Brookea, Brandisia,* and *Dermatocalyx*. The last-named genus, with representatives in Central America, concerns us here. As Monachino (1949) has indicated, *Dermatocalyx* Oerst., traditionally included in the Scrophulariaceae, and *Schlegelia* Miq., referred to the Bignoniaceae, may well be congeneric. Thus is emphasized once again the problem of so-called "borderline" genera between the Scrophulariaceae and Bignoniaceae. So far as *Dermatocalyx* and *Schlegelia* are concerned, the family to which they may be correctly referred remains to be determined, although is should be pointed out that placental and seed characteristics of these taxa definitely point to the Scrophulariaceae.

KEY TO GENERA

Inflorescence racemose; sterile filament well developed, as long as or somewhat shorter than the posterior stamens; shrubs.

18. *Tetranema*

Inflorescence cymose; sterile filament well developed or much reduced.

Sterile filament very much reduced; capsule loculicidal.

17. *Uroskinnera*

Sterile filament well developed; capsule septicidal, the valves entire or two-fid.

19. *Penstemon*

17. UROSKINNERA Lindl., in Gard Chron. 1857: 36. 1857.

A genus of four species confined to southern Mexico and Guatemala; Guatemalan species two. Type species, *U. spectabilis* Lindl. Reference: Schultes (1941).

18. TETRANEMA Benth., in Bot. Reg. pl. 52. 1843. (*Allophyton* Brandegee).

A genus of three known species, in southern Mexico and northern Central America; Central American species two. Type species, *T. mexicanum* Benth. Reference: Pennell (1952).

19. PENSTEMON Mitch., Nov. Gen. Pl. Virg. 36. 1769.

About 230 species, mostly in western United States, but extending from Alaska to Guatemala and with one species in eastern Asia; perhaps three species in Central America. Type species, *P. laevigatus* Sol.

TRIBE III. RUSSELIEAE

This tribe includes the single genus *Russelia* Jacq., characterized by the slender hairs which fill the capsule and between which are scattered seed, a character unique in the Scrophulariaceae.

20. RUSSELIA Jacq., Enum. Pl. Carib. 25. 1760.

Described species about 45 in tropical America; perhaps 8 species in Central America. Type species, *R. sarmentosa* Jacq. Reference: Robinson (1900).

TRIBE IV. VERBASCEAE

A tribe consisting of two genera, native in the Old World, but with several representatives adventive and often naturalized in the New World.

21. VERBASCUM L., Sp. Pl. 177. 1753.

About 250 species, natives of Eurasia; one or two species have been recorded as adventive in Central America. Type species, *V. thapsus* L.

TRIBE V. LEUCOPHYLLEAE

A small New World tribe of two or three genera.

22. EREMOGETON Standl. & L. Wms., in Ceiba 3: 173. 1953.
(Ghiesbreghtia A. Gray).
One species in southern Mexico and Guatemala. Type species, *Ghiesbreghtia grandiflora* A. Gray.

TRIBE VI. HEMIMERIDEAE

A tribe of about 7 genera, native to southern Africa and tropical America.

KEY TO GENERA

Corolla blue or violet, not resupinate; the tube not split to the base between the posterior lobes; minute appendage at the base of the anterior lobes; seed brown to yellow-brown, reticulate, the reticulum much raised, wing-like, interspaces deep.
23. *Angelonia*

Corolla resupinate, orange, the tube split to or almost to the base between the posterior lobes; no appendage at the base of the anterior lobes; seeds blackish, longitudinally furrowed.
24. *Alonsoa*

23. ANGELONIA H. & B., Pl. Aequin. 2: 92. 1809.
About 25 species, in tropical America; two species known to occur in Central America. Type species, *A. salicariaefolia* H. & B.

24. ALONSOA R. & P., Syst. Veg. Fl. Peruv. et Chil. 150. 1798.
About 7 species, in tropical America; two known from Central America. Type species, *A. caulialata* R. & P.

TRIBE VII. CALCEOLARIEAE

Tribe consisting mainly of the following genus, the largest of the genera of the Scrophulariaceae in the New World.

25. CALCEOLARIA L., in Kongl. Vetensk. Acad. Handl. 31: 288. 1770.
500 or more species, ranging from southern Mexico to southern South America, also in New Zealand; 4 or 5 species grow in Central America. Type species, *C. pinnata* L. Reference: Kraenzlin (1907).

TRIBE VIII. ANTIRRHINEAE

A tribe of about 10 genera native to both the Old and New Worlds.

KEY TO GENERA

Throat of corolla open; corolla gibbous at base anteriorly; leaves triangular-cordate or -hastate, angular-lobed or coarsely toothed.

26. *Asarina*

Throat of corolla nearly or quite closed; corolla calcarate at base anteriorly; leaves cordate-orbicular or -reniform, with 3-7 bluntly acuminate lobes.

27. *Cymbalaria*

26. ASARINA Mill., Gard. Dict. ed. 7. 1759. (*Usteria* Cav., *Maurandya* Ort., *Lophospermum* D. Don).

Species about 16, of northern Central America, Mexico, southwestern United States, and southern Europe; 3 species known in Central America, at least one of them native. Type species, *Antirrhinum asarina* L. Reference: Munz (1926); Pennell (1947); Rothmaler (1943).

27. CYMBALARIA Hill, Brit. Herb. 113. 1756.

An Old World genus of about 10 species; 1 species somewhat established in Central America. Type species, *Antirrhinum cymbalaria* L.

27A. ANTIRRHINUM L., a genus of some 30 species, most numerous in the Mediterranean area but also in California and adjacent territory, is represented in Central America by at least one cultivated species.

27B. LINARIA Mill., a genus of about 100 species mostly of the Old World, has one or more cultivated representatives in Central America.

TRIBE IX. DIGITALEAE

As most recently defined (by Wettstein, 1891), the Digitaleae are a most remarkably heterogeneous tribe. Two genera, *Capraria* and *Scoparia,* long included in the Digitaleae, must be transferred to the Gratioleae as indicated in the present paper. Of the remaining genera of the Digi-

taleae nothing need be said here except to quote from Pennell (1935) concerning *Digitalis* and *Veronica:* "In view of the profound distinctions separating *Digitalis* and *Veronica,* it seems impossible to maintain both within the same tribe . . ."

28. DIGITALIS L., Sp. Pl. 621. 1753.

Species about 30, native to Europe and Asia; one species naturalized in mountain meadows of Costa Rica. Type species, *D. purpurea* L.

TRIBE X. VERONICEAE

A tribe perhaps large but at present of uncertain circumscription, native to mostly temperate latitudes of both hemispheres.

KEY TO GENERA

Stamens 3-5 (-8?); sepals 4-5 (-8?), united into campanulate calyx; seeds turgid, usually somewhat concave ventrally, convex dorsally, brown to black but with white, scurfy reticulum; leaves suborbicular-reniform, deeply cordate at base, crenate-lobulate.

29. *Sibthorpia*

Stamens 2; sepals 4 (very rarely 5), essentially distinct; seeds flattened, often strongly so, plane or convex ventrally, plane or convex dorsally, yellow to brown-yellow, almost smooth to rugose; leaves neither suborbicular-reniform nor deeply cordate at base.

30. *Veronica*

29. SIBTHORPIA L., Sp. Pl. 631. 1753.

Six or more species, in Africa, Asia, Europe, Central and South America; two species at present recorded from Central America; further study of the genus in the New World will probably result in the recognition of more species. Type species, *S. europaea* L.

30. VERONICA L., Sp. Pl. 9. 1753.

A genus of about 250 species, mostly of the Old World temperate zone; two native and several naturalized species in Central America. Type species, *V. officinalis* L. Reference: Pennell (1921).

30A. HEBE Comm., a genus of about 140 species of shrubs or small trees native mostly in New Zeland, character-

ized by *Veronica*-like flowers borne in axillary racemes, is represented in Central America by one or more cultivated species.

TRIBE XI. GERARDIEAE

Perhaps 30 genera of tropical to cool temperate latitudes of both the Old and New Worlds.

KEY TO GENERA

1. Stamens with both anther cells developed; corolla campanulate or salverform, in the latter case the tube 8-15 cm long; calyx campanulate or tubular, in the latter case the tube 2.5-6 cm long.

   2. Corolla salverform; calyx tubular; seeds linear, in an ellipsoid capsule.

      31. *Escobedia*

   2. Corolla campanulate or subcampanulate; calyx campanulate; seeds not linear, or, if so, then capsule subglobose.

      3. Leaves lanceolate or triangular-lanceolate, dentate to subentire; calyx in anthesis about 20 mm long, greatly accrescent in fruit, or if smaller and only slightly accrescent, then densely hispid; corolla xanthic, nearly or quite included in the calyx, or white and conspicuously exserted; seeds linear.

         4. Corolla white, conspicuously exserted from calyx; calyx in anthesis about 20 mm long, greatly accrescent in fruit; fruiting pedicels 15-25 mm in length.

            32. *Melasma*

         4. Corolla xanthic, nearly or quite included in the calyx; calyx in anthesis 6-8 mm long, only slightly accrescent in fruit; fruiting pedicels up to 3 mm in length.

            33. *Alectra*

      3. Leaves linear or linear-subulate, entire or sparingly minutely lobed; calyx neither greatly accrescent in fruit nor densely hispid; corolla purple, pink, or white, conspicuously exserted; seeds not linear.

         5. Pedicels ebracteolate; anther cells of the same stamen equal; stem glabrous to sparingly scabrellous.

            34. *Gerardia*

5. Pedicels bibracteolate; one anther cell of each stamen smaller; stem hirsute-pubescent.

35. *Anisantherina*

1. Stamens with only one anther cell developed; corolla salverform, the tube less than 1.5 cm long; calyx tubular, the tube less than 1 cm long.

36. *Buchnera*

31. ESCOBEDIA R. & P., Syst. Veg. Fl. Peruv. et Chil. 159. 1798.

About 15 species in tropical America; five species known from Central America. Type species, *E. scabrifolia* R. & P. Reference: Pennell (1931).

32. MELASMA Berg., Descr. Pl. Cap. 162. 1767. (*Lyncea* Cham. & Schl.; *Eutheta* Standl.).

Described species 5, in tropical America and tropical and South Africa; one species in Guatemala and Honduras. Type species, *M. scabrum* Berg. Reference: Melchior (1940).

33. ALECTRA Thunb., Nov. Gen. Pl. 81. 1784.

About 40 species, in tropical and subtropical regions of both hemispheres but mainly of Africa; Central American species 1. Type species *A. capensis* Thunb. Reference: Melchior (1941).

34. GERARDIA Benth., in DC. Prod. 10: 514. 1846.

About 60 species, in temperate or slightly in tropical latitudes of the Americas; two species reported from Central America. Type species, *G. purpurea* L. Reference: Pennell (1929).

35. ANISANTHERINA Penn., in Mem. Torr. Bot. Club 16: 106. 1920.

One species of Panama, British Honduras, Cuba, and Brazil. Type species, *Gerardia hispidula* Mart. Reference: Pennell (1929).

36. BUCHNERA L., Sp. Pl. 630. 1753.

About 100 species, mostly tropical and in the Old World; about 5 species in Central America. Type species, *B. americana* L.

TRIBE XII. EUPHRASIEAE

About 30 genera, mainly of the north temperate zone, but also in the mountains in the tropics of both hemispheres

and the south temperate zone in South America and New Zealand.

KEY TO GENERA

Leaves alternate, or the lowest opposite, often chiefly radical; anther cells neither strongly calcarate at base nor woolly.

Anther cells unequally placed, the upper one attached by its middle; anterior lobe of corolla very small, much exceeded by galea; floral leaves often colored with red, yellow, or white.

37. *Castilleja*

Anther cells equally placed; anterior lip of corolla of same length as or but little exceeded by galea; floral leaves green.

38. *Pedicularis*

Leaves opposite, not chiefly radical; anther cells usually strongly calcarate at base, woolly.

39. *Lamourouxia*

37. CASTILLEJA Mutis, in L. f. Suppl. Syst. Veg. 47. 1781.

About 200 species, mostly New World, but one extending to northern Asia; about 8 species in Central America. Type species, *C. fissifolia* L. f. Reference: Eastwood (1909).

38. PEDICULARIS L., Sp. Pl. 607. 1753.

A genus of some 500 species, mostly of the north temperate zone, but in the New World extending south to the Andes of Ecuador; one species known from Guatemala. Type species, *P. sylvatica* L.

39. LAMOUROUXIA HBK., Nov. Gen. et Sp. 2: 335. 1818.

About 30 species, in tropical America; six species known to occur in Central America. Type species, *L. virgata* HBK. Reference: Robinson & Greenman (1895).

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