

A TAXONOMIC REVISION OF THE GENUS
CHAMAESYCE (EUPHORBIACEAE) IN
THE CARIBBEAN

By
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INTRODUCTION

The genus Chamaesyce (Euphorbiaceae) is represented on all continents, and, while many species are widespread in temperate areas, the genus reaches its greatest diversity in tropical and subtropical regions.

In 1941 Wheeler revised the group in North America exclusive of Mexico and southern Florida, treating it as a subgenus of the Linnaean genus Euphorbia. He found areas with high concentrations of species centered in Arizona and in Texas, and suggested that a similar concentration might exist in south Florida involving species with a Caribbean affinity. The most recent treatment of the genus in Florida by Small (1933) indicates the same thing, since eighteen species confined to Florida are included in the twenty-nine that he lists for the state. Many of these are from the pinelands around Miami or on the lower Keys, areas with very distinctive plant associations, but not generally rich in endemic species. The plants of south Florida are known to have strong floristic ties both with Cuba and the Yucatan peninsula, and with the Bahama Islands, and it was clear that the Florida species could not be dealt with effectively without considering those of the surrounding area. The Caribbean as a whole - here considered to include southern Florida as well as the Bahamas and the Greater and Lesser Antilles, but excluding Trinidad and the islands of the Dutch West Indies off the coast of Venezuela - does, however, make up a contained unit floristically, and is a convenient area for study. It has the added advantage that no

synthesis of the genus for this area has been attempted since Boissier's treatment of Euphorbia sensu lato on a worldwide basis in 1862, although certain regions have been extensively collected since that time, and the genus revised in these localities.

Regional floras with relevant material include The Bahama Flora by Britton and Millspaugh (1920), which draws on Millspaugh's strong interest in Chamaesyce, Fawcett and Rendle's Flora of Jamaica (1920), Scientific Survey of Porto Rico and the Virgin Islands by Britton and Wilson (1924), and Flora de Cuba by Alain (1953). There is also material relating to Hispaniola and to Cuba in Urban's Symbolae Antillanae (1898-1928), and in the reports of Ekman's collecting trips in Haiti (Urban and Ekman, 1929).

The consequence of this publication of works covering only small geographic areas has been the description of the same plant under different names from different parts of its range. It is fortunate that much of the type material for these names is still accessible, and it has proved possible in the course of the study to reduce many of them to synonymy. Material from twenty-two herbaria has been examined, and the large number of specimens available of many species has given valuable indications of the extent of morphological variation to be expected and taken into account when considering the validity of names about which there is doubt.

Some 4500 sheets have been studied and additional material, as well as valuable type specimens, examined during visits to other institutions. The herbaria from which material has been seen are listed below, together with the abbreviations (most from Lanjouw and Stafleu, 1964),

by which they will be referred to in the text.

A	Arnold Arboretum, Cambridge, Massachusetts
BM	British Museum (Natural History), London
BRASS	Herbarium of Archbold Biological Station, Lake Placid, Florida
BUS	University of Miami, Coral Gables, Florida
DUKE	Duke University, Durham, North Carolina
E	Royal Botanic Garden, Edinburgh, Great Britain
F	Chicago Natural History Museum, Chicago, Illinois
FLAS	University of Florida, Gainesville, Florida
FSU	Florida State University, Tallahassee, Florida
GH	Gray Herbarium of Harvard University, Cambridge, Massachusetts
IJ	Institute of Jamaica, Kingston, Jamaica
K	Royal Botanic Gardens, Kew, Surrey, Great Britain
LINN	Linnaean Society Herbarium, London
MO	Missouri Botanical Garden, St. Louis, Missouri
NCU	University of North Carolina, Chapel Hill, North Carolina
NSC	North Carolina State University, Raleigh, North Carolina
NY	New York Botanical Garden, New York
PUR	Purdue University, Lafayette, Indiana
RUS	Louisiana Technical College, Ruston, Louisiana
UCWI	University of the West Indies, St. Andrews, Jamaica
US	U. S. National Museum, Washington, D. C.
USF	University of South Florida, Tampa, Florida

GENERAL DISCUSSION

1. History

Many taxonomists have treated Chamaesyce as no more than a subdivision of the large, diverse genus Euphorbia L. To a certain extent the choice of which of these generic names to use is an academic matter, but, insofar as the schemes of biological classification are intended to have a natural basis, the collection of species into a genus should reflect a close degree of common ancestry, and the thesis of workers who would split Euphorbia into several genera is that such a division represents this close relationship better than would the maintenance of the broad genus.

The genus Euphorbia was described by Linnaeus in Genera Plantarum ed. 5 (1754), and was delimited on the basis of its floral characters. Reference was made to the earlier names Euphorbium proposed by D'Isnard in 1720 for much the same group, and to Tithymalus and Tithymaloides, both of which were used by Tournefort (1700), one of the first botanists to make such formal definitions of groups rather than simply listing species.

The "sexual system" of classification followed by Linnaeus divided plants into Classes according to the number of stamens present in the flower, with these Classes then divided into Orders, usually formed by reference to the number of styles. The genus Euphorbia was placed in the third Order of the eleventh Class, DODECANDRIA TRIGYNIA,

since Linnaeus had found that twelve or more stamens were usually present, and that there were three styles. The description in Genera Plantarum stresses the characteristic calyx of the genus, with its segments joined to form a four- or five-toothed cup and petals set on the margin alternating with the teeth, and also the tricoccate capsule with a single seed in each locule. Some of the variety to be found in the shape of the petals and in the form of the stem is also mentioned. Linnaeus was familiar with some fifty-six species at this time, and his descriptions in Species Plantarum (1753) indicate that he felt the characteristic flower to be a strong enough factor to hold together in one genus such diverse morphological forms as the cactus-like E. mammillaris, the small, prostrate E. maculata, and the erect E. lathyrus with its umbellate branches and crescent-shaped petals.

The genus, characterized by the flower type, was accepted by most authors of the period, although Wheeler (1943) points out that as early as 1754 Miller had proposed that part of the genus, homogeneous for certain morphological characters, be split off under another name.

In 1818 Robert Brown, an Edinburgh surgeon and keen botanist, published the results of anatomical work which showed that the flower which Linnaeus described was, in fact, an inflorescence. The tricoccate ovary was actually a terminal female flower with the perianth parts reduced to a vestigial calyx, and below this in the inflorescence were groups of male flowers, each reduced to a single stamen. The cup-like calyx which Linnaeus described was an involucre of fused bracts, while the petals were glands and associated appendages set on the upper rim of the involucre. The name cyathium was given to this type of inflorescence.

This work of Brown weakened the case for maintaining the diverse forms under one genus because it is inconsistent with usage in the rest of the plant kingdom, and because Linnaeus would presumably not have defined a genus on this basis of a shared inflorescence type. The parallel has been drawn with the situation in the Compositae, which are defined as a family by the capitate inflorescence and by reduction in some flower parts, and which would form a genus of some 20,000 species if these were considered generic rather than family characters. This obviously represents neither a realistic appraisal of the close degree of common ancestry which is usually sought for a genus, nor an efficient means of data retrieval which is one of the tacit aims in setting up such a system of classification.

In spite of this - or perhaps because Brown's results were not universally accepted at first (Haber, 1925) - many of the diverse species described in the hundred years after the publication of Species Plantarum were named using Euphorbia in its broad sense, and the stamp of approval was given to the practice by Boissier in a series of publications culminating in his monumental treatment of the family with J. Muller in de Candolle's Prodromus (1862). The characters of the inflorescence were still used to define the genus, but by this time the number of species known had swollen to the point at which internal subdivision of the genus was standard practice. Persoon (1806), Rafinesque (1817), and Reichenbach (1841) had all set up subgenera, while Haworth (1827) and Roeper (1828) had divided the genus into sections. Boissier himself used sections and subsections, but was apparently dissatisfied with the bases for his division, since he comments in his notes on the genus (1862) "The

characters of the sections are often trifling and open to exception but better ones cannot be found" (translation by Croizat, 1936a). We may assume from this that Boissier maintained the genus Euphorbia in its widest sense not only because of the common inflorescence type, but also because he could find no consistent characters on which to divide it.

Many more species have been added to the genus since the time of Boissier, until today Scholz (1964) estimates that it includes some 1600 entities.

The retention of the genus in its broad sense has been opposed on a number of grounds, and attempts have been made from time to time to justify the segregation of certain groups. Croizat (1936a) has pointed out that the possession of a cyathium is not restricted to this genus, but occurs in several others recognized by even the most conservative taxonomists. Among these Pax (who had written the account of the family for Engler and Prantl's Pflanzenfamilien in 1890) is quoted as saying in 1924 that the cyathium was the main character of the Tribe Euphorbieae rather than the genus Euphorbia. Croizat also suggests that the species in Euphorbia are more variable in their degree of evolution than would be expected in a single genus, and that the cyathium is not an anatomic constant, and concludes that the use of the single character of the presence of a broadly similar inflorescence, cutting across other indications of relationship as it does, is unsound from a taxonomic point of view.

Evidence from new areas of taxonomic research confirms the lack of homogeneity in the genus. Perry (1943) reports that a survey of

somatic chromosomes in the Euphorbiaceae showed a considerable degree of uniformity in size, shape, and basic number within all genera except Euphorbia, which seemed to include three distinct groups.

Studies on the electrophoresis of latex by Moyer (1934) gave groupings within the genus corresponding roughly to the sections of Boissier. The work on pollen morphology by Erdtman (1952) and Punt (1962), however, gave no clear divisions, although some of the patterns of exine surface showed differences through the genus. A difficulty with interpreting these studies lies in the fact that no voucher specimens are available, so that any conclusions drawn must be tempered by the uncertainty as to the exact taxonomic entities represented by the names used.

Haber (1925), while not favoring a division of the genus, found that the sections described by Pax in Engler and Prantl's Pflanzenfamilien (1890) showed little affinity in terms of anatomy and morphology of the cyathium.

For these reasons, together with the diversity of habit and form in the group, it is hard to accept that Euphorbia fulfills the condition of relatively close ancestry which is usually imposed when judging the soundness of a genus.

It is unfortunate that no comprehensive evaluation has been made since Boissier's work more than a century ago, since many of the proposals for segregating groups which have seemed inconsistent with usage in the rest of the unchanged genus, might well have been perfectly acceptable in the light of an overall revision. One such segregation to which this criticism of inconsistency might apply is the separation of Chamaesyce

as a genus without considering the equally valid genera Tithymalus, Agaloma and Poinsettia. It is beyond the scope of the present work to examine all these genera, but Chamaesyce is such a discrete group in the area under consideration, and so easily distinguishable from other members of Euphorbia sensu lato, that it will be accepted here as a distinct genus. A case will be presented for this division below, but final judgment of its validity must wait until a revision of the complete Tribe Euphorbieae of the Family Euphorbiaceae has been undertaken.

11. The Segregation of the Genus Chamaesyce

Chamaesyce was first proposed as a segregate genus by S. F. Gray in 1821 with a single species which would appear automatically to become the type species. Wheeler (1943), however, supports Millspaugh (1909) in designating Euphorbia peplis L. as type since Gray was clearly describing this species under his name C. maritima and, in fact, gave E. peplis in synonymy, thus making the later name illegitimate. The type specimen of E. peplis L. in the Linnaean Herbarium becomes the type of C. maritima S. F. Gray and of the genus Chamaesyce S. F. Gray.

Wheeler (1943) points out that the name had been validly published as a subgenus, and suggested provisionally as a genus, by Rafinesque in 1817, but such provisional publication is not acceptable. Gray was justified in selecting this generic name even though Anisophyllum had been proposed for the same group at this taxonomic level by Haworth in 1812, since that name was preoccupied by Jacquin's use of it in another sense in 1763.

Gray took the name Chamaesyce from Dioscorides, a Greek herbalist of the first century A.D., who compiled lists of plant names and uses from medical works and from herb-gatherers and peasants (Gunther, 1959). The word is a transliteration of two Greek components, chamae, of the ground or low-growing, and Syce which was one of the names used for the fig, and the association is probably due to the presence in members of the genus Euphorbia of a milky latex similar to that found in fig trees. The name was listed as a synonym for the genus Euphorbia by Wiman (1752)

with a similar comment that it was a type of low-growing fig (quasi humilis ficus).

Gray's name was not widely adopted for a number of years after publication, but the cohesion of the species which belong in the genus is indicated by their treatment by subsequent authors. Roeper published the group as Euphorbia section Anisophyllum in 1828, while Rafinesque changed his mind after his publication of the subgenus Chamaesyce in 1817 to treat them as a set of related genera in 1838. They were put back into a single category as Euphorbia subgenus Anisophyllum Caesalp. ex Reichenbach in 1841, treated as the genus Anisophyllum by Klotzsch and Garcke (1859), and finally the definitive work by Boissier in 1862 followed Roeper by using section Anisophyllum for the group.

Croizat (1936a, 1936b, 1937) has examined these species which have been combined so consistently by authorities on the family. They share a number of morphological characters, which have been used by the various authors in an attempt to delimit the group at the particular taxonomic level which they favored. Boissier (1862), for example, used leaf arrangement and shape, stipule shape, inflorescence type, number and form of glands and the ecarunculate nature of the seed in his comparisons with the other twenty-six sections which he recognized, while Wheeler (1941), considering only New World species, separated four subgenera on the basis of number and form of glands and their appendages, and on leaf arrangement and stipule development. Boissier's dissatisfaction with his separation has already been mentioned, and Wheeler is equally pessimistic about his success in defining his divisions. There

is general agreement in the literature, however, about the characters shared by this group of species. They all have opposite, petiolate leaves with oblique bases and interpetiolar stipules. All have an interesting distribution of chlorophyll-bearing tissue in the leaves, where it surrounds the veinlets leaving clear areas between them, and all have cyathia with four glands whose appendages, if present, are petaloid, never lunate. The fifth gland is either obsolete or much reduced and set in a sinus through which the capsule stalk often droops at maturity, and, finally, the seeds are ecarunculate.

None of these characters is restricted to this group of species, but Croizat (1936a, 1936b) has demonstrated that a particular type of branching, in which the main axis aborts early and is replaced by one or more secondary axes, is peculiar to the group, and serves as a diagnostic feature. Here, then, is a discrete character of a fundamental nature - the presence or absence of a type of branching - which gives an absolute separation of a group of species from the heterogeneous Euphorbia sensu lato. What is more, the species showing this type of branching share many other morphological features, and have been accepted as a cohesive group by most authorities on the family. On these grounds their segregation as the distinct genus Chamaesyce appears well justified.

This separation has been adopted in the present work, and is particularly appropriate in the New World where the species of Chamaesyce are easily distinguishable from other members of the family on even a casual examination. The usage is by no means novel in this area in that, of the floras mentioned in the Introduction, only those by Urban and by Fawcett and Rendle maintain Euphorbia sensu lato. The split has not been

as widely adopted in other regions, however, and an assessment of its value on a worldwide basis must await a more comprehensive study.

III. Morphology

The largest members of the genus Chamaesyce are found in the Hawaiian Islands where some species have become arborescent. In the Caribbean no such development is found, although one species, C. vaginulata (Griseb.) Millsp., has strong affinities with species of the Galapagos Islands, and exhibits some of the peculiarities of structure otherwise found only in endemics of that group. The remarks in the following sections are intended to be limited to species growing under natural conditions in the Caribbean, which include annual and perennial herbs of prostrate, ascending or erect habit, and shrubs and subshrubs of open form reaching a height of one to six meters.

Roots

The root system is not extensive, and the laterals are slender and branching. The main root in annual species is substantial and little branched, and may become quite thick in plants living beyond their normal season. Some of the perennials develop a short, thick taproot, which develops buds at or below the surface of the ground throughout the life of the plant, and often regardless of whether the above-ground portions have died back or maintained their growth.

Stems

The main axis is interrupted by the abortion of the growing point after the production of one pair of true leaves. Lateral branches (secondary axes) develop from a point below the apex with no apparent relation to the position of the pair of leaves (Croizat, 1936b). If

only one secondary axis develops its thickening may obscure and eventually conceal its origin, but in species in which a number of branches grow (particularly those in which they lie prostrate) this apex is well marked.

On these secondary axes laterals (tertiary axes) may develop, either throughout the length, or only near the lower or upper end. A common form is the production of short, rather congested laterals from the upper nodes on which most of the cyathia develop. Branching appears to be alternate, with occasional production of other weaker branches at the node, often becoming dichotomous near the apex, and may be at an obtuse or acute angle with the stem. In the herbaceous species, stems are wiry and brittle, or wider and of softer texture, often becoming woody at the base. Rooting at the nodes is common in some species. Prostrate species form tight or loose mats to 5 dm. diameter, the erect herbaceous species may reach 6-8 dm.

Croizat (1936b) describes the growth of the secondary axes as sympodial with each node terminated by a bud, a cyathium or a capitulum, and the tertiary axes developed lateral to these. This is in agreement with Roesler (1824) who explains the apparently normal lateral branching as actually a reduction from the potential dichotomy which is expressed at times at the tips of branches (Wheeler, 1941). The strongly alternate branching which many species exhibit merely requires that the reduction of the branches of the dichotomy alternates at the nodes. The same pattern of branching may develop on tertiary axes, and rarely on those of higher orders.

In the systematic part of this study the word "stem" will be used to indicate the secondary axes, and "laterals" or "side branches" will

be used for tertiary and higher order axes. The aborted apex of the stem, from which the secondary axes develop, will be called the crown of the root for convenience in making comparisons with descriptions by other authors.

Leaves

Leaves are opposite on the stem, and more or less two-ranked. The blades are simple, membranous or sometimes coriaceous or sometimes somewhat fleshy, and broad or rarely almost linear, 1 x 1 to 35 x 15 mm. The base is inequilateral, usually markedly so, the margin entire or variously toothed and plane or somewhat revolute, and the apex round to acute or sometimes minutely apiculate. The veins are rarely prominent, but in thin leaves the concentration of chlorophyll-bearing cells around the conducting tissue with clear spaces between marks out the reticulation of the veinlets.

Petioles are short, and the interpetiolar stipules may be separate, or those on either side of the stem may be joined to the corresponding one from the paired leaf. Their texture is usually membranous, and the margins may be entire or variously toothed or parted. In some species the pairs of leaflets droop at night in well-marked nastic movement.

Cyathia

These are solitary and terminal, but often appear axillary when the growth of a lateral continues the axis. They are often borne on congested leafy laterals or in short-stalked lateral and terminal dichasia, and sometimes, by reduction, in leafless dichasial glomerules.

Each cyathium is itself a compound inflorescence, but strongly

simulates a single flower. A single terminal female flower with, at most, a vestigial calyx to represent the perianth, is surrounded by groups of male flowers, each flower reduced to a single stamen and interspersed by bracteoles. These are enclosed in a cup-like involucre made up of five foliaceous structures, united at their margins but with free tips. Between these, glands are borne on the rim of the cup, supplied by a trace from each of the adjacent foliar structures (Haber, 1925) and often with a petalloid appendage, which may be as long as, and up to four times as wide as, the subcircular or transversely elliptic gland. The fifth gland is obsolete or reduced to a linear structure, and the space between the two lobes which it would occupy becomes a sinus into which the stalk of the capsule often droops at maturity. The cyathia are short-peduncled or rarely sessile. The term lobe is used here and in the systematic section to indicate the free portion of the foliar structures which are fused to make up the involucre.

The glands appear moist under magnification, and may produce a substance attractive to insects. A large number of ants are often found on and around the plants, and may be the agent for cross-pollination.

Male Flower

An articulation between the pedicel and stamen indicates that these monandrous structures are each a reduced flower rather than simply floral parts. Each is subtended by a bracteole which may grow up between the flowers. The staminate flowers form in five fascicles, arranged opposite the lobes of the involucre, and in each fascicle the flowers develop centrifugally with respect to the cyathium axis. In our species five, or rarely fewer, to about thirty is the usual number of staminate

flowers to each cyathium. The number is relatively constant in a given species. The stamens are exerted at maturity, carried on elongated glabrous pedicels (Wheeler's term "androphore" is adopted for this pedicel in the systematic section). Dehiscence of the anthers is transverse, and the serial maturation of the flowers spans the time during which the female flower is developing.

Female Flowers

The single terminal flower is pedicillate (Wheeler's term "gynophore" will be used for this pedicel), with the perianth reduced to a vestigial three-lobed calyx or a mere disc below the ovary. The pistil has three united carpels, each with a single pendulous, anatropous ovule. The three styles are joined at the base or rarely free or connate for a greater distance, and are bifid for part of their length. The gynophore is glabrous or variously pubescent, and in most cases elongates with age and bends to lie in the sinus that marks the position of the fifth gland.

Fruit

This is a trilocular capsule with one seed in each chamber, usually roundly lobed or triangular but sometimes subspherical. Dehiscence is by longitudinal splitting at the sutures, and to a smaller extent at the angles. The base of the capsule is released first, and the seed may be thrown a short distance from the flower by the parting of the capsule wall.

Seed

The caruncle, which is so well developed in other species of Euphorbia sensu lato, is completely absent in Chamaesyce. The embryo

and endosperm are surrounded by a membrane and the testa, which may in turn be covered by a persistent cellulose layer. This layer and the testa may be patterned or sculpted.

The shape of the seed follows that of the trilocular capsule in which it develops. In the systematic section the faces to the outside of the capsule will be referred to as the dorsal faces, subtending the dorsal angle, and the other two as the ventral faces subtending the ventral angle. The seed is irregularly ovoid in longitudinal section with the ventral side flattened. In cross section it is four-angled, often obscurely so, but with the dorsal angle usually more acute and pronounced than the ventral, and the lateral angles intermediate between the two.

Vesture

The stems, leaves, cyathia, ovary and capsules may be glabrous or variously long- or short-hairy. The hairs are all simple, and may be single- or several-celled. In some species the surface of the leaves and young stems may be entirely minutely white-papillose, appearing almost granular under magnification.

Latex

All species have a milky latex to which various caustic properties have been ascribed.

Morphological characters have proved to be very plastic within many of the species examined. The habit of the herbaceous species often varies widely, with occasional erect specimens in species which are usually prostrate to decumbent, and with sprawling plants from species which are normally completely upright to ascending. The number of stems

growing from the root is a more constant feature, with prostrate plants more likely to have multiple stems than erect species, but the number often changes with the change in habit in the case of erect specimens of prostrate species.

The pubescence of the plant is usually reliable as a character when contrasted with the absence of hairs (there are exceptions to this among the south Florida species), but the degree of pubescence and even the form of the hairs present is likely to vary over a wide range within a species.

Leaf shape is variable, as might be expected, but in most cases there is also a strong likelihood of toothed margins on occasional leaves (or whole plants) of species which normally have entire leaves.

Cyathial characters in general show less plasticity, but the size and form of appendages is rarely reliable, and vestiture may differ widely from plant to plant or branch to branch. The same is true of capsular characters, but the seed has proved to be stable enough that characters relating to its morphology are often sufficient to key plants out, and certainly to confirm doubtful identifications.

SYSTEMATIC TREATMENT

CHAMAESYCE S. F. Gray, Nat. Arr. Brit. Pl., 2: 260. 1821.

Type: Chamaesyce maritima S. F. Gray. This is a superfluous name for Euphorbia peplis L., and the type specimen of this species in the Linnaean Herbarium (sheet 630-18) is thus the type for C. maritima and for the genus. Euphorbia subgenus Chamaesyce (S. F. Gray) House, Bull. N. Y. State Mus. 254: 470. 1924.

Anisophyllum Haworth, Syn. Pl. Succ., 159. 1812. Type:

Anisophyllum peplis (L.) Haw., designated by Wheeler, Rhodora 43: 110. 1941. Euphorbia section Anisophyllum (Haw.) Pax in Engler & Prantl, Nat. Pflanzenfam., 3(5): 104. 1891.

Euphorbia subgenus Chamaesyce Raf., Amer. Monthly Mag. 2: 119.

1817. Type: Euphorbia supina Raf.

Euphorbia section Anisophyllum Roeser in Duby, A. P. de Candolle,

Bot. Gall, ed 2, 1: 412. 1828. Type: Euphorbia peplis L., designated by Wheeler, Rhodora 43: 111. 1941.

Euphorbia subgenus Chamaesyce Caesalp. ex Reichenbach, Fl. Germ.

Excurs., 755. 1832. Type: Euphorbia chamaesyce L., designated by Wheeler, Rhodora 43: 111. 1941.

Ditritra Raf., Fl. Tell., 4: 114. 1838. Type: Ditritra hirta

Raf., designated by Wheeler, Am. Mid. Nat. 30: 465. 1943.

Endoisila Raf., Fl. Tell., 4: 114. 1838. Type: Endoisila

myrsinites Raf.

Aplarina Raf., New Fl. N. Amer., 99. 1838. Type: Aplarina prostrata Raf., designated by Wheeler, Rhodora 43: 111. 1941.

Annual or perennial herbs, often suffrutescent, or shrubs; prostrate to ascending or erect; glabrous or variously pubescent; milky latex in all parts. Main axis aborting, secondary axes few to many, wiry or thicker, sometimes rooting at nodes. Leaves opposite, petiolate with inter-petiolar stipules; blades expanded, bases inequilateral. Cyathia terminal but appearing axillary, solitary at nodes or clustered in cymes; lobes five, approximating glands; glands four or with fifth vestigial, alternating with lobes, with or without petalloid appendages. Staminate flowers monandrous, naked, few to many, maturing serially, - exerted when mature, anther dehiscence transverse. Pistillate flower solitary, terminal; perianth reduced to pad of tissue or vestigial calyx; ovary three-celled, each with a single ovule; styles three, free or joined at base, usually bifid for part of length. Capsule dehiscent at sutures. Seed ecarunculate, coat smooth or variously sculptured.

Plants of disturbed habitats, probably poor competitors in many cases. Many species favor sandy soils, either coastal or inland and often unstable, while others are restricted to pinelands whose characteristic flora is maintained by periodic burning. The most common species, C. maculata in Florida and C. hyssopifolia in the New World tropics as a whole, follow man, and are frequent as weeds in paved areas and cultivated or abandoned ground. Many species have a wide geographic range, passing unfavorable periods of the year as seed or with growth almost quiescent and quickly resumed when conditions improve. Seed production is abundant in most species.

The use of the taxonomic categories "species", subspecies", and "variety" in this work follows conventional lines (see, for example, Davis and Heywood, 1963). They are considered to constitute an hierarchy, and the increasing degree of morphological homogeneity as the rank of the group decreases is taken to imply a greater freedom of gene interchange within the group. The use of these three ranks is a compromise between the naming as a distinct taxon of any population which is prevented by any means from exchanging genes with other populations, whether or not morphological differences have become established, and the more classical approach of applying names only to taxa which are discrete by a set number of morphological characteristics.

Key to the Species of Chamaesyce in the Caribbean

- | | |
|---|--|
| 1. Much-branched shrub, low-growing or 2-6 m. tall | 2. |
| 1. Annual or perennial herbs, often woody at the base and suffrutescent, but rarely reaching 1 m. | 3. |
| 2. Leaves fleshy, subglobose or linear; closely branched with stems often almost prostrate | 1. <u>C. <i>vaginulata</i></u> . |
| 2. Leaves membranous, ovate to ligulate; branching divaricate, stems upright | 2. <u>C. <i>articulata</i></u> . |
| 3. Capsule glabrous | 4. |
| 3. Capsule pubescent | 24. |
| 4. Plants erect or ascending | 5. |
| 4. Plants prostrate to decumbent | 12. |
| 5. Leaf margins manifestly toothed, or, if entire, leaves ligulate | 6. |
| 5. Leaf margins entire or obscurely toothed below apex, leaves never ligulate | 10. |

6. Stems several to many from the crown of a heavy root-stock, wiry, rarely more than 1 mm. diameter 13. C. brittonii.
6. Stems few to several, thick, sometimes reaching 4 mm. diameter 7.
7. Cyathia few, borne singly or rarely in groups of two or three; plant perennial 12. C. parciflora.
7. Cyathia many, grouped on short leafy laterals or in glomerules; annual but sometimes perennating 8.
8. Capsule less than 1.4 mm. long; cyathia usually in peduncled leafless glomerules 9. C. hypericifolia.
8. Capsule more than 1.6 mm. long; cyathia on leafy laterals 9.
9. Tips of shoots pubescent, at least in lines on the side of the stem; leaves pilose beneath; seed with a rippled surface 8. C. nutans.
9. Tips glabrous; leaves glabrous or sparsely pilose beneath; seed with 2-4 lateral ridges on each face 10. C. hyssopifolia.
10. (5) Leaves and young stems fleshy; stipules conspicuous, membranous, ca. 1 mm. long, white 3. C. buxifolia.
10. (5) Leaves membranous or somewhat coriaceous, young stems not fleshy; stipules not conspicuous unless because of ciliate inner surface, coriaceous, ca. 0.5 mm. long, brown 11.
11. Stipules densely white ciliate on surface nearest stem; leaf and young stem surface minutely white-papillose; glands dark, appendages obsolete 4. C. lecheoides.
11. Stipules not ciliate; stem surface smooth, somewhat waxy, leaf surface with raised markings but not papillose; glands green or red, appendages small or to twice width of gland 6. C. porteriana.
12. (4) Stems wiry and stiff, rarely exceeding 0.5 mm. diameter, usually many from root stock 13.
12. (4) Stems flexible rather than wiry, few to several from rootstock, either reaching 2-3 mm. diameter or minute, threadlike 16.
13. Leaf margins entire 14.

13. Leaf margins serrate, at least in basal leaves 15.
14. Leaves deltoid, margin somewhat revolute; glands fleshy, appendages obsolete or minute 41. C. deltoidea ssp. deltoidea var. deltoidea
14. Leaves orbicular to elliptic, plane; glands cupped, appendages prominent, to three times as wide as gland 19. C. camaguayensis.
15. All leaves serrate, most 4-8 mm. long; plants usually decumbent 18. C. torralbasii.
15. Only basal leaves serrate, most 2-3 mm. (rarely to 5 mm.) long; plants usually forming a lax, prostrate mat 17. C. centunculoides.
16. (12) Leaves and stems pubescent 39. C. paredonensis.
16. (12) Leaves and stems glabrous 17.
17. Stems minute, threadlike, tomentose on upper surface; cyathia subsessile; styles undivided at apex; capsule less than 0.7 mm. long 42. C. tumistyla.
17. Stems often reaching 2-3 mm. diameter, glabrous; cyathia with an obvious peduncle, styles bifid for part of length; capsule more than 1 mm. long 18.
18. Stipules not united, or minutely so at base, deeply parted or laciniate 19.
18. Stipules joined, at least on upper or lower surface of tips of branches, fringed or entire, never laciniate 22.
19. Seeds strongly angled; appendages conspicuous; leaves ovate to ovate-oblong, almost as wide as long..... 20. C. cordifolia.
19. Seeds terete to obscurely angled; appendages inconspicuous or absent; leaves narrowly elliptic to oblong, much longer than wide 20.
20. Capsule more than 2.5 mm. long; seed cuneiform, more than 2 mm. long 21. C. polygonifolia.
20. Capsule less than 2.5 mm. long; seed ovoid, less than 2 mm. long 21.
21. Seed 1.4-1.9 mm. long; leaves usually fleshy, size often widely different on main stem and laterals 22. C. ammannioides.

21. Seed 1-1.4 mm. long; leaves not fleshy, all similar in size 23. C. cumulicola.
22. (18) Stipules toothed at apex, white, prominent although only ca. 0.5 mm. long; faces of seed smooth; glands brown or deep purple, appendages white 16. C. serpens.
22. (18) Stipules toothed or bifid almost to base, green or tan colored, not conspicuous although often more than 1 mm. long; faces of seed obscurely transversely ridged; glands greenish, appendages white, yellow or pink 23.
23. Stipules short, to 0.4 mm.; texture of all parts of plant subcoriaceous; leaf and stem surface somewhat papillose 14. C. cowellii.
23. Stipules long, often more than 1 mm.; leaf texture only rarely firmer than membranous; leaf and stem surface smooth 15. C. blodgettii.
24. (3) Leaf margins manifestly serrate 25.
24. (3) Leaf margins entire or obscurely toothed 36.
25. Plants erect with one or few thick stems 11. C. lasiocarpa.
25. Plants prostrate to decumbent with several to many stems which rarely exceed 2 mm. diameter 26.
26. Cyathia solitary at leafy nodes, appearing clustered if on congested laterals, but not in glomerules 27.
26. Cyathia in peduncled glomerules 34.
27. Appendages of glands subequal in size, often much reduced, or if two appendages much longer than other two, capsule not fully exerted, splitting one side of cyathium at maturity, glands subcircular or somewhat transversely elongated 28.
27. Appendages of glands greatly unequal in size, one pair longer than the other pair; capsule fully exerted and nutant at maturity, often concealed by long appendages; glands enlarged in length, to extend much of the distance around rim of cyathium 33.
28. Capsule pubescent only along the angles 29.
28. Capsule pubescent all over 30.

29. Stem short-pubescent in lines at sides and sometimes on upper surface; faces of seed with deep, transverse furrows 24. C. prostrata.
29. Stem long-hirsute, at least in lines at sides; surface of seed rippled 25. C. mendezii.
30. Capsule not completely exerted, splitting one side of cyathium at maturity 32. C. thymifolia.
30. Capsule completely exerted at maturity 31.
31. Leaf margin and coarsely serrate, often incised 1/2-1/3 distance to midrib; stems wiry, scarcely reaching 1 mm. diameter, many from heavy root stock 26. C. hepatica.
31. Leaf margin serrate but not deeply incised; stems not wiry, usually 1 mm. or more in diameter, few to several from annual or perennating root stock 32.
32. Stem deliquescent through dichotomous branching in upper part; leaf texture heavy; seeds with two broad faces and one angle acute, almost triangular in cross-section 27. C. helwigii.
32. Stem excurrent, forming only congested leafy laterals in upper part; leaf texture membranous; seeds with all faces subequal, angles obtuse, almost square in cross-section 31. C. maculata.
33. (27) Stems long-pilose on upper surface; leaf apex acute; cyathia congested on short laterals 34. C. conferta.
33. (27) Stems short-tomentose or strigose on upper surface; leaf apex obtuse or rounded; cyathia borne singly or in small groups at upper nodes, if on laterals not congested 33. C. adenoptera.
34. (26) Leaf margins crenate-dentate or roundly serrate, apex obtuse 30. C. berteriana.
34. (26) Leaf margins sharply serrate, apex acute 35.
35. Cymules terminal and lateral on leafless peduncles; stem branching at base but only infrequently near tips (when plant may appear to have cymules on laterals with a pair of subtending leaves); mostly robust, ascending, large-leaved plants 28. C. hirta.
35. Cymules terminal and on leafy laterals; stem branching freely; mostly low, small-leaved plants 29. C. ophthalmica.

36. (24) Plants suffrutescent; branches to 5 dm. long 37.
36. (24) Plants herbaceous, or, if woody at the base, of small stature, branches rarely exceeding 1 dm. long 39.
37. Appendages obsolete; glands deep purple 5. C. cayensis.
37. Appendages prominent; glands yellow or green 38.
38. Open shrubs, branched from base; capsules more than 2 mm. long 7. C. myrtillifolia.
38. Suffrutescent, base mostly unbranched; capsules 1.3-1.5 mm. long 6. C. porteriana var. keyensis.
39. (36) Stems pubescent on only one surface 40.
39. (36) Stems pubescent on all surfaces 41.
40. Stems tufted, upright, usually less than 0.5 mm. diameter; leaf surface glabrous 37. C. minutula.
40. Stems prostrate, usually ca. 1 mm. diameter; scattered white hairs on surface of leaf 36. C. multinodis.
41. Cyathia in groups of 2-5 at nodes 43. C. leonardii.
41. Cyathia solitary at nodes 42.
42. Plants robust, stems 1-3 mm. diameter, to 3 dm. long, leaves 4-9 mm. long 35. C. garberi.
42. Plants delicate, stems wiry, scarcely reaching 1 mm. diameter even in old plants, to 2 dm. long, leaves 2-5 mm. long 43.
43. Plants closely appressed forming a dense mat, sometimes becoming diffuse with age 41. C. deltoidea.
43. Plants decumbent at tips or erect 44.
44. Stems almost unbranched, villous-hirsute, tips canescent; capsule reniform, sharply three-lobed, angles acute 40. C. pinetorum.
44. Stems branched freely, particularly in upper part of stem, sparsely or densely short-pilose, tips only occasionally canescent; capsule ovoid, roundly lobed, angles obtuse 38. C. turpinii.

1. CHAMAESYCE VAGINULATA (Griseb.) Millsp., Field Mus. Bot. 2:

302. 1909. Euphorbia vaginulata Griseb., Fl. Brit. W. I. Islands, 52.

1859. Type: Turk Islands, Hjalm. (Lectotype: K !, fragment NY !).

Designation of the lectotype is made here. The specimen at Kew was chosen because there is a strong probability that it was examined by Grisebach. Many of Hjalmarsson's collections were deposited at Systematisch-Geobotanisches Institute, Goettingen, and an isotype may exist there. The photograph of a Hjalm. sheet from Kew at IJ can have no standing as type material since it is not of this species but of C. ? lecheoides (Millsp.) Millsp.

Shrub; prostrate or ascending to 2 m. Stem to 1.5 cm. diameter, internodes to 3 cm. or congested; branching from base and throughout length, laterals often lying in one plane, not rooting at nodes, glabrous, becoming dark brown with age. Leaves fleshy; blades subglobular or linear-elliptic, 1.5 mm. diameter or 5 x 1-1.5 mm., base subequal, subcordate or rounded, margin entire, apex rounded, subarticulate from petiole, glabrous, yellow-green to purple-brown; petiole 0.3-1 mm. long; stipules sheathing stem and persistent, short, ciliate, white. Cyathia solitary at nodes, often on vestigial branches; peduncle short, somewhat expanded into obconical involucre, to 1 mm. diameter at mouth, lobes fleshy, equalling glands, triangular, glabrous on outside, ciliate within, glands transversely elliptic, 0.5 x 0.3 mm., fleshy, deep purple, appendages absent, fifth gland triangular, large, equalling lobes or rarely of same form as other glands, sinus shallow. Staminate flowers 3-5 per cyathium or absent, androphores glabrous, scarcely exerted. Gynophore glabrous, to 1.5 mm. long at maturity, exerted, usually upright;

calyx a triangular pad of tissue; ovary glabrous; styles spreading, 0.4 mm. long, joined at base, bifid for 1/2 length. Capsule glabrous, globose, 1.5 mm. long, 1.8-2 mm. at equator, roundly three-lobed, angles rounded. Seed ovoid, 1.5 x 1.2 mm., scarcely angled, usually white.

Restricted to a few islands of the southern Bahamas, but locally frequent on these in rocky and sandy areas behind the shore (Map 1).

Representative specimens seen: BAHAMAS. Inagua, 6 Mar. 1962, Dunbar 107 (GH); Turtle Cove, Inagua, 19 Oct. 1904, Nash & Taylor 1170, (NY); Caicos Islands: North Caicos, 24 Apr. 1954, Lewis s.n. (GH, IJ); Bambarra, Middle Caicos, 2 July 1954, Proctor 9096 (IJ); South Caicos, 14-16 Dec. 1907, Wilson 7681 (GH, NY). Turks Islands: Waterloo, Grand Turk, 20 Feb.-24 Mar. 1911, Millspaugh & Millspaugh 9055 (GH, NY); Grand Turk, 27 Aug.-1 Sept. 1905, Nash & Taylor 3764 (NY); Long Cay, 12 June 1954, Proctor 8793 (GH, IJ). Watling's Island: Southeast End, 27, 28 Nov. 1907, Wilson 7259 (NY). Castle Island, 22 Dec. 1907, Wilson 7790 (NY).

The fleshy leaves and involucre, and the shrubby habit with the closely branched stems often held almost prostrate, make this quite different from any other species in the area. Boissier (1862) grouped it with endemics of the Galapagos Islands on the basis of its appearance, fleshiness, and the persistent, ciliate stipules that ring the stem, but this morphological similarity is probably fortuitous and not an indication of close common ancestry. Many species of other families grow in



Plate 1. *CHAMAESYCE VAGINULATA* (Griseb.) Millsp.

C. vaginulata (Griseb.) Millsp., Long Cay, Caicos Group, Bahamas, 7 Mar. 1911, Millspaugh & Millspaugh 9237 (NY).



Map 1. Distribution of *C. vaginulata*



Map 2. Distribution of *C. buxifolia*

both the Bahamas and the Galapagos, but most of these are common throughout the intervening tropics, and give no hint of a disjunction of range such as this species would show from those which it resembles.

2. CHAMAESYCE ARTICULATA (Aubl.) Britton, Mem. N.Y. Bot. Gard. 6: 574. 1916. Euphorbia articulata Aubl., Pl. Guian., 1: 480. 1775. Type in Herb. Brit. Mus. if extant.

Euphorbia linearis Retz., Observationes Botanicae, 3: 32. 1783. Type: Bot. Mus., Lund, Sweden, if extant. E. linearis heterophylla Kuntze, Rev.Gen. Pl., 605. 1891. C. linearis (Retz.) Millsp., Field Mus. Bot. 2: 410. 1916.

Anisophyllum vahlii Kl. & Gke., Monats. Akad. Berlin 1859: 36. 1859. Type: Specimen by Willdenow, in Bot. Mus. Berlin, if extant. Euphorbia vahlii Willd. ex Kl. & Gke., loc. cit. 37. 1859. Chamaesyce vahlii (Kl. & Gke.) P. Wilson, Bull. N.Y. Bot. Gard. 8: 395. 1917.

Shrub; to 6 m., erect. Stems to 2 cm. at base, internodes to 5 cm. long; divaricate-branched throughout length, glabrous or canescent at tips, light brown becoming black with age. Leaves membranous; blades elliptic, broadly so to linear, 20-60 x 2-12 mm., base subequal, rounded, margin entire, slightly thickened, apex obtuse, mucronate, midrib prominent on underside, glabrous or short pubescent, light green; petiole 1 to 1.5 mm. long; stipules joined, deltoid, to 0.5 mm. long, densely ciliate on inner surface, somewhat persistent. Cyathia solitary; peduncles 5 to 7 mm. long, involucre obconical, to 2 mm. diameter at mouth, lobes scarcely equalling glands, deltoid, glabrous on outside, densely ciliate within, glands broadly transversely elliptic, to 1 mm. long, broadly cupped, appendages absent, fifth gland deltoid, short, sinus broad, shallow.

Staminate flowers 8 - 20 per cyathium, androphores glabrous, to 2.5 mm. long at maturity. Gynophore glabrous, to 3 mm. long at maturity, exerted, nutant; calyx vestigial; ovary glabrous; styles erect, to 3 mm. long, joined for half length, bifid in apical 1/3. Capsule glabrous or minutely pubescent, ovoid or conical, 2.3 mm. long, 2.3 mm. wide above base, roundly three-lobed, angles rounded. Seed elliptic-ovoid, 1.8 - 2 mm. long, 1.2 - 1.4 mm. radial width at equator, four-angled, the dorsal faces longer and dorsal angle more acute than others, surface pitted and wrinkled, brown or ashen.

Frequent from Puerto Rico south through the Lesser Antilles to the northern coast of South America. No collections have been seen from the Bahamas since those of Millspaugh in 1911 from East Caicos, but these specimens are undoubtedly of the species (Map 10).

Representative specimens seen: BAHAMAS. East Caicos: Rocky plain, Jacksonville and vicinity, 26-27 Feb. 1911, Millspaugh & Millspaugh 9086 (F, NY); Low scrub, Jacksonville and vicinity, 26-27 Feb. 1911, Millspaugh & Millspaugh 9102 (F, NY). PUERTO RICO. Susua State Forest, 28 June 1961, Alain 9265 (IJ); Yauco, 2 Apr. 1880, Garber s.n. (GH); Seashore, Fajardo, 17 Feb. 1900, Heller 4608 (F, GH, MO, NY); Santurce, 21 Feb. 1900, Heller 4678 (F, MO, NY); Rio Piedras, Fajardo, 4 July 1913, Johnston 792 (NY); Guayanilla to Tallahoa, 13 Mar. 1913, Shafer 1993 (F, NY); Fajardo, 19 May 1885, Sintenis 1612 (MO, NY). LESSER ANTILLES. Culebra, 3-12 Mar. 1906, Britton & Wheeler 4 (F, NY); Culebras Island, 19-20 Jan. 1899, Millspaugh 1781 (F); Racoon Bay, St. Thomas, 31 Jan.-4 Feb. 1913, Britton, Britton & Shafer 167 (F, NY); St. Thomas, Jan. 1887, Eggers s.n. (F); Tortola, 16 Nov. 1918, Fishlock 263 (F, GH, NY); Anagada, 19-20 Feb. 1913, Britton & Fishlock 978 (NY); Barbuda, 6 Apr. 1956, Smith 10466 (GH, IJ). St. Kitts: Canada Estate, 8 Sept.-5 Oct. 1901, Britton &



Plate 2. CHAMAESYCE ARTICULATA (Aubl.) Britton

E. linearis Retz., St. Thomas, ? Bertero (MO).

Cowell 263 (NY); Sir Timothy's Hill, 24 Dec. 1958, Proctor 18418 (IJ); Nag's Head, 27 Dec. 1958, Proctor 18514 (IJ). Antigua: Santa Maria Hill, 25 Apr. 1937, Box 756 (MO); Nook Hill, 3 Oct. 1937, Box 1134 (MO). Montserrat, 8 Feb. 1959, Proctor 19079 (IJ); Guadeloupe, 1892, Duss 2451 (NY); Martinique, Sieber 392 (F); St. Lucia, 22 Apr.-18 May 1950, Howard 11417 (IJ). St. Vincent: Mt. Pleasant, 22 Mar. 1962, Cooley 8534 (GH); Bequia, 26-31 Mar. 1950, Howard 11269 (GH).

The affinities of this species are with C. myrtillifolia (L.) Millsp. and with coastal species of the Bahamas and Florida such as C. lecheoides (Millsp.) Millsp. and C. porteriana Small. These, however, differ in size, habit, cyathial and stipular characters.

A number of pubescent collections of C. articulata have been compared with the more common glabrous plants, but these prove to be only the extremes of a range, with many intermediates showing occasional shoots with minute velvety pubescence.

The name is accepted although no type material has been seen. There is general agreement in the literature with this application, and that E. linearis is a synonym.

3. CHAMAESYCE BUXIFOLIA (Lam.) Small, Fl. SE. US., 712. 1903. Euphorbia buxifolia Lam., Encyc. 2: 421. 1786. Type: plate in manuscript of Botanicum Americanum t.4, f.2 by Plumier, in the Bibliotheque General, Museum D'Histoire Naturelle, Paris.

E. glabrata Sw., Prodr., 76. 1788. Type: unknown. A specimen from Swartz with this name is reported from Herb. Stockholm, Fawcett & Rendle, Fl. Jam., 4(2): 336. 1920.

E. litoralis HBK., Nov. Gen. et Sp., 2: 44. 1817. Type: Cumana, prope Bordones (Herb. Mus. Paris, not seen).

E. flexuosa HBK., Nov. Gen. et Sp., 2: 44. 1817. Type: Cumana,

Bonpland (Herb. Mus. Paris, not seen). *E. buxifolia* Lam. var. *flexuosa* (HBK.) Boiss. in DC., Prod., 15(2): 15. 1862.

Perennial shrub or subshrub; erect to ascending, or nearly decumbent in shifting sand, to 6 dm. Stems to 8 mm. diameter at naked woody base, internodes to 3 cm.; branching sparse at base, more frequent near shoot apex, glabrous, green becoming darker. Leaves somewhat fleshy; blades ovate to elliptic, 5-12 x 3-6 mm., base slightly unequal, truncate to cordate and obscuring stem, margin entire, apex obtuse, midrib sometimes prominent on underside of folded leaf, glabrous, yellowish to dark green and glaucous; petiole 0.5 to 1 mm. long; stipules united, to 1 mm. long, ligulate or deltoid, short cleft or fringed, white. Cyathia solitary at upper nodes; peduncles 0.5-1 mm. long, cyathia campanulate, to 0.7 mm. diameter at mouth, lobes equalling glands, triangular glabrous outside, densely ciliate in throat, glands transversely elliptic, to 0.5 mm. long, brown, fleshy, appendages slightly longer than, and as wide as gland, white, margin entire or undulate, fifth gland linear, shorter than lobes, sinus shallow, broad. Staminate flowers 12-20 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, to 3 mm. long at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary glabrous; styles spreading, 0.3-0.4 mm. long, joined at base, bifid for 1/2 length. Capsule glabrous, subspherical 1.5-2 mm. long, 2.2-5 mm. wide just below equator, deeply three-lobed, angles rounded. Seed broadly ovoid, 1.3 mm. long, 1.2 mm. wide just below equator, angles mere ridges except near apex, faces plump, convex, surface obscurely pitted, ashen.

A frequent component of the vegetation of sandy and rocky shores,



Plate 3. CHAMAESYCE BUXIFOLIA (Lam.) Small

C. buxifolia (Lam.) Small, Grassy Key, Monroe County, Florida, 9 Aug. 1963, Burch 153 (FLAS).

and of their associated beach-scrub; Bermuda, Florida in all coastal areas south of Pinellas and Volusia counties, Bahamas, Yucatan, Cuba, Jamaica, Hispaniola, Puerto Rico, Lesser Antilles and the northern coast of Venezuela (Map 2).

Representative specimens seen: FLORIDA. Brevard: Cape Canaveral, 2-5 Apr. 1904, Burgess 668 (F, NY); Merritt Island, 18 Apr. 1946, Foster & Smith 1364 (DUKE, F, FLAS, IJ, MO, NSC, NY); Malabar Cape, 17 Oct. 1964, Lakela (FLAS, USF). Broward: Port Everglades, 3 Aug. 1955, Godfrey & Kral 53854 (FSU, NSC); Lauderdale Beach, 17 Dec. 1929, Moldenke 263a (DUKE, MO, NY). Collier: Vanderbilt Beach near Naples, 13 Aug. 1963, Burch 182 (FLAS); Marco Island, 19 Mar. 1938, Standley 57622 (F). Dade: Soldier Key, 30 Mar. 1904, Britton 337 (F, NY); Miami, May 1877, Garber s.n., (FLAS, NY); Key Biscayne, 17 Jan. 1937, McAllister 210a (DUKE); Lemon City, 6 Nov. 1903, Small & Carter 1116 (NY). Flagler: Beach near Marineland, 18 Nov. 1961, Godfrey 61675 (FSU). Indian River: Vero Beach, 7 Aug. 1963, Burch 112 (FLAS). Lee: Sanibel Island, 19 Dec. 1953, Cooley 2401 (FLAS, NY); Punta Rassa, July-Aug. 1900, Hitchcock 325 (F, MO); Captiva Island, 21 May 1901, Tracy 7226 (F, MO, NY). Manatee: Anna Maria Key, 12 July 1917, Cuthbert 1578 (FLAS, NY); Sneed's Island, 9 Oct. 1899, Tracy 6377 (F, MO, NY). Martin: Atlantic side of Jupiter Island, 7 Aug. 1963, Burch 125 (FLAS). Monroe: Cape Sable, Middle Cape, 18 Apr. 1964, Burch & Ward 304 (BM, BUS, E, F, FLAS, GH, IJ, MO, NSC, NY); New Found Harbor Key, 13-14 Feb. 1935, Killip 31395 (NY); Marquesas Keys, 10-12 Mar. 1904, Lansing, Jr. 2225 (F, NY); Key Largo, 12 Jan. 1930, Moldenke 402 (DUKE, MO); Key West, 1874, Palmer 499 (MO, NY); Big Pine Key, 27 June 1960, Webster & Samuel 10210 (DUKE, IJ, PUR). Palm Beach:

Beach between Palm Beach and Lake Worth, 7 Aug. 1963, Burch 118 (FLAS); Palm Beach, 24 May 1895, Curtiss 5404 (NY); Juno Beach, 20 Apr. 1962, Lakela 24955 (FLAS, USF); Lake Worth Inlet, 28 Dec. 1895, Webber 236 (F, MO). Pinellas: St. Petersburg, Williamson s.n. (NY). St. Lucie: North of Ft. Pierce, 7 Aug. 1963, Burch 120 (FLAS). Sarasota: Longboat Key, 20 Nov. 1964, Godfrey 65236 (FSU); South end of Longboat Key, 6 Oct. 1964, Long & Lakela 27547 (FLAS, USF); Casey Keys, Spring 1887, Rothrock s.n. (F, NY). Volusia: Turtle Mound, 27 Apr. 1961, Ray, Wood, Smith & Eaton 10821 (FSU, NCU). BAHAMAS. Great Bahama, 5-13 Feb. 1905, Britton & Millspaugh 2365 (F, NY); Bimini, 27 July 1964, Stimson 776 (DUKE, FLAS); Riding Rocks, Great Bahama Bank, 13 May 1909, Wilson 7914 (F, MO, NY); New Providence, Nov. 1890, Hitchcock 26 (F, MO); Salt Key, 21 May 1909, Wilson 8089 (F, MO, NY); Watling's Island, Graham's Harbor, 26 Nov. 1907, Wilson 7228 (F, NY); Hog Island, Jan. 1905, Wight 55a (F, NY); Inagua, 15-25 Aug. 1960, Williams 7 (DUKE, PUR); South Caicos, 27 June 1954, Proctor 8981 (IJ); Grand Turk, 22-27 Apr. 1954, Lewis s.n. (IJ). CUBA. Isles of Pines: Caleta Cocodrilos, 8 Mar. 1916, Britton, Wilson & Leon 15295 (F, NY). Havana: Havana, 6 May 1905, Curtiss 752 (F, MO, NY). Oriente: Santiago, Siboney, 1917, Ekman 8719 (F). Camaguey: Cayo Sabinal, 9 Mar. 1909, Shafer 699 (F, NY); Cayo Palo, 24 Oct. 1909, Shafer 2733 (F, NY). Pinar del Rio: Las Martinas to the coast, 19 Dec. 1911, Shafer 11105, (MO, NY). CAYMAN ISLANDS. Cayman Brac., South Shore, 10 Feb. 1899, Millspaugh 1233 (F); Grand Cayman, Grape Tree Point, 14 Apr. 1956, Proctor 11973 (IJ). JAMAICA. Portland: Port Antonio, 21 June 1897, Fredholm 3038 (NY). St. Catherine: Healthshire Hills, 3 May 1913, Harris 11627 (F, MO, NY, UCWI). St. Elizabeth: Long Acre Point,

13 Sept. 1907, Harris 9967 (F, NY, UCWI). St. James: Montego Bay, June 1951, Robbins 423 (UCWI). St. Mary: Galina Point, 7 Dec. 1952, Proctor 7452 (IJ). St. Thomas: Morant Point, 1-13 Mar. 1909, Britton 4098 (F, NY). Westmoreland: Negril area, Homer's Cove, 23 June 1959, Webster, Ellis & Miller 8501 (PUR). HAITI. Bayeux, 28 Nov. 1924, Ekman H2676 (IJ); Port de Paix, 28 Apr. 1925, Ekman H3957 (IJ); Gonave Island, Aug. 1927, Eyerdam 213 (F, NY); Tortue Island, 3-10 May 1929, Leonard & Leonard 15328 (MO). DOMINICAN REPUBLIC. Monte Cristi: Monte Grande, 12 July 1929, Ekman H13165 (F, PUR). Barahona: San Domingo, May 1911, Fuertes 1111 (F, NY); Trail between Pedernales and Aceitial, 8-12 Aug. 1946, Howard 8106 (NY). PUERTO RICO. Condado, San Juan, 16 Sept. 1941, Blomquist 11789 (DUKE); Fajardo, 4 July 1913, Johnston 791 (NY); Ratones Island, 21 Jan. 1899, Millspaugh 658 (F); Salinas de CaboRojo, 6 Feb. 1885, Sintenis 559 (UCWI); Beach at Santurce, 21 Feb. 1900, Heller 4681 (F, MO, NY). LESSER ANTILLES. Soldier Bay, St. Thomas, Dec. 1880, Egger s.n. (F); St. Croix, 1 Nov. 1895, Ricksecker 36 (F, MO, NY); Anguilla, 1908, Boldingh 3561 (NY); Barbuda, 27 Apr. 1959, Cowan 1656 (IJ, NY); Guadeloupe, 1894, Duss 2741 (MO, NY); Martinique, 25 June 1939, Egler 173 (NY); St. Lucia, 1 Aug. 1958, Sauer 2174 (F); St. Vincent, Smith & Smith, 208 (NY); Grenada, Pointe Saline, 23 Sept. 1945, Beard 1222 (MO, NY). Extra-territorial specimens: BERMUDA. Ducking Stool, 31 Aug.-20 Sept. 1905, Brown & Britton 6 (F, NY); Agar's Island, 22 July 1913, Collins 219 (F, NY); Rocky shore, 18 Mar. 1910, Flynn 101 (MO); Hamilton Bay Islets, 29 Dec. 1898, Millspaugh 10 (F).

The species named by Kunth are no more than growth forms of this taxon, which is just as plastic in its response to soil and wind conditions

as the completely herbaceous species.

Euphorbia mesembrianthemifolia Jacq., Enum. Pl. Carib., 22. 1760, and Sel. Stirp. Amer., 150. 1763, was put into synonymy for this species by Boissier (1862) on the basis of Jacquin's description. This is unacceptable, since, if the name can be linked to the species beyond reasonable doubt, it is much earlier than Lamarck's and would have to replace it. Jacquin's description suggests this species in many respects, but has no character which is diagnostic. However, if it could be shown that specimens of this entity were in Jacquin's possession at the time that his description was written, this would support the acceptance of his name. Mr. W. T. Stearn of the British Museum (Natural History) was kind enough to search their herbarium, and Dr. K. H. Rechinger checked that of the Naturhistorisches Museum, Vienna, but in neither case were any specimens found which were known to have passed through Jacquin's hands at this time. Many of Jacquin's specimens were lodged in these two herbaria, and the absence of any relevant to this problem, together with the fact that Boissier did not see any specimens to support the name, suggest that none have survived. With nothing more than Jacquin's description to typify the name E. mesembrianthemifolia, it would be irresponsible to accept it and upset the well-understood use of C. buxifolia, which will be maintained here until some firm evidence supports a change.

4. CHAMAESYCE LECHEOIDES (Millsp.) Millsp., Field Mus. Bot. 2: 301. 1909.

Shrub; erect or ascending to 4 dm. Stem to 8 mm. diameter, internodes to 2 cm.; branched either from crown of root and throughout length

or from only the upper half of the single or few stems from base, branching open or strict, old stem ringed by stipule scars, glabrous, brown. Leaves membranous, somewhat coriaceous; blades ovate to linear elliptic, 3-7 x 1.5 - 5 mm., midrib sometimes prominent on under side of leaf, marked by depression on upper surface, glabrous, the surface minutely white-papillose, base inequilateral, rounded to subcordate, margin entire, somewhat revolute, rarely crenulate or serrate toward apex, apex obtuse or rounded, gray-green or pink; petiole 0.5 - 1 mm. long; stipules distinct or joined, deltoid to 1 mm., densely ciliate on inner surface, brown, cilia white. Cyathia in upper nodes; peduncles to 1 mm. long, involucre campanulate, 1-1.6 mm. diameter at mouth, lobes equalling glands, triangular, glabrous on outside, densely pilose within, glands broadly transversely elliptic, 0.4 - 0.7 by 0.2 mm., often dark purple, rarely much reduced, appendages obsolete, fifth gland vestigial or absent, sinus V-shaped, to 1/4 depth of cyathia. Staminate flowers to 30 per cyathium, androphores glabrous, to 0.7 mm. at maturity. Gynophores glabrous, to 2 mm. long at maturity, exserted, nutant or upright; calyx a triangular pad of tissue; ovary glabrous; styles spreading, 0.3 mm. long, joined at base, subentire to 1/3 bifid, somewhat clavate. Capsule glabrous, ovoid, 1.5 mm. long, 2 mm. wide between equator and base, three-lobed, angles obtuse. Aberrant inflorescences are quite frequent, producing a thick (to 0.6 mm.) gynophore and sterile capsule to 2.5 mm. long. Seed angular-ovoid, 1 mm. long, to 0.7 mm. diameter at equator, ventral angle somewhat obscure, others well marked, faces flat, somewhat pitted, gray-brown.

Key to varieties of C. lecheoides

1. Plant branching from crown of root and throughout length of stem; branches decumbent a. var. wilsonii.
1. Plant with few stems from ground level, branching mostly in upper part of stem; branches erect, strict 2.
2. Leaves linear-ovate, much longer than wide, apex acute b. var. lecheoides.
2. Leaves ovate-elliptic, scarcely longer than wide, apex obtuse c. var. exumensis.

4a. C. LECHEOIDES (Millsp.) Millsp. var. WILSONII (Millsp.) comb. nov. C. wilsonii Millsp., Field Mus. Bot. 2: 301. 1909. Type: Castle Island, Bahamas, 22 Dec. 1907, P. Wilson 7795 (Holotype: F !; Isotype: NY !).

Restricted to the whitelands of islands of the Inagua, Turks and Caicos groups at the southern end of the Bahamas (Map 3).

Representative specimens seen: BAHAMAS. Great Inagua, near lighthouse, 20 Feb. 1963, Dunbar 239 (GH); Inagua, 14 Oct. 1904, Nash & Taylor 1034 (NY); South Caicos, near East Bay, 17 June 1954, Proctor 8828 (IJ); Turks Islands, Salt Cay, 10 Mar. 1911, Millspaugh & Millspaugh 9253 (NY).

Much branched from a heavy rootstock, with the branches lying almost prostrate. Distinguished from var. lecheoides only on the basis of its many wiry stems, much-branched throughout length.

4b. C. LECHEOIDES (Millsp.) Millsp. var. LECHEOIDES. Euphorbia lecheoides Millsp., Field Mus. Bot. 2: 163. 1906. Type: Grand Turk, Turks Islands, Bahamas, 27 Aug.-1 Sept. 1905, G. V. Nash & N. Taylor 3888

(Lectotype: F !; Isotype: NY !). Selection of type made here.

Restricted to scrub areas and rocky shores on islands in the southeast of the Bahamas chain from Watling's Island to the Turks group (Map 4).

Representative specimens seen: BAHAMAS. Watling's Island, S. W. End, 30 Nov. 1907, Wilson 7347 (NY); Long Cay, 7-17 Dec. 1905, Brace 4179 (NY); Crooked Island, 9-23 Jan. 1906, Brace 4588 (NY); Mariguana, 6-8 Dec. 1907, Wilson 7534 (NY); Inagua, 21 Jan. 1962, Dunbar 53 (GH). South Caicos: Northern Hills, 19 June 1954, Proctor 8887 (GH, IJ); Cockburn Harbor, 28 Mar. 1958, Proctor 17497 (IJ). Between Commissioner's House and airfield, Grand Turk, 13 June 1954, Proctor 8799 (GH, IJ).

Usually rather few, stout stems from ground level which remain simple for about half their length. Branching is often, but not invariably, rather strict. The leaves are smaller and narrower than those of var. exumensis.

4c. *C. LECHEOIDES* (Millsp.) Millsp. var. *EXUMENSIS* (Millsp.) comb. nov. *C. exumensis* Millsp., Field Mus. Bot. 2: 301. 1909. Type: Stocking Island, Great Exuma, Bahamas, N. L. Britton & C. F. Millspaugh 3071 (Holotype: F !; Isotype: NY !).

Whitelands and coastal sands of islands in the Bahama group from Eleuthera south to Great Ragged Island (Map 5).

Representative specimens seen: BAHAMAS. Eleuthera, S. E. Point, 27 July 1960, Webster & Williams 10659 (DUKE, IJ, PUR); Little San Salvador, 25-26 Feb. 1907, Britton & Millspaugh 5666 (NY); Cat Island, Bight and vicinity, 1-6 Mar. 1907, Britton & Millspaugh 5804 (NY); Watling's



Wilson 7795
Wilson 7795

NEW YORK BOTANICAL GARDEN
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7795

Plate 4. *C. LECHEOIDES* (Millsp.) Millsp. var. *WILSONII* (Millsp.) ined.

Isotype: *C. wilsonii* Millsp., Castle Island, Bahamas, 22 Dec. 1907,
 Wilson 7795 (NY).



Plate 5. CHAMAESYCE LECHEOIDES (Millsp.) Millsp. var. LECHEOIDES

Isotype: E. lecheoides Millsp., Grand Turk, Bahamas, 27 Aug.-1 Sept. 1905, Nash & Taylor 3888 (NY).



Plate 6. *C. LECHEOIDES* (Millsp.) Millsp. var. *EXUMENSIS* (Millsp.) ined.
Isotype: *E. exumensis* Millsp., Stocking Island, Bahamas, 22-28 Feb. 1905,
Millspaugh 3071 (NY).



Map 3. Distribution of C. lecheoides var. wilsonii



Map 4. Distribution of C. lecheoides var. lecheoides



Map 5. Distribution of *C. lecheoides* var. *exumensis*



Map 6. Distribution of *C. cayensis*

Island, 12-13 Mar. 1907, Britton & Millspaugh 6143 (NY); Conception Island, 5 Jan. 1932, Fairchild 16 (GH); Rum Cay, 4 Dec. 1905, Brace 3927 (NY); Long Island, Clarence Town, 16-19 Mar. 1907, Britton & Millspaugh 6323 (NY); Great Ragged Island, 24-25 Dec. 1907, Wilson 7807 (NY).

Stems usually rather few and stout from ground level, branching freely only in upper half of stem. Branching often obtuse. The leaves are usually rather wider than those of the other two varieties.

These varieties are not well marked, but the key characters serve to separate most specimens seen. The slight difference in range may prove to be significant in allowing speciation to proceed if the vegetation of the islands remain undisturbed, and communication between them remains restricted.

The ciliate stipules and glabrous, markedly papillose surface of stems and young shoots distinguishes these plants from all others of similar size in the area. A similar surface marking, often much less pronounced, is found in a number of species from islands to the south, and is usually associated with plants from a saline habitat.

5. *CHAMAESYCE CAYENSIS* (Millsp.) Millsp., Field Mus. Bot. 2: 302. 1909.

Subshrub; ascending to 3 dm. Stems to 3 mm. wide, internodes to 2 cm.; branching sparingly throughout, tomentose, sometimes canescent at tips, somewhat glabrate, brown or gray. Leaves membranous or subcoriaceous; blades ovate, sometimes orbicular or lanceolate, 5-12 x 3-9 mm., base inequilateral, rounded or cuneate, margin entire, slightly thickened, apex obtuse or rounded, midrib sunken on underside of leaf,

both surfaces sparsely to densely tomentose, or woolly, the surface minutely white-papillose, yellowish green or pink, often ashen; petiole to 1 mm. long; stipules united, triangular, to 1 mm. Cyathia solitary at uppermost nodes; peduncle to 1 mm. long, involucre broadly obconical, 1.5 - 2 mm. diameter at mouth, lobes scarcely equalling glands, triangular, strigose on outside, hairy within, glands broadly transversely elliptic, 0.7 x 0.5 mm., appendages obsolete, fifth gland vestigial or absent, sinus shallow. Staminate flowers to 30 per cyathium, androphores glabrous, to 1 mm. long at maturity, exserted, somewhat nutant; calyx obsolete; ovary pilose; styles spreading, 0.3 - 0.4 mm. long, joined at base, subentire to 1/3 bifid, somewhat clavate. Capsule strigose, broadly ovoid, 1.7 mm. long, 1.8 - 2.1 mm. wide between base and equator, three-lobed, angles rounded. Seed cuneiform, to 1.2 mm. long, 0.6 mm. wide above base, strongly four-angled with ventral angle somewhat rounder than others, faces flat, wrinkled, brown.

Restricted to the coastal whitelands and pine and palmetto-scrub areas of the northern and western islands of the Bahamas chain (Map 6).

Representative specimens seen: BAHAMAS. Grand Bahama: Freeport, 30 Oct. 1964, McDaniel & Schmiederer 5395 (FSU); Freeport, 8 Aug. 1960, Webster 10896 (DUKE, PUR); Abaco, 8 Dec. 1904, Brace 1571 (NY). Berry Islands: Whale Cay, 29 Jan. 1905, Britton & Millspaugh 2178 (NY); Great Sturrupe Cay, 1 Feb. 1905, Britton & Millspaugh 2266 (NY); Great Harbor Cay, 2-3 Feb. 1905, Britton & Millspaugh 2334 (NY). Salt Key Bank: North End, Anguilla Isles, 15-18 May 1909, Wilson 7961 (MO, NY); South End, Anguilla Isles, 15-18 May 1909, Wilson 8027 (MO, NY); Water Key, 22 May 1909, Wilson 8139 (MO, NY).



Plate 7. CHAMAESYCE CAYENSIS (Millsp.) Millsp.

Isotype: E. cayensis Millsp., Joulter's Cays, Bahamas, 11 April 1904, Millspaugh 2295 (NY).

Recent collections have extended the geographical range, and also the habitats, from which this species is known. The whitelands, from which the type collections came, are sandy areas with a very limited flora, but the collections from Grand Bahama, from the pinelands and from pine/palm scrub, suggest that the plant is able to tolerate quite strong competition and shading.

C. bracei Millsp. is no more than a trivial variation of this species. Of the two specimens cited by Millspaugh with his description, one is also cited for C. cayensis, and the other differs from the usual appearance of that species only in the degree of pubescence.

6. CHAMAESYCE PORTERIANA Small, Fl. SE. US., 711. 1903.

Annual or perennating; erect or ascending to 5 dm. Stems to 4 mm. thick at somewhat woody base, internodes to 2 cm.; branching sparse, mostly from upper nodes or, rarely, much branched, branches at times at a very acute angle to stem, broom-like, more usually lax, glabrous or short-tomentose, green, often with a purple cast, or red. Leaves membranous or somewhat chartaceous; blades elliptic or ovate, in some suborbicular, in others almost lanceolate, 4-10 x 1-5 mm., base inequilateral, rounded or subcordate, margin entire or rarely somewhat serrate, apex obtuse to acute, sometimes mucronate, glabrous or sparsely pubescent, rarely tomentose, green, often suffused purple or red particularly on underside; petiole 0.5 - 1 mm. long; stipules distinct or joined at base, triangular, to 0.4 mm. long, entire or 2-3 parted. Cyathia solitary at upper nodes; peduncle 0.5 - 1 mm. long, involucre campanulate, 0.8 - 1.2 mm. diameter, lobes scarcely equalling glands, triangular, entire or short-cleft, glabrous or strigose on outside, pilose at mouth within,

glands fleshy, somewhat concave, transversely elliptic, 0.3 - 0.5 x 0.1 mm., appendages a mere rim, to twice as wide as gland, white, pink, or dark red, margin entire or crenulate, fifth gland linear, shorter than lobes or obsolete, sinus broad and shallow. Staminate flowers 8-14 or more per cyathium, androphores glabrous, ca. 1 mm. long at maturity. Gynophore glabrous or sparsely pilose, 1-1.5 mm. long at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary glabrous or strigose; styles spreading, 0.4 mm. long, minutely joined at base, bifid for 1/2 length. Capsule glabrous or strigose, ovoid, 1.5 mm. long, 1.8 - 2.1 mm. wide close to base, three-lobed, angles obtuse. Seed oblong-ellipsoid, 0.7 - 0.9 mm. long, 0.6 mm. diameter at equator, four-angled, with ventral angle somewhat rounded, faces flat, obscurely wrinkled, red-brown or gray.

Key to varieties of C. porteriana

1. Plant pubescent, sometimes glabrate; branching usually rather lax; leaves membranous, usually deep green; appendages white, margin entire or crenulate a. var. keyensis.
1. Plant glabrous or, rarely, sparsely short-pubescent; branching usually strict; leaves parchment-like, often flushed with red or purple; appendages white or pink, margins entire 2.
2. Leaves ovate-elliptic, most almost as wide as long, apex obtuse to rounded; usually rather sparingly branched b. var. porteriana.
2. Leaves linear-elliptic, all except oldest much longer than wide, apex acute; freely branched, often strict and broom-like c. var. scoparia.

6a. CHAMAESYCE PORTERIANA Small var. KEYENSIS (Small) comb. nov.

Chamaesyce kevensis Small, *Torreyia* 28: 6. 1928. Type: No Name Key, Monroe County, Florida, 4-5 Feb. 1916, J. K. Small 7439 (Holotype NY!).

Restricted to coastal scrub and open hammocks of the Florida Keys, as far north as Lignum Vitae Key (Map 7).

Representative specimens seen: FLORIDA. Monroe County: Lignum Vitae Key, 13 Dec. 1921, Small, Small & Matthews 10260 (NY); Long Key, 25 Aug. 1949, Woodbury & Jackson s.n. (BUS); Greyhound Key, 21 Nov. 1964, Burch 562 (BM, BUS, DUKE, E, F, FLAS, GH, IJ, MO, NY); Ohio Key, 19 Nov. 1964, Burch 538 (FLAS, FSU, MO, NSC, PUR, US); Bahia Honda Key, 9 May 1919, Small, Cuthbert & Mattaus 9139 (FLAS, NY, US); Big Pine Key, 27 June 1960, Webster & Samuel 10216 (DUKE, PUR).

Strongly erect unless growing through dense grass, and evenly branched, particularly in the upper third of the stem. Distinguished from the other two varieties by its pubescence and the membranous leaves which rarely have the suffusion of red or purple that the others show.

6b. CHAMAESYCE PORTERIANA Small var. PORTERIANA. Type: Miami, Florida, 1877, A. P. Garber s.n. (Holotype: NY!).

Locally frequent in Dade and Monroe counties, Florida. In pineland on oolitic limestone from Miami south through the Everglades Keys, and on the lower Florida Keys. (Map 8).

Representative specimens seen: FLORIDA. Dade County: Pinelands between Cutler and Black Point Creek, 15 Nov. 1906, Small & Carter 2504 (NY); Pinelands east of Naranja, 14 Jan. 1909, Small & Carter 3066 (NY); Camp Longview, Everglades, 11 Nov. 1912, Small 3705 (DUKE, FLAS); 6 mi. west of entrance, Everglades National Park, 17 April 1964, Burch & Ward 298

(BM, BUS, E, F, FLAS, GH, IJ, MO, NSC, NY, PUR, US, USF). Monroe County: Vacca Keys, 28-29 Jan. 1909, Small & Carter 3048 (NY); Boot Key, 7-12 April 1909, Britton 540 (NY); Big Pine Key, 14 Dec. 1951, Killip 41547 (NY); Key West, 19 Sept. 1954, Killip 44474 (US).

The leaves are broader than those of var. scoparia, and the plant is usually more sparsely branched. Occasional specimens show sparse pubescence on the underside of leaves and on the capsules, but the hairs are shorter and stiffer than is usual in var. keyensis.

6c. CHAMAESYCE PORTERIANA Small var. SCOPARIA (Small) comb. nov.
Chamaesyce scoparia Small, Fl. Florida Keys, 81. 1913. Type: Big Pine Key, Monroe County, Florida, 17 Nov. 1912, J. K. Small 3819 (Holotype: NY !).

Restricted to the lower Florida Keys, usually in pineland on oolitic limestone, but occasionally in sand or in open hammocks (Map 9).

Representative specimens seen: FLORIDA. Monroe County: Pinelands, Big Pine Key, 17 Nov. 1912, Small 3770 (DUKE, FLAS, NY); Pinelands, Big Pine Key, 17 Dec. 1913, Small & Small 5030 (MO, NY); Pinelands, Big Pine Key, 19 April 1942, Eyles & Eyles 8186 (GH); Pine woods, Big Pine Key, 10 Aug. 1963, Burch 140 (BM, E, F, FLAS, IJ, MO, NY, US); No Name Key, no date, Curtiss s.n. (GH, NY); Edge of airport, Key West, 26 Dec. 1964, G. Avery s.n. (FLAS, MO).

There is some intergradation of leaf form between this taxon and var. porteriana, but the extremes are quite distinct. Plants showing the strict branching that Small described as "broom-like" when describing the species have so far only been found on Big Pine Key.

The differences between the type specimens of Small's species do



Plate 8. CHAMAESYCE PORTERIANA Small var. KEYENSIS (Small) ined.

Holotype: *C. keyensis* Small, No Name Key, Monroe County, Florida, 4-5 Feb. 1916, Small 7439 (NY).



C. Porteriana Small



CHAMAESYCE PORTERIANA
Chamaesyce Porteriana Small
 Holotype: Miami, Florida, 1877, Garber s.n. (NY).
 Small, Proc. Acad. Nat. Sci. Philad.,
 1877, p. 107.

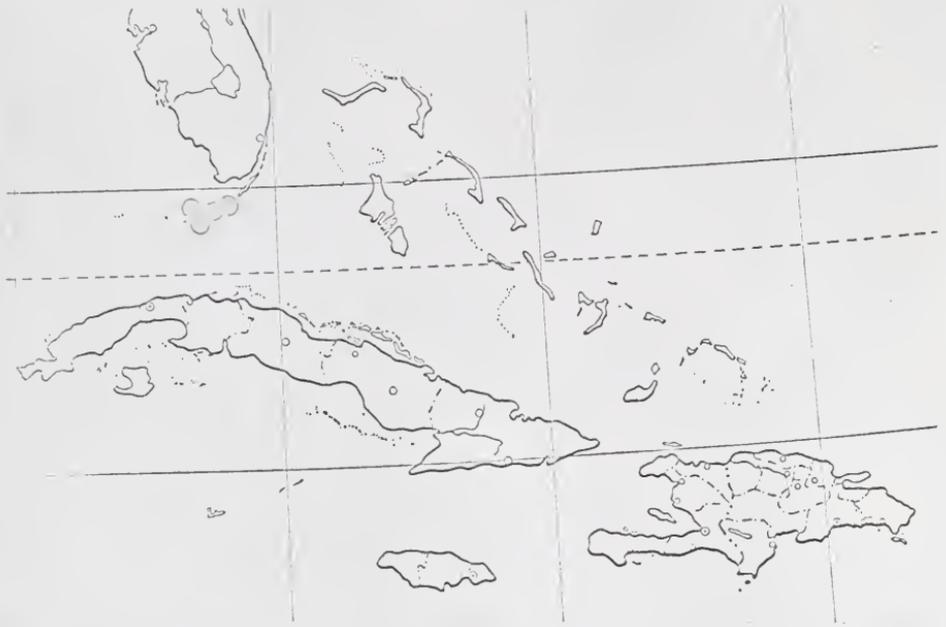
Plate 9. CHAMAESYCE PORTERIANA Small var. PORTERIANA

Holotype: C. porteriana Small, Miami, Florida, 1877, Garber s.n. (NY).



Plate 10. CHAMAESYCE PORTERIANA Small var. SCOPARIA (Small) ined.

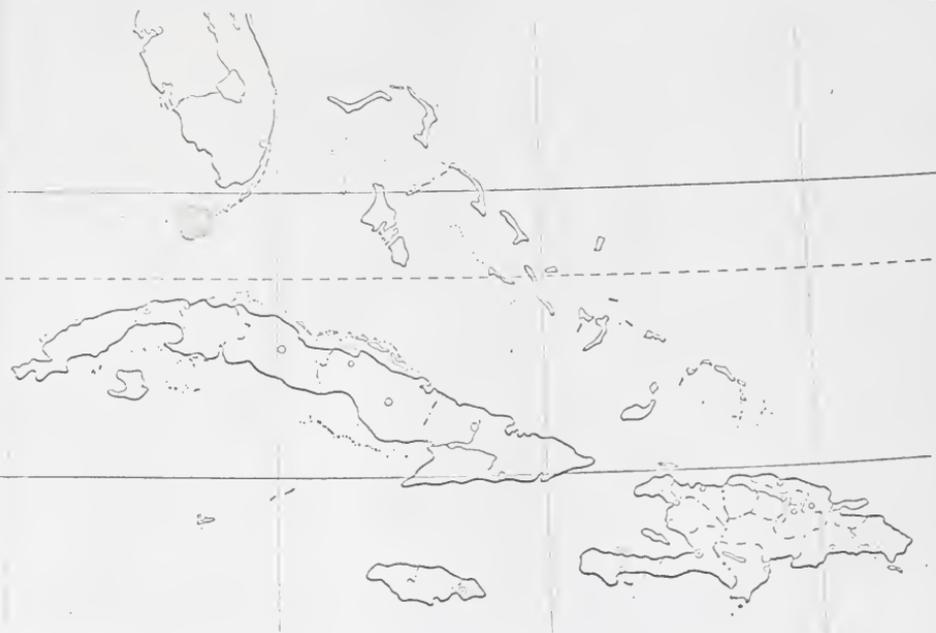
Holotype: *C. scoparia* Small, Big Pine Key, Monroe County, Florida, 17 Nov. 1912, Small 3819 (NY).



Map 7. Distribution of *C. porteriana* var. *keyensis*



Map 8. Distribution of *C. porteriana* var. *porteriana*



Map 9. Distribution of C. porteriana var. scoparia



Map 10. Distribution of C. articulata and C. myrtillofolia

not hold up on examination of a range of collections. Pubescence seems to be, in general, a very plastic character in the genus, and can rarely be trusted as a major character for the differentiation of species. The texture of the leaves and the coloring of the plant appear to be correlated with habitat, and the branching pattern changes radically with the accompanying vegetation and the period of time since the area was exposed to fire. In consideration of these factors it was deemed more realistic to reduce the species to varietal status until some clear distinction between them can be demonstrated.

7. CHAMAESYCE MYRTILLIFOLIA (L.) Millsp., Field Mus. Bot. 2:

410. 1916. Euphorbia myrtillifolia L. Syst. Nat. ed. 10, 1048. 1759.

Shrub, erect, to 1 m. Stems to 5 mm. diameter, internodes to 4 cm. long; branching open, throughout length, short-pubescent, brown. Leaves membranous; blades elliptic or obovate, 7-15 x 5-10 mm., base oblique, obtuse or cuneate, margin serrate, often only in upper half, apex emarginate, obscurely mucronate, midrib prominent on lower surface, upper surface glabrous or sparsely pilose, lower pilose-pubescent, yellow-green; petiole to 1 mm. long, short-pubescent; stipules joined for half length, free part narrow, ciliate or toothed. Cyathia solitary at upper nodes; peduncle to 2 mm. long, involucre obconical, to 1.5 mm. diameter at mouth, lobes equalling glands, deltoid, toothed, pilose on outside and within, glands transversely elliptic, 0.5 x 0.2 mm., dark brown, appendages longer than glands and as wide, margin somewhat dentate, creamy-yellow, fifth gland linear, short or obsolete, sinus shallow. Staminate flowers 18-30 per cyathium, androphores glabrous, to 1.5 mm. long at maturity. Gynophore short-pubescent, to 3 mm. long at maturity, exerted, upright;



Plate 11. CHAMAESYCE MYRTILLIFOLIA (L.) Millsp.

E. myrtillifolia L., Gordon Town, St. Andrew, Jamaica, 8 Dec. 1954, Proctor 9595 (NY).

calyx a pad of tissue or obsolete; ovary sparsely pilose; styles spreading, to 1 mm. long, joined at base, bifid for one-third length. Capsule sparsely pubescent, glabrate, ovoid with truncate or cordiform base, 2.2 mm. long, 2.3 mm. wide above base, broadly three-lobed, angles rounded. Seed long-conical, to 1.8 mm. long, triangular with ventral angle obsolete, others acute, dorsal faces convex, strongly wrinkled, base truncate, dark reddish-brown.

Reported only from the Gordon Town and Guava Ridge area of the Blue Mountains of Jamaica (Map 10).

Specimens seen: JAMAICA. St. Andrew: Near Gordon Town, 23 May 1894, Harris 5196 (NY); Valley of Hog Hole River above Gordon Town, 8 Dec. 1954, Proctor 9595 (IJ, NY); 1/4 mile northeast of Gordon Town, 20 Mar. 1956, Proctor 11874 (GH, IJ).

The affinities of this species are with the shrubby C. articulata, but it differs from that species in being smaller and having elliptic leaves which are pilose on the under surface. The involucre of C. myrtillifolia is smaller, with less prominent glandular appendages, and the style and other floral parts are reduced proportionally.

8. CHAMAESYCE NUTANS (Lag.) Small, Fl. SE. US. 712. 1903. Euphorbia nutans Lag., Gen. et Spec. Pl. 17. 1816. Type: "Habit.[at] in N.[ova] H.[ispania]. Perhaps at Madrid . . ." (Wheeler, 1941).

E. preslii Guss., Fl. Sic. Prod. 1: 539. 1827. Type: Palermo, Italia, Todaro (fragment F seen by Wheeler). C. preslii (Guss.) Arthur, Torreyia 11: 260. 1912.

E. hypericifolia L. var. communis Engelm. in Emory, U.S. & Mex. Bound. Surv. 2: 188. 1859. Type: New Mexico, 1851-52, C. Wright 1842

(fragment F seen by Wheeler).

E. hypericifolia L. sensu Michaux, Fl. Bor.-Am., 1803; Torrey, Fl. State New York, 1843.

E. maculata L. sensu Wheeler, Contr. Gray Herb. 127: 74. 1939.

Annual; erect or ascending to 8 dm. Stem to 4 mm. thick at somewhat woody base, internodes to 3 cm. long; branched mostly from upper nodes, young tips and a line on older stem densely tomentose, glabrate, straw-colored or darker brown. Leaves membranous; blades ovate-lanceolate, often somewhat oblong or falcate, 10-30 x 6-10 mm., base inequilateral, rounded, margin serrate, apex acute to obtuse, glabrous or sparsely long-pilose on upper surface, more generally long-pilose below, both surfaces mid-green often with a red spot on upper surface or the whole suffused with red; petiole 1-2 mm. long; stipules joined or nearly distinct near tip of shoot, triangular to 1 mm. long, margin toothed and ciliate, thin textured, brown. Cyathia borne singly in lateral and terminal short-stalked compound dichasia; peduncle 0.5 - 2 mm. long, involucre campanulate, 0.7 - 1 mm. diameter, lobes triangular exceeding glands, subentire or deeply lacinate, glabrous outside, slightly hairy within, glands broadly transversely elliptic, 0.1 - 0.3 mm. long, appendages obsolete or to three times width of gland, white or pink, fifth gland linear, shorter than lobes, sinus shallow. Staminate flowers 5-14 per cyathium, androphores glabrous, 1 mm. long at maturity. Gynophore glabrous, to 2 mm. long at maturity, exerted, upright or nutant; calyx obsolete; ovary glabrous; styles spreading, 0.4 - 1 mm. long, minutely joined at base, bifid for 1/3 - 1/2 length. Capsule glabrous, broadly ovoid with somewhat flattened base, 1.8 - 2.3 mm. long, 2 - 2.3 mm. diameter



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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Plate 12. CHAMAESYCE NUTANS (Lag.) Small

C. nutans (Lag.) Small, between Marianna and Campbellton, Jackson County, Florida, 7 Nov. 1964, Godfrey 64932 (FLAS).

below equator, strongly three-lobed, angles subacute. Seed oblong-ovoid, to 1.3 mm. long, 0.8 mm. wide at equator, ventral angle rounded and obscure, others well marked, faces convex, rippled, black, often with light angles.

A common weed of the eastern United States reaching its southern limit in north Florida. It is possible that it was present as a weed of cultivated ground in Puerto Rico and many of the Caribbean islands as reported by Britton and Wilson (1924), but almost all of the specimens in NY and F on which these records might have been based prove to be misidentifications of plants of E. hyssopifolia L. and E. hypericifolia L. The collections by Fredholm and by Hitchcock from central Florida are correctly named, but no more recent records have been obtained from this area in spite of heavy collecting, and it is doubtful that the species is present as more than a short-lived, casual introduction. (Map 11).

Specimens seen: FLORIDA. Alachua: June-July 1898, Hitchcock 1697 (F). Brevard: Okeechobee region, 17 Sept. 1903, Fredholm 6014 (GH, NY). Citrus: June-July 1898, Hitchcock 1699 (F, M0). Gadsden: Jim Woodruff Dam, Chattahoochee, 19 Oct. 1963, Burch 207 (FLAS, 1J, US); River Junction, 7 Aug. 1927, Wiegand & Manning 1818 (GH); Chattahoochee, 7 Aug. 1927, Wiegand & Manning 1819 (GH); Chattahoochee, 8 Sept. 1931, West s.n. (FLAS). Jackson: Marianna, 19 Oct. 1963, Burch 210 (FLAS); near Cottondale, 26 Oct. 1964, Burch 504 (FLAS, M0, NCU, NY); between Marianna and Campbelltown, 7 Nov. 1964, Godfrey 64932 (FLAS, FSU); Marianna State Park, 15 Sept. 1960, Mitchell 839 (FSU); Marianna Caverns State Park, 19 Nov. 1960, Mitchell 903 (FSU). Leon: Tallahassee, 11 Sept. 1942, Henry & Baggs s.n. (FLAS); 18 Sept. 1942, Kurz s.n. (FLAS); Tallahassee, 2-3 Sept. 1895, Nash 2519

(F, GH, NY). Levy: June-July 1898, Hitchcock 1698 (F). Wakulla: Newport, 13 Sept. 1964, Godfrey 64618 (FLAS). Walton: Northwest section, 9 July 1964, Hume s.n. (FLAS). Washington: west side of Careyville, 26 Oct. 1964, Burch 499 (FLAS). Extra-territorial specimens: BERMUDA. North Shore, 31 Aug.-20 Sept. 1905, Brown & Britton 8 (F, NY); Devonshire, 31 Aug.-20 Sept. 1905, Brown & Britton 79 (F, NY); Devonshire, 19 Aug. 1963, Manuel 265 (A).

This species bears a strong resemblance to C. hypericifolia (L.) Millsp., C. hyssopifolia (L.) Small and C. lasiocarpa (Klotzsch) Arth., but may be distinguished by its stem pubescence, limited to the tips and lines at the side of older parts; by the cyathia carried in a leafy dichasium; by the large capsules and by the black, plump seed with a rippled surface.

The application by Wheeler (1939) of the name E. maculata L. to this species, rather than to the prostrate plant for which it has been widely used, deserves comment. His case, based on the selection of a specimen from Herb. Linn. as the type, was never proved, since there was some doubt about the identification that Linnaeus made for this sheet. The description of E. maculata in Species Plantarum is placed among the low-growing rather than the erect species, suggesting that Linnaeus intended it for a prostrate plant and that the traditional application is correct.

The use of the name E. hypericifolia L. for this species may be traced to annotations on the Linnaean specimens made by Sir J. E. Smith during the years when he owned the herbarium. Michaux (1803) may have examined the material and arrived at the decision independently, but the use in this fashion was confirmed by correspondence between Smith and Torrey when his Flora of the State of New York (1843) was in preparation.



The basis for Smith's actions was sound in that the description of E. hypericifolia in Linnaeus' early works was written from this northern plant. The specific limits were widened to include a tropical plant, however, before the publication of Species Plantarum, and since the name has been used most widely for this entity, the interests of stability of nomenclature are best served by maintaining this application. Burch (1965) deals more fully with the questions relating to the name of this species.

9. CHAMAESYCE HYPERICIFOLIA (L.) Millsp. Field Mus. Bot. 2: 302. 1909. Euphorbia hypericifolia L., Sp. Pl. ed. 1, 454. 1753. Type: Sloane Hist. 1, t. 126. (lectotype, designated by Burch, Rhodora 67. 1965, in press).

E. pilulifera L. sensu Wheeler, Contr. Gray Herb. 127: 76. 1939. (But see disclaimer, loc. cit. 78).

C. glomerifera Millsp. Field Mus. Bot. 2: 377. 1913. Type: El Rancho, Dept. Jalapa, Guatemala, 20 Jan. 1908, W. A. Kellerman 8053 (F!).

E. glomerifera (Millsp.) L. C. Wheeler, Contr. Gray Herb. 127: 78. 1939.

Annual or perennating in tropics; erect to ascending, or sprawling to 4 dm. Stem to 3 mm. diameter at somewhat woody base, internodes to 3 cm. long; branching throughout length particularly in upper part of stem, glabrous, tan to dark brown. Leaves membranous, blades ovate-elliptic to elliptic-obovate, at times somewhat falcate, 15-35 x 8-14 mm., base inequilateral, rounded or cuneate, margin serrate, apex acute, glabrous, green, sometimes purple-spotted above and lighter green on underside; petiole to 1 mm. long; stipules joined, sheathing, 1 - 1.5 mm. long, margin serrate, inner surface pubescent at least at apex, light-brown, or, at upper nodes, separate, to 0.5 mm. long, entire or deeply 2-4 cleft. Cyathia in

short-stalked, lateral and terminal, congested dichasia forming glomerules with a few basal leaves; involucre short-peduncled with stipule-like bracts at junction with pedicel, narrow campanulate or more flaring, to 0.8 mm. diameter at mouth, lobes equalling or exceeding glands, triangular, toothed or cleft, glabrous on outside, sparsely long-pilose within, glands subcircular to 0.1 mm. diameter, appendages obsolete or prominent, to 1 mm. wide, entire, white or pink, fifth gland obsolete, sinus shallow. Staminate flowers 10-12 or rarely only 4 per cyathium, androphores glabrous, to 0.6 mm. long at maturity. Gynophore glabrous, to 1 mm. long at maturity, exserted, nutant; calyx a triangular pad of tissue; ovary glabrous; styles 0.3 mm. long, spreading, minutely joined at base, bifid for 1/2 length. Capsule glabrous, subspherical, to 1.2 mm. diameter, roundly three-lobed, angles rounded. Seed ovoid, to 0.8 mm. long, 0.5 mm. wide, strongly four-sided, ventral angle more obtuse than others, faces flat or convex, wrinkled, light brown.

A frequent plant of waste places in Old and New World tropics and subtropics. Common in the southern part of Florida with isolated collections as far north as Sapelo Island, Georgia, and present throughout the Greater and Lesser Antilles (Map 12).

Representative specimens seen: FLORIDA. Alachua: University of Florida campus, Gainesville, 30 Oct. 1964, Burch 521 (FLAS). Broward: Fort Lauderdale, 19-25 Nov. 1903, Small & Carter 644 (NY). Collier: road to Marco Island, 15 Apr. 1954, West, Arnold & Cooley 147 (FLAS). Dade: vicinity of Homestead, 22 Nov. 1964, Godfrey 65583 (FLAS, FSU); Buena Vista, 1 Jan. 1930, Moldenke 330 (DUKE, NY); Miami, 14 May 1904, Tracy 9127 (F, MO, NY). Glades: Caloosahatchee River bank, 7 Nov. 1964,



Plate 13. CHAMAESYCE HYPERICIFOLIA (L.) Millsp.

C. hypericifolia (L.) Millsp., University of Florida campus, Gainesville, Alachua County, Florida, 30 Oct. 1964, Burch 521 (FLAS).

Hodgson 230 (FLAS). Highlands: Rd. 25, south of Sebring, 22 June 1948, Garrett s.n. (FLAS). Lee: Sanibel Island, 13 Apr. 1954, West & Cooley 2630 (USF). Manatee: U.S. 41 & U.S. 19, 29 Nov. 1962, Ward & Burch 3163 (FLAS). Monroe: Upper Matecombe Key, June, ??, Curtiss 2486 (F, MO); No Name Key, 21 Mar. 1898, Pollard, Collins & Morris 126 (F, NY); Key Vaca, 3 Sept. 1954, Thorne 15177 (IJ); Key Largo, north end, 27 June 1960, Webster & Samuel 10239 (DUKE, PUR). Palm Beach: Jupiter Inlet, west of DuBoise Park, 27 Aug. 1964, Christensen RC-44a (FLAS, FSU). Pinellas: Don Caesar Hotel, St. Petersburg Beach, 24 May 1964, Taylor s.n. (FLAS). Polk: Haines City, 25 June 1963, Conard s.n. (FSU). Sarasota: Laurel, 21 Nov. 1964, Godfrey 65273 (FLAS, FSU). Sumter: Wildwood exit, I-75, 18 Nov. 1964, Burch 524 (FLAS). Volusia: Pierson, 17 Sept. 1943, West & Arnold s.n. (FLAS). BAHAMAS. Great Bahama, 5-13 Feb. 1905, Britton & Millspaugh 2476 (F, NY); North Bimini, 16 Apr. 1904, Millspaugh 2399 (F, NY). Andros: Mastic Point, 19-28 Mar. 1907, Brace 7087 (F, NY); Nicholl's Town, 4-5 Feb. 1910, Small & Carter 8937 (F, NY). New Providence, Nassau, Nov. 1890, Hitchcock s.n. (F, MO). Eleuthera: Gregory Town, 6 July 1903, Coker 371 (NY); Governor's Harbor, 14 Nov. 1890, Hitchcock s.n. (F). Cat Island, the Bight & vicinity, 1-6 Mar. 1907, Britton & Millspaugh 5816 (F, NY); Watling's Island, Cockburn Town, 12-13 Mar. 1907, Britton & Millspaugh 6053 (F, NY); Great Exuma, 22-28 Feb. 1905, Britton & Millspaugh 2945 (F, NY); Long Cay, 7-17 Dec. 1905, Brace 4036 (F, NY); Inagua, 3 Dec. 1890, Hitchcock s.n. (F, MO). CUBA. Camaguey: Atalaya, 20 Mar. 1909, Shafer 983 (F, NY). Havana: Havana, 5 May 1905, Curtiss 743 (F, MO, NY). Oriente: Monte Verdi, Jan.-July 1859, Wright 1422 (F, MO, NY). Santa Clara: Cienequita, Cienfuegos, 2 May 1895, Combs 4 (F, MO, NY); Limones, Soledad,

Cienfuegos, 27 Sept. 1924, Jack 6334 (MO). GRAND CAYMAN. Georgetown, 2 June 1963, Crosby, Hespeneheide, & Anderson 50 (DUKE, UCWI); Spot Bay, 13-14 Feb. 1899, Millspaugh 1304 (F). JAMAICA. Portland: Kildare, 21 Aug. 1962, Adams 11555 (UCWI); Port Antonio, 4 Jan. 1906, Wight 2 (F, NY). St. Andrew: Mount Pleasant, Stony Hill, 21 July 1912, Harris 11134 (F, NY, UCWI); Long Mountain, June 1953, Robbins 434 (UCWI). St. Ann: Mosely Hill Cave, 1 mile west of Blackstonedged, 12 Dec. 1952, Proctor 7474 (IJ). St. James: Ironshore, May 1953, Asprey 432 (UCWI). Trelawny: Cowie Park near Troy, 19 Oct. 1917, Harris 12646 (F, MO, NY, UCWI). Westmoreland: Negril, 29 Mar. 1962, Adams 10980 (UCWI). HAITI. Jeremie, 13 July 1941, Seibert 1725 (MO); Port au Prince, 21-23 Feb. 1920, Leonard 2778 (NY); St. Michel de l'Abalaye, 1927, Ekman 8394 (F, IJ). DOMINICAN REPUBLIC. Barahona, June 1910, Fuertes 255 (F, MO, NY); San Pedro de Macoris, 26 Mar. 1913, Rose, Fitch & Russell 4154 (NY); Santo Domingo City, 9-10 Mar. 1913, Rose, Fitch & Russell 3769 (NY). PUERTO RICO. Camuey, 14 June-22 July 1901, Underwood & Griggs 204 (NY); Fajardo Light House, 17 Apr. 1899, Heller 1179 (F, NY); Guanica, 22 Jan. 1899, Millspaugh 753 (F); Guayama, May 1874, Kuntze 554a (NY); Penuelas, 16 July 1886, Sintenis 4823 (MO, NY); Rio Piedras, 9 Apr. 1912, Johnston 216 (NY); San Juan, Dec. 1913, Hiorani s.n. (NY). LESSER ANTILLES. St. Thomas: Charlotte Amalie, 17-18 Jan. 1899, Millspaugh 382 (F); Forts Square, Jan. 1877, Eggers s.n. (MO, NY). St. Croix: Bassin Yard, 15 Nov. 1895, Ricksecker 75 (F, MO, NY); Peter's Rest, 2 June 1924, Thompson 772 (NY). Tortola, 18 Sept. 1918, Fishlock 144 (NY). St. Kitts, 8 Sept.-5 Oct. 1901, Britton & Cowell (NY). Guadeloupe, Pointe-a-Pitre, 19 May 1936, Stehle 1190 (NY); Dominica, Soufriere, 1903, Lloyd 490 (NY).

Martinique: Case Pilote, 1879, Duss 488 (F, MO, NY); Ste. Anne village, 29 July 1939, Egler 39-208 (NY). Barbados: Bathsheba, Apr.-June, 1895, Waby 101 (F); Waterford, St. Michael, 15 Aug. 1906, Dash 166 (F). Grenada, St. George's, 29 Sept. 1906, Broadway s.n. (F). Extra-territorial specimens: BERMUDA. St. David's Isle, 22 May-6 June 1914, Brown, Britton & Bisset 2093 (F, NY); neglected field, 7 July 1921, Degener 1003 (MO). GEORGIA. S.W. section, Sapelo Island, 13 Oct. 1956, Duncan 20624 (DUKE, NCU, NSC).

The Linnaean name E. hypericifolia has been applied to this species and to the one known here as C. nutans. Both elements were represented in the diagnosis and in the synonymy of the original publication in Species Plantarum, and the choice of this species to carry the name was made on the basis of its widespread application in this way dating from Miller's Gardener's Dictionary edition 8 (1768). This matter, and Wheeler's application of the name to the plant known here as C. lasiocarpa, are discussed in more detail by Burch (1965).

The use of the name E. pilulifera L. for this species cannot be accepted if the sheet (630-8) in the Linnaean Herbarium bearing this name is allowed any status as type material. The identity of the specimen is not clear, but the small part of a seed visible in one capsule showed none of the surface markings characteristic of seed of C. hypericifolia, and the general aspect of the plant was closer to that of C. hirta.

10. CHAMAESYCE HYSSOPIFOLIA (L.) Small, J. N.Y. Bot. Gard. 3: 429. 1905. Euphorbia hyssopifolia L. Syst. Nat. ed 10, 1048. 1759. Type: in Herb. Linn. sheet 630-9 ! Anisophyllum hyssopifolium (L.) Haw., Syn. Pl. Succ., 161. 1812. E. hypericifolia L."β hyssopifolia L." Griseb. Fl. Br.

W. Ind. Isl., 54. 1859. E. brasiliensis Lam. var. hyssopifolia Boiss.
in DC. Prod. 15(2): 24. 1862.

E. brasiliensis Lam., Encyc. 2: 423. 1786. Type: Mus. Nat.,
Paris, if extant. C. brasiliensis (Lam.) Small, Fl. SE, US., 712. 1903.

C. nirurioides Millsp., Field Mus. Bot. 2: 394. 1914. Type: Malvern,
Santa Cruz Mountains, Jamaica, 5 Sept. 1907, Britton 1186 (holotype: F !,
isotype: NY !). E. nirurioides (Millsp.) Fawcett & Rendle, Fl. Jam., 4(2):
339. 1920.

C. jenningsii Millsp. in Britton, Bull. Torr. Bot. Club 43; 465.
1916. Type: near Vivijagua, Isle of Pines, Cuba, 7 May 1910, Jennings 621
(Holotype: Herb. Carnegie Mus., portion of holotype F !; Isotype: NY !).

Annual, occasionally perennating; erect or ascending or rarely
decumbent, to 6 dm. Stem to 4 mm. thick at somewhat woody base, internodes
to 3 cm. long; branched at all levels but most in upper part of plant,
glabrous or sparingly long hairy near base, rarely strongly short-pubescent
at lower nodes particularly in plants from more tropical areas, straw-
colored or darker brown. Leaves membranous; blades very variable, linear-
lanceolate, 15-35 x 3-6 mm., with subcordate inequilateral base, margin
serrate in upper half, apex acute, to ovate-elliptic, occasionally some-
what falcate, 10-30 x 6-10 mm., with rounded to subcordate inequilateral
base, margin generally serrate, apex obtuse, glabrous or sparsely long
pilose, on shoots near base of plant, both surfaces mid-green; petiole 1-2
mm. long; stipules joined or nearly free at upper nodes, almost obsolete to
deltoid, 0.8 mm. long, margin short-fringed. Cyathia borne singly,
terminal and axillary in short-stalked, diffuse or compact, leafy dichasia;
peduncle short, involucre commonly narrowly tubular, 0.7 - 1 mm. diameter,

sometimes flaring-campanulate, lobes triangular, deep cleft, exceeding glands, glabrous outside, sparsely pilose within, glands transversely elliptic or almost circular, 0.1 - 0.3 mm. long, appendages obsolete to prominent, elliptic, twice as long and three times as wide as gland, white or pink, fifth gland obsolete or tiny, linear, sinus shallow. Staminate flowers 9-20 per cyathium, androphores glabrous, 0.6 - 1 mm. long. Gynophore glabrous, ca. 1 mm. long at maturity, exerted, usually nutant; calyx a triangular pad; ovary glabrous; styles upright or spreading, to 0.4 mm. minutely joined at base, bifid for 1/3 - 1/2 length. Capsule glabrous, truncate-cuneiform to broadly ovoid, 1.5 - 2 mm. long, 1.6 - 1.8 mm. wide just above base, strongly three-lobed, angles subacute. Seed oblong-ovate, to 1 mm. long, 0.5 mm. wide, four-angled with ventral angle less acute than others, faces flat, marked with transverse ridges, a central longitudinal ridge sometimes on dorsal faces, brown or black, angles sometimes light.

Widespread throughout Florida and sporadically to South Carolina, common in all parts of the Caribbean except the Bahamas, where the reports for New Providence and Eleuthera (Britton and Millspaugh, 1920) are probably based on collections by Britton and Coker (NY !) which prove to be misidentifications of plants of C. hypericifolia (L.) Millsp. (Map 13).

Representative specimens seen: FLORIDA. Alachua: Pineland, Gainesville, 15 June 1910, Hood 24465 (FLAS, MO); University of Florida campus, Gainesville, 10 Sept. 1956, Jackson 707 (FLAS). Baker: Olustee National Forest, 28 Nov. 1955, Kral 1572 (FSU). Brevard: Melbourne, 22 Aug. 1958, Kral 7971 (FLAS, GH, NY, USF). Broward: Pinelands, Ft. Lauderdale, 19 & 25 Nov. 1903, Small & Carter 1141 (F, NY); U.S. 27, north of Andytown,



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 0 5 1 3 2 1 1

Plate 14. CHAMAESYCE HYSSOPIFOLIA (L.) Small

C. hyssopifolia (L.) Small, Fairchild Tropical Gardens, Dade County, Florida, 31 December 1962, Burch 52 (FLAS).

C. nirurioides sp. nov.



THE NEW YORK BOTANICAL GARDEN

SANTA CRUZ MOUNTAINS

Chamaesyce nirurioides Millsp.
 Britton 1186 (NY)

Plate 15. CHAMAESYCE HYSSOPIFOLIA (L.) Small

Isotype: *C. nirurioides* Millsp., Malvern, Santa Cruz Mountains, Jamaica; 5 Sept. 1907, Britton 1186 (NY).



Plate 16. *CHAMAESYCE HYSSOPIFOLIA* (L.) Small

Isotype: *C. jenningsii* Millsp. in Britton, near Vivijagua, Isle of Pines, Cuba, 7 May 1910, Jennings 621 (NY).

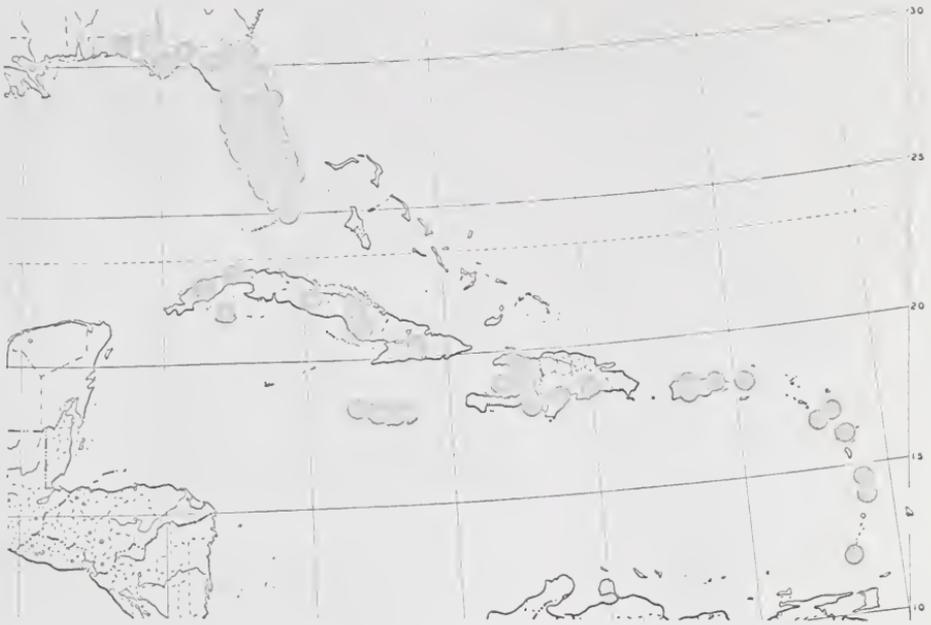
PLANTS OF ISLE OF PINES
EXPEDITION OF CARNEGIE MUSEUM, MAY, 1910

26 Jan. 1963, Ward & Burch 3338 (FLAS). Calhoun: N.W. of Blountstown,
 25 Oct. 1964, Burch 506 (FLAS). Charlotte: Charlotte Harbor, 21 Nov.
 1964, Godfrey 65360 (FLAS); Peace River, 13 Aug. 1963, Burch 185 (FLAS).
 Citrus: Dunnellon, 16 June 1958, Kral 6901 (FLAS, FSU, USF). Collier:
 Immokalee, 26 Sept. 1964, Lakela 27492 (USF). Dade: Buena Vista, 1 Jan.
 1930, Moldenke (DUKE, F, MO, NY); Miami-Kendall Station, 5 Nov. 1906,
 Small & Carter 2521 (NY). Duval: Jacksonville, 17 Nov. 1929, Moldenke
 5232 (NY). Franklin: Apalachicola, 2 Nov. 1875, Chapman 3844a (MO, NY).
 Gadsden: Greensboro, 9 July 1955, Godfrey 53614 (DUKE, FSU, NY). Hendry:
 La Belle, 19 Apr. 1930, Moldenke 5911 (NY). Hernando: Brooksville,
 3 Sept. 1959, Ray 9461 (USF). Highlands: Childs, 3 Mar. 1945, Brass
 14744 (US); Sebring, 25 Apr. 1960, Ray, Gleason & Eaton 9728 (USF).
 Hillsborough: Tampa, 20 Mar. 1923, Churchill 546 (MO, US); Oldsmar,
 12 Aug. 1960, Ray, Lakela & Patman 10006 (USF). Jackson: between Mari-
 anna & Campbellton, 7 Nov. 1964, Godfrey 64933 (FSU). Lake: Eustis,
 16-30 June 1894, Nash 1076 (F, MO, NY). Lee: Ft. Myers, July-Aug. 1900,
 Hitchcock 324 (F, MO, NY); 5 miles east of Ft. Myers Beach, 1 Aug. 1958,
 Kral 7539 (GH, USF). Leon: Tallahassee, 30 June 1955, Godfrey 53571
 (DUKE, FSU, NY). Marion: Silver Springs, 1 Oct. 1963, Godfrey 63145 (FSU).
 Manatee: Bradenton, 13 June 1916, Cuthbert 1312 (NY); Cortez, 19 July 1958,
 Jackson 732 (FLAS). Martin: Stuart, 3 Sept. 1944, West & Arnold s.n.
 (FLAS). Monroe: Key Largo, 26 Jan. 1963, Ward & Burch 3332 (FLAS). Nassau:
 Fort Clinch, 12 Oct. 1963, Burch 195 (FLAS). Okaloosa: Ft. Walton Beach,
 24 Oct. 1964, Burch 470 (FLAS). Okeechobee, 27 Dec. 1964, Burch 589 (FLAS).
 Orange: Orlando, 21 June 1900, Curtiss 6670 (MO, NY). Osceola: St. Cloud,
 27 Feb. 1952, Cooley 1032 (USF). Palm Beach: between Palm Beach & Lake

Worth, 7 Aug. 1963, Burch 119 (FLAS). Pasco: Land O'Lakes, 10 July 1958, (FLAS, GH, NY). Pinellas: St. Petersburg, 23 Sept. 1907, Deam 2758 (MO). Polk: Lake Hamilton, 30 Sept. 1962, Conard s.n. (FLAS). Putnam: Welaka, 5 Aug. 1940, Laessle s.n. (FLAS). St. Lucie: Ft. Pierce, 7 Aug. 1963, Burch 122 (FLAS). St. Johns: Ponte Vedra, 11 Oct. 1964, Burch 437 (FLAS). Sarasota: Osprey, 10 Mar. 1904, Smith 712 (DUKE). Sumter: Withlacoochee River bridge, 8 Nov. 1946, West & Arnold s.n. (FLAS). Suwannee: Live Oak, 4 Oct. 1964, Elam s.n. (FLAS). Volusia: Daytona Beach Shores, 3 Aug. 1962, Ray 11159 (USF). Wakulla: 3 Nov. 1964, Godfrey 64887 (FLAS, FSU). Washington: Chipley, 31 July 1954, Ford & Arnold 3860 (FLAS). CUBA. Camaguey: La Gloria, Feb. 1909, Shafer 285 (F, NY). Cienfuegos: Colonia Limones, Ingenio Soledad, 24 Jan. 1903, Pringle 59 (F, MO, NY); 2 May 1895, Combs 3 (F, MO, NY). Havana: Guanabacoa, 27 Jan. 1905, Curtiss 618 (F, MO, NY); Havana, Apr. 1903, Shafer 91 (F). Isle of Pines: Nueva Gerona, 19 Dec. 1903, Curtiss 244 (F, NY). Oriente: Bayate, 18 July 1914, Ekman 2012 (NY). Pinar del Rio: Herradura, 26-30 Aug. 1910, Britton, Britton, Earle & Gager 6332 (F, NY); between Vinales and Pinar del Rio, 16 June 1953, Webster 4670 (PUR). San Pedro: banks of Ariguanaba lagoon, 5 Apr. 1923, Leon 11417 (NY). Santa Clara: Hoyo de Manicaragua, 26-28 Feb. 1910, Britton, Britton & Wilson 4660 (F, NY); Rio Hondo Plains, 5 May 1903, Cook & Doyle 528 (F). JAMAICA. Clarendon: Alley, 11 Feb. 1947, von der Porten s.n. (IJ); Kupaui, 23 June 1955, Proctor 10330 (IJ). Hanover: Negril to Bloody Bay, 12 Sept. 1962, Adams 11663 (UCWI). Manchester: Lititz, 5 Nov. 1961, Adams 9864 (UCWI). Portland: Port Antonio, Dec. 1890, Hitchcock s.n. (MO). St. Andrew: Constant Spring to Bardowie, 2 Aug. 1915, Harris 12112 (F, MO, NY, UCWI);

Hope, 18 Aug. 1897, Harris 6803 (F, NY, UCWI); road to Constitution Hill, 20 Oct. 1905, Harris 9035 (F, NY, UCWI); University of West Indies campus, 4 June 1963, Crosby, Hesperheide & Anderson 60 (F). St. Catherine: Bog Walk, 17 Dec. 1890, Hitchcock s.n. (MO). St. Thomas: Morant Bay, 6 Dec. 1959, Adams 5678 (UCWI); Port Morant, 24 Dec. 1890, Hitchcock s.n. (MO). Westmoreland: Bluefields & vicinity, 6-7 Mar. 1908, Britton & Hollick 1943 (F, NY). HAITI. Gonaives, Dec. 1899, Buch 278 (IJ); La Gonave, 9 Aug. 1927, Ekman 8862 (A); Mt. La Porte, near Pilate, 21 Aug. 1903, Nash 628 (NY); Pointe-a-pitre, 12 July 1936, Stehle 497 (NY); Port de Paix, 9 Jan. 1929, Leonard & Leonard 13543 (NY); St. Michel de l'Atalaye, 1 Jan. 1926, Leonard 8501 (MO); San Michel, 5 Aug. 1905, Nash & Taylor 1417 (NY). DOMINICAN REPUBLIC. Barahona, Feb. 1910, Fuertes 149 (F, NY). San Juan: Rio Arriba, 9-14 Sept. 1946, Howard & Howard 8821 (GH, NY). Santo Domingo: Villa Allagrancia, 19 Jan. 1929, Ekman H11229 (PUR). PUERTO RICO. Guayanilla-Tallahoa, 13 Mar. 1913, Shafer 1976 (F, MO); Martin Pena Station, 20 Feb. 1900, Heller 4665 (F, MO); Punta Arenas, 15 Feb. 1914, Shafer 2896 (F, NY); Rio Piedras, Station Grounds, 2 Oct. 1937, Otero 123 (MO); Utuado, 15-20 Mar. 1906, Britton & Cowell 409 (F, NY). LESSER ANTILLES. Charlotte Amalie, 17-18 Jan. 1899, Millspaugh 398 (F); Antigua, Belvidere, 15 Aug. 1937, Box 964 (MO); Montserrat, 5 Aug. 1939, Friend 51 (NY); Guadeloupe, Manive, 1893, Duss 2920 (NY); Martinique, Case-Pilote, 1901, Duss 4641 (F, NY); St. Lucia, 7 Sept. 1935, Potter 5508 (GH); St. Vincent, Kingstown, 2 Dec. 1945, Beard 1397 (MO, NY); Grenada, St. George's, 30 Oct.-11 Dec. 1957, Proctor 16812 (IJ).

C. hyssopifolia (L.) Small may be distinguished from similar species by its combination of usually glabrous stems, cyathia in a leafy dichasium,



Map 13. Distribution of C. hvssopifolia



Map 14. Distribution of C. lasiocarpa

large capsules and seed with prominent transverse ridges on at least the tangential faces.

The specimen in the Linnaean Herbarium is of a plant with linear leaves and rather few cyathia in a diffuse dichasium. This form occurs in most of the islands of the Greater Antilles, and is particularly well-marked on Hispaniola, but grades into the broader leaf form (often on the same plant), and the type specimen represents only the extreme leaf shape of this very variable species.

11. CHAMAESYCE LASIOCARPA (Klotzsch) Arthur, *Torreyia* 11: 260.

1911. Euphorbia lasiocarpa Klotzsch, *Nov. Act. Nat. Cur.* 19, supp. 1:

414. 1843. Type: Bot. Mus., Berlin, if extant. E. hypericifolia L.

" lasiocarpa Kl." Griseb., *Fl. Brit. W. I. Isl.* 54. 1859. (excl. syn. Balb.).

E. hypericifolia L. sensu Wheeler, *Contr. Gray Herb.* 127: 73. 1939.

Annual; erect or ascending to 1 m. Stem to 5 mm. thick at somewhat woody base, internodes to 3 cm. long; branched throughout, densely tomentose, straw-colored becoming darker with age. Leaves membranous; blades ovate-lanceolate to obovate, somewhat falcate, 15-40 x 8-20 mm., base inequilateral, rounded to obtuse, margin sharp-serrate, apex acute to obtuse, densely gray pubescent, rarely glabrate, green; petioles 2 to 3 mm. long; stipules joined, deltoid to 1 mm., toothed or ciliate, sometimes deeply bifid near tips of shoot. Cythia solitary in lateral and terminal short-stalked compound dichasia; peduncle ca. 1 mm. long, involucre campanulate, 1.2 mm. diameter at mouth, lobes triangular equalling glands, toothed or cleft, densely pubescent on outside, pilose within, glands transversely elliptic 0.3 mm. x 0.1 mm., appendages lunate, to three times as

long and broad as gland, white, fifth gland deltoid, short or obsolete, sinus to one fourth depth of involucre. Staminate flowers ten to eighteen per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore pilose to 1.5 mm. long at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary strigose; styles upright, to 0.7 mm. long, joined at base, bifid for $\frac{1}{3}$ length. Capsule densely pilose, broadly ovoid or conical, 1.5 - 2 mm. long, 2 mm. wide below equator, broadly three-lobed, angles acute. Seed oblong-ovoid, to 1 mm. long, 0.6 mm. wide, strongly four-angled, ventral angle more obtuse and rounded than other three, faces flat, with 2-4 deep transverse ridges, dorsal faces with an additional central longitudinal ridge, black, often with light angles.

A common roadside weed in Jamaica and Haiti, less common in Puerto Rico. Collections have been seen from Barbados and Tobago, and the plant is reported from Central America and northern South America (Wheeler, 1939) (Map 14).

Specimens seen: JAMAICA. St. Andrew: Kingston, 29 Aug. 1908, Britton 2978 (NY); Irish Town, 17 June 1963, Crosby, Hespenheide & Anderson 186 (DUKE, PUR); Liguanea, 7 Feb. 1960, Proctor 20564 (IJ, NY, PUR); Stony Hill, 21 July 1912, Harris 11136 (NY, UCWI). St. Thomas: Easington Bridge, 23 Mar. 1954, Proctor 8512 (IJ). Manchester: Warwick, 8 Nov. 1962, Proctor 22886 (IJ). St. Elizabeth: Unity Hill, Aug. 1961, Robertson 9136 (UCWI). HAITI. Port-au-Prince, Sept. 1919, Buch 1713 (IJ); St. Marc, 25-28 Feb. 1920, Leonard 2954 (NY); Petionville, 15-28 June 1920, Leonard 4967 (NY); St. Michel de l'Atalaye, 26 Dec. 1925, Leonard 8483 (MO); Jean Rabel, 27 Jan.-9 Feb. 1929, Leonard & Leonard 12789 (NY). PUERTO RICO. Coamo, 23 Nov. 1899, Goll 756 (NY); Juana Diaz, 3 Nov. 1913, Hess 4002 (NY).

LESSER ANTILLES. Barbados, 30 July 1901, Freeman s.n. (UCW1); Tobago, 6 Feb. 1913, Broadway 4415 (GH, MO).

This species is distinguishable by the dense pubescence of its stem and leaves, which even the most heavily pubescent specimens of C. hyssopifolia do not approach. In most other characters there is a close resemblance between the two.

Wheeler's application of the name Euphorbia hypericifolia L. to this species was based on a misidentified specimen in the Linnaean Herbarium, which was not seen or annotated by Linnaeus until long after the publication of the name.

12. CHAMAESYCE PARCIFLORA (URB.) comb. nov. Euphorbia parciflora Urban in Fedde, Repert. 15: 411. 1919. Type: prope Marmelade, Haiti, 1-2 Aug. 1905, G. V. Nash & N. Taylor 1269 (in Herb. Bot. Mus. Berlin, if extant; Isotype: NY !).

Perennial; erect or ascending to 3 dm. Stem to 2 mm. diameter, internodes to 3 mm. long; branched sparsely throughout length, glabrous or sparingly short-tomentose on one surface, dark brown. Leaves membranous; blades ovate, 6-10 x 3-5 mm., base inequilateral, rounded, margin sharply serrate, apex acute to obtuse, midrib distinct, glabrous, olive-green; petiole 1 mm. long; stipules joined, triangular to 1 mm. long, toothed or deeply cleft, sometimes bifid and almost distinct. Cyathia solitary at upper nodes; peduncle slender, to 3 mm. long, involucre campanulate, to 1.8 mm. diameter at mouth, lobes barely exceeding glands, attenuate, glabrous on outside, densely ciliate within, glands transversely elliptic, 0.6 x 0.1 mm., cupped, appendages as long as gland and up to four times as wide, creamy white, margin entire or crenulate, fifth gland linear,



Map 15. Distribution of C. parciflora



Map 16. Distribution of C. brittonii

almost equalling lobes, sinus shallow. Staminate flowers 4-12 per cyathium, androphores glabrous, to 1.3 mm. long at maturity. Gynophore glabrous, to 2.5 mm. long at maturity, exerted, nutant; calyx obsolete or a subcircular pad of tissue; ovary glabrous; styles spreading, 0.5 mm. long, joined at base, bifid for 1/2 length. Capsules glabrous, broadly ovoid, 2 - 2.2 mm. long, 2.5 - 2.8 mm. wide above base, narrowly three-lobed, angles acute. Seed ovate, to 1.3 mm. long, 1 mm. diameter just above base, four-angled, dorsal faces larger than ventral, dorsal angle acute, ventral angle flattened, faces flat, wrinkled, white.

Reported only from the mountains of Haiti, at elevations of 500-2000 m. in pineland or open woods (Map 15).

Specimens seen: HAITI. Badeau, 21 Feb. 1927, Ekman H4968 (IJ); Gonaïves, June 1901, Buch 634 (IJ); M. Bonfiere, 29 Sept. 1925, Ekman H7627 (IJ); Petionville, 24 Aug. 1924, Ekman H1593 (IJ); San Michel to Marmelade, 6 Aug. 1905, Nash & Taylor 1466 (NY).

The affinities of this species are not clear. Some of the extreme forms of C. hyssopifolia in Hispaniola have similar cyathia but are narrow-leaved, and plants growing strongly usually develop lateral dichasia of cyathia as they get older.

13. CHAMAESYCE BRITTONII (Millsp.) Millsp., Field Mus. Bot. 2: 303. 1909. Euphorbia brittonii Millsp., Field Mus. Bot. 2: 159. 1906. Type: Race course, New Providence, 26 Aug. 1904, Britton & Brace 839 (Lectotype: F !; Isotype: NY !).

Chamaesyce paucipila (Urb.) Millsp., Field Mus. Bot. 2: 410. 1916. Euphorbia paucipila Urban, Symb. Ant., 5: 389. 1908. Type: Prope Guanabacoa, Habana, Cuba, August, Baker and Hasselbring 7199 (Holotype:

Herb. Estac. Agron., Havana, Cuba, not seen).

Euphorbia niqueroana Urban in Fedde, Repert. 28: 234. 1930.

Type: South of Niquero, peninsula de Cabo Cruz, Oriente, Cuba, 17 Jan.

1923, E. L. Ekman 16176 (Holotype: Mus. Bot. Stockholm, not seen, photograph of holotype and Isotype: NY !). Chamaesyce niqueroana (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col. 'de la Salle', Habana 11: 12. 1952.

Perennial; erect or ascending to 1.5 dm. Stem to 1 mm. diameter at base, internodes to 2 mm. long, sparsely branched throughout, sparsely long-pilose particularly at nodes, brown. Leaves membranous; blades ovate-elliptic or somewhat orbicular, 2-5 x 1.5 - 3 mm., base inequilateral, rounded, margin entire or rarely crenate, apex rounded to obtuse, glabrous, or with scattered long hairs, green; petiole 0.5 mm. long; stipules separate, triangular, to 0.5 mm. long, toothed or 2-3 cleft. Cyathia solitary at upper nodes; peduncles to 0.3 mm. long, involucre campanulate, to 0.7 mm. diameter at mouth, lobes equalling glands, triangular, toothed, glabrous on outside, ciliate at mouth within, glands broadly transversely elliptic, to 0.2 mm. long, cupped and somewhat stipitate, appendages a rim to twice as wide as gland, fifth gland linear, short, sinus shallow. Staminate flowers 5-10 per cyathia, androphores glabrous, to 0.7 mm. long at maturity. Gynophore glabrous to 0.8 mm. long at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary glabrous; styles spreading, to 0.3 mm. long, minutely joined at base, bifid for 1/3 length. Capsule glabrous, broadly ovoid with somewhat flattened base, 1.2 mm. long, 1.5 mm. wide just above base, broadly three-lobed, angles acute. Seed broadly conical-ovoid, 0.8 mm. long, 0.6 mm. wide below equator, four-angled, dorsal faces larger than ventral, dorsal angle more acute than others, brown.



Plate 17. CHAMAESYCE BRITTONII (Millsp.) Millsp.

Isotype: *E. brittonii* Millsp., Race course, New Providence, Bahamas, 26 August 1904, Britton & Brace 839 (NY).

Sandy areas and barrens of several Cuban provinces, and from whitelands of New Providence, Bahamas (Map 16).

Specimens seen: BAHAMAS. New Providence, near race course, 26 Aug. 1904, Britton & Brace 279 (NY). CUBA. Havana, Loma de la Cruz, 27 Oct. 1927, Leon 13089 (NY). Las Villas: west of Santa Clara, 1-20 July 1950, Howard, Briggs, et al. 416-b (A). Matanzas: Corral Nueva, 13 Oct. 1927, Leon 13101 (NY); San Miguel de los Baños, 10 Oct. 1950, Alain A 1574 (NY). Oriente: Guantanamo Bay, 17-30 Mar. 1909, Britton 2159 (NY). Santa Clara: Loma de Belen, 24 June 1932, Leon 15628 (NY); Placetas del sur, 10 Aug. 1918, Leon & Roca 8145 (NY); Sti. Spiritus, 27 Aug. 1909, Leon 1352 (NY); Serpentine Barrens near Santa Clara, June 1941, Howard 5106 (GH).

The three species, which are here combined, vary in the degree of pubescence which they show but have no characters on which to base a consistent separation. The group differs from the least pubescent forms of C. turpinii only in habit and in the pubescent capsule of that species, and from C. insulaesalis only in its complete lack of pubescence. When more collections are available, the species limits set here may well need revision.

14. CHAMAESYCE COWELLII Millsp. in Britton, Bull. Torr. Club 43: 457. 1916. Type: Cayo Muertos, Puerto Rico, 9-12 Mar. 1915, Britton, Cowell & Brown 5007 (Holotype: F !; Isotype: NY !).

Perennial from a thickened rootstock; prostrate, forming mats to 15 cm. diameter. Stems many, wiry, ca. 0.5 mm. diameter, internodes to 1 cm.; branching throughout length, nodes not rooting, glabrous, brown or ashen. Leaves chartaceous; blades ovate-elliptic, somewhat reniform near

base of stem, 2-5 x 1-3 mm., base oblique, cordate or obtuse, margin entire, apex emarginate, rounded or obtuse, glabrous, obscurely papillose, green or ashen; petiole 0.4 - 0.6 mm. long; stipules joined at base, 0.3 mm. long, deeply cleft, sometimes ciliate on surface near stem. Cyathia solitary at upper nodes; peduncle short, involucre obconical, to 0.6 mm. diameter at mouth, lobes equalling glands, deltoid, glabrous on outside, ciliate within, glands transversely elliptic, 0.2 mm. long, somewhat cupped, appendages a rim to slightly wider than gland, fifth gland short or obsolete, sinus to one-third depth of involucre. Staminate flowers 6-14 per cyathia, androphores glabrous, to 0.8 mm. long at maturity. Gynophore glabrous, to 1 mm. long at maturity, exserted, nutant; calyx obsolete; ovary glabrous; styles spreading, to 0.2 mm. long, joined at base, bifid for half length. Capsule glabrous, ovoid, 1.2 mm. long, 1.4 mm. wide at equator, sharply three-lobed, angles acute. Seed long-ellipsoid, to 1 mm. long, strongly four-angled with ventral angle somewhat rounded, other angles acute, surface slightly convex, obscurely wrinkled, tan or darker brown.

Found in crevices of coastal limestone cliffs, Antigua and Cayo Muertos, Puerto Rico (Map 17).

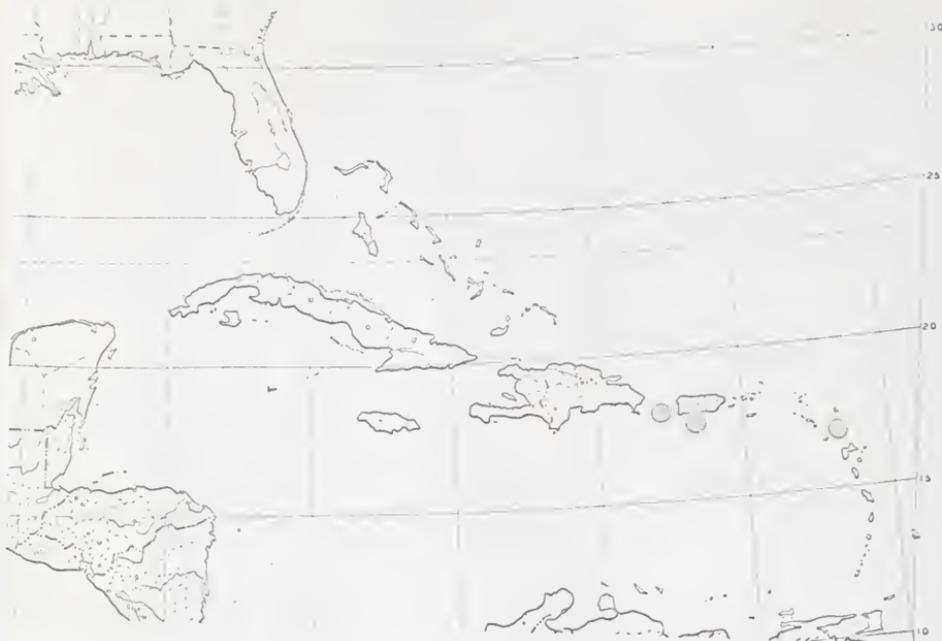
Specimens seen: PUERTO RICO. Sardinera, Mona Island, 20-26 Feb. 1914, Britton, Cowell & Hess 1670 (NY). LESSER ANTILLES. Antigua: Soldier Point, Half-Moon Bay, 1 May 1938, Box 1426 (NY); near English Harbor, 18 July 1937, Box 900 (BM, NY).

The resemblance between this species and *C. turpinii* in all characters except the pubescence of the latter suggests a close relationship. Future collections may indicate that the two should be separated at only the varietal level, but until more material is available the existing names



Plate 18. CHAMAESYCE COWELLII Millsp. in Britton

Isotype: C. cowellii Millsp., Cayo Muertos, Puerto Rico, 9-12 March 1915, Britton, Cowell & Brown 5007 (NY).



Map 17. Distribution of C. cowellii



Map 18. Distribution of C. blodgettii

will be maintained.

There is a description of the species filed with the type specimen in F which was probably drawn up by Millspaugh and sent with the name to Britton for the publication. The citation was made in the form that reflects this authorship.

15. *CHAMAESYCE BLODGETTII* (Engelm. ex Hitchc.) Small, Fl. SE. US. 712. 1903. *Euphorbia blodgettii* Engelm. ex Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 126. 1893. Type: Key West, Florida, Blodgett s.n. (Lectotype: MO !, fragment F !, isotype: NY !).

E. bermudiana Millsp., Field Mus. Bot. 2: 65. 1900. Type: Walsingham, Bermuda, 31 Dec. 1898, Millspaugh 60101 (Holotype: F !, Isotype: F !, NY !).

E. cozumelensis Millsp., Field Mus. Bot. 2: 61. 1900. Type: East Shore, Cozumel Island, 21 Feb. 1899, Millspaugh 61606 (Holotype: F !).

C. nashii Small, Fl. SE. US., 709. 1903. Type: Tampa, Hillsborough County, Florida, 20 August 1895, Geo. V. Nash 2427 (Distributed as *Euphorbia maculata*) (Holotype: NY !, Isotypes: F !, GH !, US !).

Chamaesyce chiogenes Small, Fl. SE. US. 709. 1903. Type: Key West, Florida, Blodgett s.n. (Holotype: Herb. Columbia College, if extant; most of this herbarium now in NY, but sheet there not marked with Columbia stamp, ? isotype !; portion of isotype F !).

E. batabanensis Urb., Symb. Ant., 5: 390. 1908. Type: Prope Batabano, prov. Havana, Cuba, October, Baker & Wilson 2212, 2341, 2375 (Syntypes: Herb. Bot. Mus. Berlin, if extant; Baker & Wilson 2301 NY ! - mistake in number?).

Annual, sometimes persisting; prostrate to decumbent forming mats

to 6 dm. diameter, rarely erect to 3 dm. Stem to 2 mm. diameter, larger in single-stemmed erect plants, internodes to 2 or rarely 3 cm. long; branching throughout length, sometimes rooting at nodes, glabrous, green or brown, often with reddish cast. Leaves membranous; blades oblong-elliptic 4-6 x 2-3 mm., base inequilateral, rounded or subcordate, margin entire or toothed in upper third, apex mucronulate or obtuse, blades of leaves of laterals smaller, uniform, base usually cuneate, glabrous, green, often suffused red; petiole to 1 mm.; stipules joined on upper surface to 1 mm. long, deeply bifid with each half several-cleft or toothed, on lower surface longer, triangular, several-cleft, sometimes deeply bifid, light-colored. Cyathia solitary at upper nodes or appearing clustered on congested leafy laterals; peduncle ca. 0.5 mm. long, involucre campanulate, to 0.5 mm. diameter at mouth, lobes equalling glands, triangular, entire or toothed, glabrous on outside, pilose within, glands transversely elliptic-oblong, 0.2 x 0.05 mm., appendages obsolete or semi-lunate, to twice as wide as glands, the two nearer the sinus larger than the other pair, white or pink, fifth gland linear, short, sinus shallow. Staminate flowers 8-12 per cyathium, androphores glabrous, to 0.5 mm. long at maturity. Gynophore glabrous, to 0.7 mm. long at maturity, exserted, nutant; calyx a three-cornered pad of tissue; ovary glabrous; styles spreading, to 0.3 mm. long, minutely joined at base, bifid for 1/3 to 1/2 length. Capsule glabrous, conical-ovoid, truncate at base and apex, 1.2 - 1.4 mm. long, 1.4 - 1.6 mm. wide above base, roundly three-lobed, angles acute to obtuse. Seed oblong-ovoid, to 1 mm. long, equally four-angled with rounded angles, faces flat or slightly convex, obscurely wrinkled, brown or gray-brown.



Plate 19. CHAMAESYCE BLODGETTII (Engelm. ex Hitchc.) Small

Lectotype: *E. blodgettii* Engelm. ex Hitchc., Key West, Florida, Blodgett s.n. (MO).



Plate 20. *CHAMAESYCE BLODGETTII* (Engelm. ex Hitchc.) Small

Holotype: *C. nashii* Small, Tampa, Hillsborough County, Florida, 20 August 1895, Geo. V. Nash 2427 (NY).



Plate 21. CHAMAESYCE BLODGETTII (Engelm. ex Hitchc.) Small
 ?Isotype: C. chiogenes Small, Key West, Florida, Blodgett s.n. (NY).

A very common component of beach scrub and dune vegetation, and also sandy inland areas, in the southern half of Florida, Bermuda, the Bahamas, Cuba, Jamaica and the Caymans. Only one specimen has been seen from the Virgin Islands, and the absence of the species from Hispaniola south through the Antilles is in striking contrast with its abundance in the other islands (Map 18).

Representative specimens seen: FLORIDA. Brevard: Patrick AFB, 24 Sept. 1957, Crawford s.n. (FLAS); St. Johns River valley west of Mims, 24 June 1957, Kral & Sincock 5008 (FSU). Charlotte: Bermont, 7 Nov. 1964, Hodgson 213 (FLAS); Charlotte Harbor, 21 Nov. 1964, Godfrey 65361 (FLAS, FSU). Collier: Naples Beach, 21 Nov. 1964, Godfrey 65441 (FLAS, FSU); Tamiami Trail, 1 Apr. 1930, Moldenke 869 (NY); Vanderbilt Beach, 13 Aug. 1963, Burch 184 (FLAS). Dade: Adams Key, 11 Mar. 1915, Small & Mosier 5729 (NY); Biscayne Bay, Indian River, 1874, Palmer 500 (NY); Cutler to Point Creek, 1 July 1915, Small, Mosier & Small 6689 (MO, NY, US); Homestead Bayfront Park, 20 July 1964, Lakeia 27316 (FLAS, USF); Miami Beach, 11 Jan. 1930, Moldenke 390 (DUKE, MO, NY). Glades: Moore Haven, 28 Dec. 1963, Burch 236 (FLAS). Hendry: Big Cypress Seminole Reservation, 8 June 1964, Brass 33229 (FLAS); near Clewiston, 9 Apr. 1950, Killip & Swallen 40498 (US). Hernando: County line N.E. of Brooksville, 15 Oct. 1964, Burch 449 (FLAS). Highlands: Junction FLA 70 & FLA 17, 18 Nov. 1964, Burch & Ward 527 (FLAS). Hillsborough: Tampa airport, 7 Sept. 1953, Garrett s.n. (FLAS). Lee: Punta Rassa, 24 June 1916, Standley 274 (MO, US). Levy: mouth of Withlacoochee River, 16 Sept. 1959, Cooley, Eaton & Ward 6984 (DUKE, FLAS, FSU). Manatee: north end Longboat Key, 1 Aug. 1950, Wilbur & Webster 2509 (US); Manatee, 11 Sept. 1899, Tracy

6374 (F, MO, NY); Sneeds Island, 12 Sept. 1899, Tracy 6373 (F). Monroe: Big Pine Key, 27 Feb. 1911, Small, Carter & Small 3563 (NY); Flamingo, Cape Sable, 26 Nov. 1916, Small 7994 (NY); Key West, 1836, Blodgett s.n. (MO); Lower Matecumbe Key, 18 Mar. 1930, Moldenke 784 (DUKE, MO, NY); Pine Crest, 1 Apr. 1930, Moldenke 853 (DUKE, F, MO, NY, US); Upper Matecumbe Key, Curtiss 2487 (FLAS, GH, MO, NY, US). Okeechobee: 3 miles east of Okeechobee City, 3 Feb. 1945, Brass 14593 (US). Pinellas: Maximo Point, St. Petersburg, 10 Sept. 1954, Thorne 15411 (FSU, IJ, NCS, US); north end of Sunshine Skyway Bridge, St. Petersburg, 5 June 1964, Burch 359 (FLAS). St. Johns: Crescent Beach, 14 Oct. 1941, West & Arnold s.n. (FLAS). Sarasota: Longboat Key, 27 Sept. 1964, Burch 426 (FLAS); 2 miles south of Venice, 30 Dec. 1956, Kral 3833 (FSU). Volusia: 9 miles south of New Smyrna Beach at Turtle Mound, 27 Apr. 1961, Ray, Wood et al. 10780 (FSU). BAHAMAS. Grand Bahama: 3 miles SE of Freeport, 1 Nov. 1964, McDaniel & Schmiederer 5428 (FSU); Eight Mile Rocks, 5-13 Feb. 1905, Britton & Millspaugh 2470 (F, NY). Great Sturup Cay, 1 Feb. 1905, Britton & Millspaugh 2257 (F, NY); Bimini, 16 Apr. 1904, Millspaugh 2204 (F, NY); Andros, 18 Aug.-10 Sept. 1906, Brace 5115 (F, NY). New Providence: Ocean Hole, Coral Harbor, 7 July 1960, Webster & Williams 10328 (PUR); Hog Island, 30 May 1909, Wilson 8259 (F, MO, NY). Eleuthera, Glass Window, 26 July 1960, Webster & Williams 10636 (PUR); Salt Key Bank, Anguilla Isles, 15-18 May 1909, Wilson 7946 (MO, NY); Exuma Chain, Ship Channel Cay, 17 Feb. 1905, Britton & Millspaugh 2755 (F, NY); Little San Salvador, 25-26 Feb. 1907, Britton & Millspaugh 5660 (F, NY); Watling's Island, 27-28 Nov. 1907, Wilson 7286 (F, NY); Crooked Island, 24 Nov. 1890, Rothrock 241 (F, NY). Inagua: South of Matthewtown, 15-25 Aug. 1960, Williams

102 (DUKE, IJ, PUR); 8 miles N.E. of Matthewtown, 15-25 Aug. 1960, Williams 37 (DUKE, PUR). South Caicos: Cockburn Harbour, 26 June 1954, Proctor 8938 (IJ); East Bay, 24 June 1954, Proctor 8915 (IJ). Grand Turk, between Commissioner's House & airfield, 22-27 Apr. 1954, Lewis s.n. (IJ). CUBA. Camaguay: Cayo Cruz, 27 Oct. 1909, Shafer 2783 (F, NY); Cayo Paredon Grande, 25 Oct. 1909, Shafer 2756 (F, NY). Havana: Batabano, 10 Apr. 1903, Shafer 514 (NY). Isle of Pines: Vivijagua, 20 Feb. 1916, Britton, Britton & Wilson, 14692 (F, NY). Pinar del Rio: Coloma, 6 Sept. 1910, Britton, Britton & Gager 7007 (F, NY). Santa Clara: Rio San Juan, 24-25 Mar. 1910, Britton, Earle & Wilson 5915 (F, NY). CAYMAN ISLANDS. Grand Cayman: north of Georgetown, 1 June 1963, Crosby, Hespeneide & Anderson 18 (DUKE, UCWI); North Side village, 19 Apr. 1956, Proctor 15123 (IJ); Bodden Bay Road, 13 Feb. 1899, Millspaugh 1333 (F); Jan. 1891, Hitchcock s.n. (MO); Spot Bay, 13-14 Feb. 1899, Millspaugh 1314 (F). JAMAICA. Clarendon: between Portland & Rocky Point, 5 Mar. 1908, Britton 1911 (F, NY). Kingston: Palisadoes, near Harbour Head, 4 Oct. 1960, Proctor 21392 (IJ, NY, PUR). St. Andrew: Palisadoes, 5 Nov. 1957, Yuncker 17299 (F, MO). St. Catherine: Cayamanas, June 1952, Asprey 437 (UCWI); Ft. Clarence Hill, 9 Dec. 1906, Harris 9536 (NY, UCWI). St. Elizabeth: Great Pedro Bay, 6-8 Sept. 1907, Britton 1250 (F, NY); Pedro Bluff, 7 Sept. 1907, Harris 9731 (F, NY, UCWI). Westmoreland: West Point lighthouse, 26 July 1954, Webster & Wilson 5057 (IJ). LESSER ANTILLES. Tortola, Lower Estate, 8 Oct. 1918, Fishlock 222 (NY). Extra-territorial specimens: BERMUDA. Hamilton Bay Islets, 29 Dec. 1888, Millspaugh 9 (F); Jew's Bay, 23 July 1913, Collins 332 (F, NY); North Shore, 31 Aug.-20 Sept. 1905, Brown & Britton 4

(F, NY); Warwick March, Sept. 1913, Brown & Britton 1719 (F, NY).

Hitchcock described this plant after collecting it a number of times in the West Indies, adopting a name used by Engelmann on herbarium sheets but not published. A specimen in Herb. Torrey and Herb. Engelmann is cited as type, and the article is illustrated with a plate in which the habit drawing was made from the upper right hand plant on a sheet which he collected in Grand Cayman in 1891 (MO !). Detail on the plate is from sketches probably made by Engelmann.

The sheet from Herb. Engelmann (now Mo. Bot. Gard.# 1792993) was probably made from a specimen sent by Torrey for identification, and may well have come from his much fuller sheet which is now in NYBG. It seems likely that only Engelmann's sheet would have been readily available to Hitchcock, and it is designated as lectotype for that reason. The sheet now in NYBG is an isotype since it is from the same collection.

The sheet from Millspaugh's private herbarium in F includes two numbers. The origin of 196079 is not obvious, but the label data clearly indicates that 196078 is fragments from the Herb. Engelmann specimen and may be considered part of the lectotype.

The variability of this species is reflected in the number of attempts which have been made to segregate portions of it as discrete taxa. None of the criteria by which Millspaugh, Small and Urban distinguished their species holds when a long series is examined, but there appear to be certain trends which may merit recognition if this seems desirable at a later date.

The habit of the plant is most commonly prostrate or decumbent, with several stems from the crown of the root. In Cuba, in Florida on

the coast south of Miami, and particularly in the islands on the Atlantic edge of the Bahama chain, there are plants of this species which are strongly ascending or completely erect with one or a few stems from ground level. In all other respects - stipules, leaf-shape, and cyathial and seed characters - they fall within the limits of variability usual for the species, and often grow interspersed with "normal" plants.

Branching pattern shows a similar break from the usual, rather sparingly branched form with cyathia on short laterals, to a much-branched, almost dichotomous form with cyathia solitary and spaced rather widely. Leaf size is often small in these plants. Others show an extreme reduction in laterals, and, with their many small leaves, have a superficial resemblance to C. maculata. Branching on some plants shows more than one of these patterns, but in some areas, such as Hendry and Glades counties in Florida, the much-branched habit with small leaves is almost the only form found.

The form distinguished by Small as C. chiogenes is quite widespread in dry, saline areas. The plants have a more chartaceous texture, with the stipules reduced in size, but no way of making a positive identification of the species was found, and it seemed more in keeping with treatment elsewhere in the group to reduce it to synonymy.

Chamaesyce blodgettii comes close to C. serpens in many characters, but can be distinguished by the obscurely wrinkled seed even when the difference in habit and size is less clear than usual. The two occupy a similar set of habitats in their respective ranges, which overlap only in Cuba and Jamaica.

16. CHAMAESYCE SERPENS (HBK.) Small, Fl. SE. US., 709. 1903.

Euphorbia serpens HBK., Nov. Gen. et Sp., 2: 52. 1817. Type: Cumana, Venezuela, Bonpland 407 (Herb. Mus. Paris, not seen, photograph G and fragment F seen by Wheeler, Rhodora 43: 198. 1941.). Anisophyllum serpens (HBK.) Kl. & Gke., Abh. Akad. Berlin, Phys. 1859: 23. 1860.

Euphorbia crassinodis Urb., Symb. Ant., 1: 340. 1899. Type: Cuba, Wright 547 p.p., 2014 (Herb. Mus. Bot., Berlin, if extant; sheets with these collection numbers in GH !, but both are E. gundlachii (Urb.)). C. crassinodis (Urb.) Millsp., Field Mus. Bot. 2: 408. 1916. Placed here in synonymy on the basis of other sheets identified as this species by Urban.

E. pileoides Millsp., Field Mus. Bot. 2: 62. 1900. Type: Guanica, Porto Rico, 22 Jan. 1899, C. F. Millspaugh 743 (Holotype: F. not found; Isotype: F !). C. pileoides (Millsp.) Millsp., Field Mus. Bot. 2: 411. 1916.

E. microclada Urb., Symb. Ant., 9: 215. 1924. Type: prope Daiquiri, Oriente Province, Cuba, 23 Nov. 1916, E. L. Ekman 8430 (Holotype: Mus. Bot. Stockh., not seen; Isotype NY !). C. microclada (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col.'de la Salle', Habana 11: 12. 1952.

E. excisa Urb. & Ekman, Arkiv. Bot. Stockh. 22A(8): 66. 1929. Type: Anse-a-Pitre, Haiti, 15 Sept. 1926, E. L. Ekman H 6986 (Holotype: Mus. Bot. Stockh., not seen; Isotypes: IJ !, K !, NY !).

E. biramensis Urb. in Feddes, Repert. 28: 232. 1930. Type: Cienaga de Birama, Oriente Province, Cuba, 10 Jan. 1923, E. L. Ekman 16137 (Holotype: Mus. Bot. Stockh., not seen; Isotypes: NY !, US !).

C. biramensis (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col.'de la Salle', Habana 11: 12. 1952.

E. mangletii Urb. in Feddes, Repert. 28: 233. 1930. Type: Castillo de Atares, Habana, Cuba, 2 Oct. 1921, E. L. Ekman 13293 (Holotype: Mus. Bot. Stockh., not seen; Isotype: NY !). C. mangletii (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col.'de la Salle', Habana 11: 12. 1952.

The unpublished name E. antiquensis used by Millspaugh on a plant collected in Antigua, 16-17 Jan. 1907, Shafer 20 (NY !, F !) should be referred here.

Perennial or winter killed; prostrate, forming mats to 4 dm. diameter. Stem several from somewhat thickened root, to 1 mm. wide, internodes to 3 cm. long; branching throughout length, often rooting at nodes, glabrous, yellowish-green. Leaves membranous; blades ovate, sometimes orbicular, 2-6 x 1.5 - 4 mm., base inequilateral, rounded to subcordate, margin entire, apex rounded, mucronulate or emarginate, midrib prominent on underside, glabrous, green; petiole ca. 0.5 mm. long; stipules united, deltoid, toothed at apex, to 0.5 mm. long, white. Cyathia solitary at upper nodes; peduncle to 1 mm., involucre campanulate, to 0.7 mm. diameter at mouth, lobes equalling glands, deltoid, toothed, glabrous on outside and within, glands transversely elliptic to 0.2 mm. long, usually deep purple, sometimes brown or olive, appendages longer than glands and narrower to twice as wide, margin entire or crenulate, white, fifth gland linear equalling lobes, sinus shallow. Staminate flowers 3-10 per cyathium, androphores glabrous, to 0.5 mm. long at maturity. Gynophore glabrous, to 0.7 mm. long at maturity, exserted, nutant; calyx three-lobed,



Plate 22. CHAMAESYCE SERPENS (HBK.) Small

C. serpens (HBK.) Small, Vicinity of Port de Paix, Haiti, 1 May 1929,
Leonard & Leonard 15242 (NY).

each lobe often toothed and recurved, to 0.3 mm. long; ovary glabrous; styles spreading, 0.2 mm. long, joined at base, bifid for 1/2 length. Capsule glabrous, ovoid, 1.2 - 1.4 mm. long, 1.4 - 1.6 mm. wide below equator, three-lobed, angles obtuse. Seed oblong-ovoid, to 1 mm. long, equally four-angled with rounded angles, faces flat or slightly convex, smooth, usually brown or gray-brown.

A common plant of the Mississippi valley and of scattered occurrence in most states east of the Rocky Mountains. Collected only as a ballast plant in Florida, and the last collection from the site in Pensacola was in 1897. Present in Cuba, Jamaica, Hispaniola, Puerto Rico and islands of the Lesser Antilles to South America (Map 19).

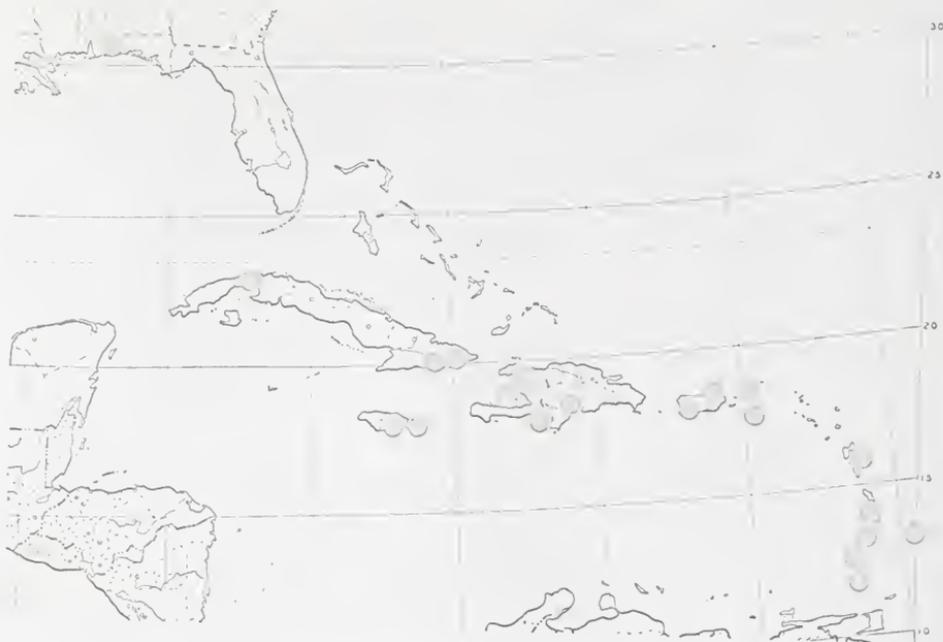
Representative specimens examined: FLORIDA. Ballast ground, Pensacola, Escambia County, 2 July 1897, Curtiss 5920 (MO, FLAS, NY, US); Apalachicola, ex herb. Chapman, no further data (MO). CUBA. Oriente Province. Baitiquiri 27 Dec. 1954, Alain & Figueras 7 (GH); Daiquiri, 14-16 Mar. 1912, Britton & Cowell 12692 (F, NY); near Cajobabo, 12 Jan. 1956, Alain & Morton 5015 (GH). Habana Province. Vedado, Feb. 1948, Clemente 5936 (NY). JAMAICA. St. Thomas, 3 July 1964, Powell & Green 1634 (IJ); St. Catherine, 4 Feb. 1953, Proctor 7607 (IJ). HAITI. Gonave Island, Aug. 1927, Eyerdam 228 (F, GH, MO); near Hervee, 27 Feb. 1925, Ekman 3341 (NY); Gonaives, 24 Dec. 1927, Ekman 9453; vicinity Port-de-Paix, 9 Jan. 1929, Leonard & Leonard 11776 (GH); vicinity Port-de-Paix, 1 May 1929, Leonard & Leonard 15242 (NY). DOMINICAN REPUBLIC. Province of Barahona, 1910, Fuertes 134 (NY), Fuertes 485 (F, GH, MO, NY), 1911 Fuertes 970b (GH), Fuertes 992b (GH). PUERTO RICO. Paraquera, 24 Feb. 1924, Britton & Britton 8044 (GH, NY); Aguirre, 14 Feb. 1922, Britton,

Britton & Brown 6030 (F, NY); San Juan, 14 June-22 July 1901, Underwood & Griggs 913 (F, NY). LESSER ANTILLES. St. Thomas, 31 Jan.-4 Feb. 1913, Britton, Britton & Shafer 5 (F, MO, NY); St. Croix, 17-25 Mar. 1923, Britton, Britton & Kemp 132 (NY); Marie-Galante, 26 Mar. 1936, Stehle 480 (NY); Martinique, 4 July 1939, Egler 39-65 (NY); Martinique, 11 Jan. 1939, Stehle 3466 (GH); Martinique, April 1903, Duss 4722 (F, NY); Barbados, Apr.-June 1895, Waby 94 (F); St. Lucia, 27 Nov. 1960, Proctor 21638 (IJ); Cannuon Island, 26-31 Mar. 8-20 Apr. 1950, Howard 11113 (FLAS, GH, IJ, NY); Grenada, 24 Feb.-6 Mar. 1950, Howard 10547 (GH, IJ).

There seems no reason for the absence of this species from Florida but an intensive search in most parts of the state has failed to find any. The plants from the United States usually have brown or pale glands rather than the deep purple type found in the West Indies, but this is not considered significant. The slight tendency to enlargement of the nodes which occurs throughout the range is particularly pronounced in the plants which Urban named *E. crassinodis* and *E. excisa*, and *E. excisa* also has a higher frequency of leaves with an emarginate apex than is common in the remainder of the range. Both species tend to be of a somewhat heavier texture than the average run of plants, but in spite of these differences, all specimens examined appear to fall within the range of variation expected from the species.

The species is interesting for the marked development of the calyx, which forms a toothed and recurved three-lobed structure, much more prominent than in any other species examined.

17. CHAMAESYCE CENTUNCULOIDES (HBK.) Millsp., Field Mus. Bot. 2: 408. 1916. *Euphorbia centunculoides* HBK., Nov. Gen. et Sp. 2: 51. 1817.



Map 19. Distribution of C. serpens



Map 20. Distribution of C. centunculoides

Type: Prope Guanavacoa et portum Havanae, Cuba, (Herb. Mus. Paris, not seen). Fragments of collections by Poeppig "in maritimus Cubae" are in MO(!) and F(!) - the fragments are from Herb. Martius, Herb. Univ. Prague and Herb. Bernardi, so the collection must have been widely distributed, and may have been seen by Kunth. There is also a fragment in MO(!) of a collection from Havana by Humboldt. These are regarded as supporting the use of the name which is maintained here, but their status as possible type material cannot be decided until Herb. Mus. Paris has been examined.

Euphorbia balbisii Boiss., Cent. Euph., 11. 1860. Placed here in synonymy on the basis of the description by Boissier in DC. Prod. 15(2): 38. 1862.

Chamaesyce insulaesalis Millsp., Field Mus. Bot. 2: 395. 1914.

Type: Sandy places, Salt Key, Salt Key Bank, Bahamas, 21 May 1909, P. Wilson 8082 (Holotype: F, not seen; Isotypes: MO !, NY !).

Euphorbia filicaulis Urban, Symb. Ant., 9: 217. 1924. Type:

Cerro de Fraile prope Holguin, Oriente, Cuba, 28 Oct. 1914, E. L. Ekman 3237 (Holotype: Mus. Bot. Stockholm, not seen; Isotypes: K !, NY !, US !).

Chamaesyce filicaulis (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col.'de la Salle', Habana 11: 12. 1952.

Euphorbia pachypoda Urban, Symb. Ant., 9: 216. 1924. Type: Prope

Vedado, Habana, Cuba, 21 April 1914, E. L. Ekman 146 (Holotype: Mus. Bot. Stockholm, not seen; photograph of holotype, and Isotype: NY !). Chamaesyce pachypoda (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col.'de la Salle', Habana 11: 12. 1952.

Perennial; prostrate forming mats to 2 dm. diameter. Stems many from crown of root, wiry, 0.3 mm. diameter, internodes to 1.5 cm.;

branching throughout length, sparsely at base, not rooting at nodes, glabrous, straw-colored or brown. Leaves membranous; blades elliptic, sometimes broadly so, to subcordate, 2-5 x 1-3 mm., base oblique, rounded to subcordate, margin entire or crenate in lower leaves of stem, apex rounded, midrib sometimes prominent on lower surface of leaf, glabrous, green; petiole ca. 0.3 mm. long; stipules joined, sometimes only at base, triangular to 0.2 mm., variously toothed or deep cleft. Cyathia solitary; peduncle to 0.5 mm., involucre broadly obconical, to 0.7 mm. diameter at mouth, lobes slightly exceeding glands, triangular, entire, glabrous on outside, densely pilose within, glands transversely elliptic to 0.2 mm. long, cupped, appendages as long as gland and twice as wide, margin entire or lobed, yellowish, fifth gland linear, short or obsolete, sinus shallow. Staminate flowers 8-20 per cyathium, androphores glabrous, to 0.5 mm. long at maturity. Gynophore glabrous, to 1.3 mm. long at maturity, exserted, upright or nutant; calyx vestigial; ovary glabrous; styles 0.2 mm. long, spreading, to 0.3 mm. long joined at base, bifid for 1/3 - 1/2 length, slightly clavate. Capsule glabrous, ovoid, 1.2 mm. long, 1.2 mm. wide between base and equator, roundly three-lobed, angles obtuse to acute. Seed triangular-ovoid, 0.8 mm. long, 0.5 mm. wide below equator, strongly four-angled, ventral angle somewhat obtuse, others acute, faces flat or slightly convex, obscurely wrinkled, brown or white.

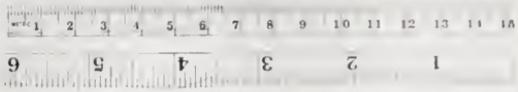
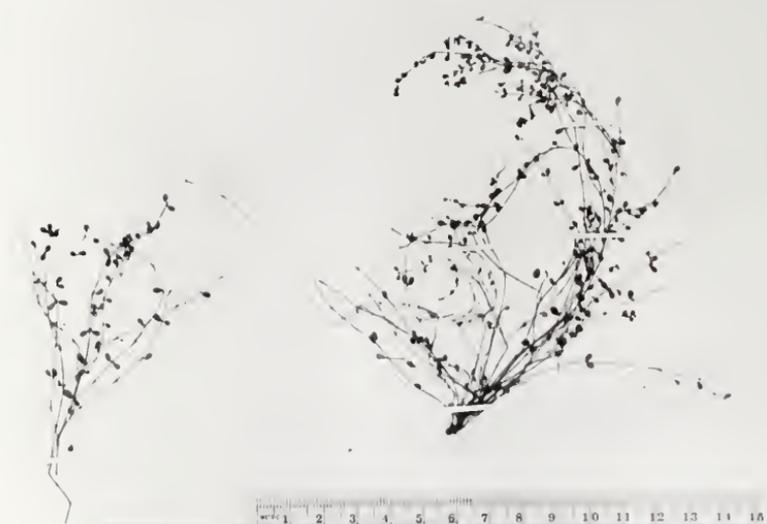
In sand and coastal rocks, Salt Key Bank and Salt Cay, New Providence, Bahamas, and Cuba (Map 20).

Specimens seen: BAHAMAS. New Providence: Salt Cay, Feb. 1890, Northrop & Northrop 277 (F, GH, NY). CUBA. Camaguey: Cayo Paredon Grande,



Plate 23. CHAMAESYCE CENTUNCULOIDES (HBK.) Millsp.

Isotype: *C. insulaealis* Millsp., Salt Key, Salt Key Bank, Bahamas,
 21 May 1909, P. Wilson 8082 (NY).



E. filicaulis Urban

Cerro de Fraile, Oriente,
 Cuba, 28 October 1914,
 E. L. Ekman 3237 (NY).

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Plate 24. CHAMAESYCE CENTUNCULOIDES (HBK.) Millsp.

Isotype: E. filicaulis Urban, Cerro de Fraile prope Holguin, Oriente,
 Cuba, 28 October 1914, E. L. Ekman 3237 (NY).

25 Oct. 1909, Shafer 2753 (F, NY); E. part of Cayo Cruz, 27 Oct. 1909, Shafer 2781 (F, NY). Havana: Guanabacoa, 27 Oct. 1927, Leon 13089 (NY). Matanzas: Boca de Canasi, 7 Dec. 1927, Leon 13173 (NY). Oriente: Sardinero, June 1948, Clemente Cl. 6097 (NY); S.E. of Helguin, 7 Apr. 1909, Shafer 1215 (F, NY).

The plant called C. insulaesalis by Millspaugh is of heavier texture than is usual in the species, and E. pachypoda Urban is intermediate in this respect, but no features were found to justify their separation. Very little material has been seen, and further collections will allow a more sound assessment of the relationship of these plants.

18. CHAMAESYCE TORRALBASII (Urb.) Millsp., Field Mus. Bot. 2: 412. 1916. Euphorbia torralbasii Urban, Symb. Ant., 1: 339. 1899. Type: prope Habana ad Vedado, Torralbas 93, Wright 2012 p.p. (Herb. Mus. Bot., Berlin, if extant; Wright 2012 NY !, but a sheet of Wright 2012 in MO(!) is not this species but C. serpens).

Euphorbia andromedae Millsp., Field Mus. Bot. 2: 63. 1900. Type: Cape Corientes, Cuba, 17 Feb. 1899, Millspaugh 1466 (Holotype: F sheet 61466, not seen; Isotypes: F !, NY !).

Perennial; prostrate to 2 dm. Stems several to many from crown of root, wiry or thicker to 0.5 mm. diameter, internodes to 1.5 cm. long; branching sparsely, mostly at upper nodes, not rooting at nodes, glabrous, straw-colored. Leaves membranous, sometimes slightly thickened; blades ovate or somewhat cordate, 4-8 x 3-5 mm., base inequilateral, subcordate, margin serrate, apex obtuse or rounded, glabrous, green or somewhat yellow-brown on under surface; petiole to 1 mm. long; stipules joined, sometimes only at base, subentire or variously parted, at times almost to base.

Cyathia solitary at upper nodes; peduncle to 1 mm. long, involucre broadly obconical, to 1 mm. diameter at mouth, lobes scarcely equalling glands, triangular, entire or cleft, glabrous on outside, ciliate within, glands transversely elliptic to 0.4 x 0.1 mm., cupped, appendages as long as gland and to twice as wide, margin entire or crenulate, greenish-yellow, fifth gland linear, short, sinus shallow. Staminate flowers rarely more than 5 per cyathium, androphores glabrous, to 0.7 mm. long at maturity. Gynophore glabrous, to 0.8 mm. long at maturity, exserted, nutant; calyx obsolete or a triangular pad of tissue; ovary glabrous; styles upright, to 0.3 mm. long, joined at base, bifid for 1/3 length. Capsule glabrous, ovoid, 1.5 mm. long, 1.5 mm. wide just below equator, three-lobed, angles acute. Seed oblong-ovate, to 0.9 mm. long, 0.5 mm. wide at equator, almost equally four-angled, faces slightly convex, smooth or obscurely wrinkled, brown.

Savannas and sandy areas from all parts of Cuba but not reported from any other island (Map 21).

Specimens seen: CUBA. Camaguey: Silla de Cayo, Cayo Romano, 9-11 Oct. 1909, Shafer 2510 (MO, NY); Silla de Cayo, Cayo Romano, 9-11 Oct. 1909, Shafer 2543 (MO, NY). Havana: Sea shore, 18 Feb. 1905, Curtiss 652 (NY); 15 July 1928, Roig 4699 (NY); Playa del Vedado, 20 Sept. 1904, Baker 1830 (NY); Havana, Reparto biramar, 10 Feb. 1921, Ekman 13304 (NY); Cojimar, 24 Aug. 1910, Britton, Earle & Gager 6279 (NY); on walls of Cabana Fortress, Dec. 1922, Leon 11394 (NY); Morro Castle, Nov. 1908, Leon 736 (NY); near Playa de St. Anna, 2 Nov. 1915, Leon & Cazanias 5721 (NY); Playa de Marianao, 22 Feb. 1910, Britton & Wilson 4544 (NY). Pinar del Rio: Laguna Jovero and vicinity, 5-7 Dec. 1911, Shafer 10707 (NY); Bay of Mariel, 21 Sept. 1910,



Chamaesyce torralbasii Urb.

Plate 25. CHAMAESYCE TORRALBASII (Urb.) Millsp.

Duplicate Coll: E. torralbasii Urban, prope Habana ad Vedado, Cuba, Wright 2012 p.p. (NY).



Map 21. Distribution of *C. torralbasii*



Map 22. Distribution of *C. camaquayensis*

Britton & Earle 7595 (NY). Matanzas: near mouth of Bueyvaca, 28 Aug. 1903, Britton & Wilson 45 (NY); Boca de Canasi, 7 Dec. 1927, Leon 13173 (NY); 1905, Van Hermann 921 (NY); Playa, 12 Mar. 1903, Britton, Britton & Shafer 80 (NY).

Plants of this species are usually larger than those of C. centunculoides, and have all leaves serrate. The two species are very close, and the distinction between them is not always absolute, but the strong growing form represented in the type specimen is of frequent occurrence, and is so consistent in appearance that it is felt that it merits recognition as a species.

19. CHAMAESYCE CAMAGUAYENSIS Millsp., Field Mus. Bot. 2: 392.

1914. Type: Near Camaguey, Cuba, 2-7 April 1912, N. L. and E. G. Britton and J. F. Cowell 13233 (Holotype: NY !; Isotypes: F !, MO !). Euphorbia camaguayensis (Millsp.) Urban, Symb. Ant., 9: 217. 1924.

Euphorbia pinariona Urb. in Fedde, Repert. 28: 234. 1930. Type: San Juan y Martinez, Pinar del Rio, Cuba, 18 June 1923, E. L. Ekman 16782 (Holotype: Mus. Bot. Stockholm, not seen; Isotype: NY !). Chamaesyce pinariona (Urb.) Alain, Contr. Ocas. Mus. Hist. Nat., Col. 'de la Salle', Habana 11: 12. 1952.

Perennial, erect or ascending to 1 dm. Stems many from root-stock, wiry, to 0.3 mm. diameter, internodes to 1.5 mm. long; scarcely branched, glabrous, light brown. Leaves membranous; blades elliptic to suborbicular, 3-5 x 2-3 mm., base inequilateral, subcordate, margin entire or rarely somewhat erose, apex rounded rarely obscurely mucronulate, midrib slightly raised on underside, glabrous, rarely minutely and sparsely puberulous, green; petiole ca. 0.5 mm. long; stipules joined, deeply 3-5 parted or

bifid, to 0.3 mm. long. Cyathia solitary at upper nodes; peduncle to 1.5 mm. long, involucre broadly campanulate, to 1.5 mm. diameter at mouth, lobes scarcely equalling glands, triangular, entire or toothed, glabrous on outside, ciliate at mouth within, glands transversely elliptic 0.5 x 0.2 mm., cupped, appendages obconical, longer than glands and to three times as wide, fifth gland linear, shorter than lobes, sinus to 1/3 depth of involucre. Staminate flowers 5-14 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, to 1.2 mm. long at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary glabrous; styles spreading, 0.3 mm. long, joined at base, bifid for 1/3 length. Capsule glabrous, ovate-ellipsoid, 1.3 mm. long, 1.5 mm. wide at equator, broadly three-lobed, angles acute. Seed ovate, truncate at base, apex acute, 0.8 mm. long, ventral angle rounded, dorsal angle acute, dorsal faces wide, slightly convex, obscurely ridged, chestnut brown, sometimes overlaid white.

Savannas in most parts of Cuba, but not reported from any other parts of the area (Map 22).

Specimens seen: CUBA. Camaguey: Sabana de la Matanza, 10 July 1948, Leon & Dahlgren 23398 (NY); Camaguey to Santayana, 4 Apr. 1909, Britton 2394 (NY); Savannas near Camaguey, 2-7 Apr. 1912, Britton, Britton & Cowell 13130 (NY). Isle of Pines: May 1910, Jennings 608 (NY); La Canada, 16 Feb. 1916, Britton, Britton & Wilson 14400 (NY). Oriente: Vicinity of El Morro, Santiago Bay, 10-11 Mar. 1912, Britton & Cowell 12537 (MO, NY). Santa Clara: Cayo Frances, 22 Feb. 1924, Ekman 18575 (NY).

The prominent glandular-appendages of this species distinguish it from all other Cuban species, but there are clear affinities with



BOTANICAL
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THE NEW YORK BOTANICAL GARDEN

PROVINCE OF CAMAGUEY
SAVANNAH NEAR CAMAGUEY

Chamaesyce camaguayensis Millsp.
Britton & Cowell 13233

Plate 26. CHAMAESYCE CAMAGUAYENSIS Millsp.

Holotype: *C. camaguayensis* Millsp., near Camaguey, Cuba, 2-7 April 1912, Britton, Britton & Cowell 13233 (NY).

some of the other wiry-stemmed plants of the island and Hispaniola and the nearby Bahama groups.

20. CHAMAESYCE CORDIFOLIA (Ell.) Small, Fl. SE. US., 709. 1903. Euphorbia cordifolia Elliott, Sketch Bot. South Carolina & Georgia, 2: 656. 1824. Type: Beaufort, South Carolina (Charleston, South Carolina, Museum).

Annual; prostrate forming mats to 4 dm. diameter. Stems to 1.5 mm. diameter, internodes to 2 cm. long; branching throughout length, not rooting at nodes, glabrous, brown. Leaves membranous; blades broadly elliptic to orbicular or somewhat oblong, 3-8 by 2-4 mm., base inequilateral, rounded or subcordate, margin entire, apex rounded or obtuse, sometimes obscurely mucronate, midrib distinct on lower surface, glabrous, green or red; petioles to 1.5 mm. long; stipules parted almost to base into several filiform segments. Cyathia solitary at nodes of short dichasia; peduncle to 1 mm. long, involucre campanulate, to 1 mm. diameter at mouth, lobes exceeding glands, attenuate, toothed or ciliate, glabrous outside and within or with cilia at mouth, glands transversely elliptic to 0.3 mm. long, appendages the same length as gland, up to three times as wide, rarely obsolete, fifth gland linear, shorter than lobes, sinus shallow. Staminate flowers 4-18 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, to 3 mm. long at maturity, exserted, upright or reflexed; calyx a triangular pad of tissue; ovary glabrous; styles upright or spreading, to 0.5 mm. long, minutely joined at base, bifid for 1/3 length. Capsule glabrous, ovoid, to 1.8 mm. long, 2 mm. wide just below equator, three-lobed, angles acute. Seed oblong-ovoid, 1.2 mm. long, to 0.8 mm. wide below equator, equally four-angled,



Plate 27. CHAMAESYCE CORDIFOLIA (Elli.) Small

C. cordifolia (Elli.) Small, Sebring, Highlands County, Florida,
 17 May 1948, Garrett 7 (FLAS).

faces flat, smooth or obscurely wrinkled, brown or gray.

Locally frequent in sandy areas from North Carolina to Florida and west to Texas. Known in Florida only from the northern counties and from the central ridge, and apparently absent from the Caribbean (Map 23).

Representative specimens seen: FLORIDA. Alachua: Gainesville, 21 Nov. 1939, Murrill s.n. (DUKE, MO); Gainesville, 9 Nov. 1959, West s.n. (FLAS). Citrus: Hernando, 15 Oct. 1964, Burch 443 (FLAS). Columbia: Lake City, 20 Dec. 1893, Rolfs s.n. (FLAS). Dixie: Along Suwannee River E. of Oldtown, 14 July 1924, Small, Small & De Winkeler 11470 (NY). Escambia: Elliott, 2 Sept. 1901, Biltmore 5895b (NY). Highlands: E. of Sebring, 30 Apr. 1924, Small, De Winkeler & Mosier 11355 (NY). Jackson: 1869, Chapman s.n. (MO). Lake: Eustis, June-July 1894, Hitchcock 1071 (MO, NY); Eustis, 16-30 June 1894, Nash 1070 (F, MO, NSC, NY); Tavares, 19 Aug. 1901, Biltmore 3848b (NY). Lee: Ft. Myers, July-Aug. 1900, Hitchcock 319 (MO). Leon: 6 miles S.E. Tallahassee, 22 Sept. 1957, Godfrey 56088 (FSU, GH, NSC, NY). Levy: S.W. of Chiefland, 30 Oct. 1964, Godfrey, Clewell & Blaisdell 64780 (FLAS). Liberty: Apalachicola National Forest, 8 Sept. 1960, Godfrey 60234 (FSU). Madison: 9 miles E. Greenville, 2 Oct. 1955, Godfrey, Kral & Gillespie 54012 (DUKE, FSU, NY). Marion: Eureka, 16 Sept. 1941, West & Arnold s.n. (FLAS). Okaloosa: between Valparaiso & Ft. Walton, 4 Sept. 1958, Godfrey 57662a (FSU). Orange: 1894, Lewton s.n. (NY). Polk: Haines City, 16 Aug. 1897, Curtiss 5959 (F, FLAS, MO, NCU, NY). Putnam: Lake Swan, 5 Dec. 1964, Bratley s.n. (FLAS). Suwannee: Ellaville, 15 July 1961, Ramsey, Godfrey & Mitchell 267 (FSU). Walton: Mossy Head, De Funiak Springs, 23 Sept. 1956, Godfrey



Map 23. Distribution of C. cordifolia



Map 24. Distribution of C. polygonifolia

& Kral 55141 (FSU, NSC, NY); Summer 1885, Curtiss s.n. (NY).

This temperate species appears to have no strong affinities with any taxa of the Caribbean.

21. CHAMAESYCE POLYGONIFOLIA (L.) Small, Fl. SE. US., 708.

1903. Euphorbia polygonifolia L., Sp. Pl. ed. 1, 455. 1753. Type: K[alm], no other data, (Herb. Linn. sheet 630-19 !). Anisophyllum polygonifolium (L.) Haw., Syn. Pl. Succ., 160. 1812.

Annual; prostrate, rarely ascending, forming sparse or occasionally dense mats to 4 dm. diameter. Stem to 2 mm. diameter, internodes to 3 cm. long; sparingly branched throughout length, not rooting at nodes, glabrous, green or light brown. Leaves membranous or slightly fleshy; blades oblong-linear to lanceolate, 6-10 x 3-5 mm., base inequilateral, rounded or obtuse, margins entire, apex acute, often mucronate, midrib prominent on lower surface, glabrous, green; petiole 1-3 mm. long; stipules distinct, rarely joined near tip of stem, entire, toothed or deeply 2-3 parted. Cyathia solitary, terminal on branches of short laterals; peduncle 0.5 - 2 mm. long, involucre broadly obconical, 1 - 1.4 mm. diameter, lobes equalling or exceeding glands, entire or toothed, glands obsolete and replaced by additional lobes or broadly transversely elliptic, 0.05 - 3 mm. long, concave, stipitate, usually exappendiculate, fifth gland vestigial or absent, sinus shallow. Staminate flowers 5-10 per cyathium, androphores glabrous, ca. 1 mm. long at maturity. Gynophore glabrous, 2-3 mm. long at maturity, exserted, nutant; calyx a triangular pad of tissue; ovary glabrous; styles upright or spreading, 0.3 - 0.7 mm. long, minutely joined at base, bifid for 1/3 - 1/2 length, somewhat clavate. Capsule glabrous, truncate-ovoid, 2.8 - 3.2 mm. long, 2.5 - 3 mm.



Plate 28. CHAMAESYCE POLYGONIFOLIA (L.) Small

C. polygonifolia (L.) Small, Amelia Island, Nassau County, Florida,
6 July 1951, Hood 4401 (FLAS).

wide just above base, three-lobed, angles obtuse or rounded. Seed ovoid-cuneiform, to 2.4 mm. long, ca. 1.5 mm. diameter below equator, dorsal side rounded, angles apparent only near apex, white.

Beaches and sand dunes of the Atlantic coast of North America. The collections from northeast Florida represent the southern limit of its range (Map 24).

Specimens seen: FLORIDA. Curtiss 2498 (F); East Florida, 1874, Palmer 7425 (MO). Duval: Little Talbot Island, 12 Oct. 1963, Burch 200 (FLAS). Nassau: Amelia Island, 6 July 1951, Hood 4401 (FLAS); W. of Fort Clinch, 12 Oct. 1963, Burch 194 (FLAS, FSU, GH, IJ); Fort Clinch State Park, 12 Oct. 1963, Burch 199 (FLAS, MO, NCU, NY).

Found growing with C. ammannioides (HBK.) Small in Florida, but distinguished from it by the possession of much larger capsules and seeds, which are also cuneiform rather than ovoid. Other differences, in stipular and gland characters, are less reliable in separating the species.

These two species are both able to grow when partially covered by shifting sand, and are often collected with the rootstock and all but the tips of the branches covered to a depth of an inch or more.

22. CHAMAESYCE AMMANNIOIDES (HBK.) Small, Fl. SE. US., 709. 1903. Euphorbia ammannioides HBK., Nov. Gen. et Sp., 2: 55. 1817. Type: Cumana, Venezuela, Bonpland 406 (Herb. Mus. Bot., Berlin seen by Boissier, and ? Herb. Mus. Paris, not seen; fragment F and photograph G seen by Wheeler).

C. ingallsii Small, Fl. SE. US., 708. 1903. Type: New Orleans, Louisiana, 1835, Ingalls (NY and photograph G seen by Wheeler).

E. ingallsii (Small) Cory, Rhodora 38: 406. 1936.

E. poliosperma Urban in Feddes, Rep. 28: 234. 1930. Type: Guanabo, Prov. of Habana, Cuba, 14 Oct. 1921, E. L. Ekman 13336 (Holotype: Mus. Bot. Stockh., not seen; Isotype: NY!).

Annual, perhaps perennating in the south; prostrate or decumbent forming loose mats to 6 dm. diameter. Stems 1-2 mm. thick, internodes to 4 cm. long; branching throughout length, not rooting at nodes, glabrous, green, somewhat glaucous and often suffused red. Leaves membranous or slightly fleshy; blades oblong-elliptic, 6-12 x 2.5 - 6 mm., base inequilateral, obtuse, margins entire, apex obtuse, often mucronate, both surfaces glabrous, green, somewhat glaucous and often suffused with red; petioles 1-2 mm. long; stipules distinct, deeply lacinate into 3-6 linear segments. Cyathia solitary, terminal on branches of lateral shoots near tips of main stems; peduncle 1-3 mm. long, involucre campanulate, 1.2 - 1.5 mm. diameter near mouth, lobes triangular, slightly exceeding glands, glabrous outside, hairy within, glands broadly elliptic or sub-circular, 0.3 - 0.6 mm. long, concave, somewhat stipitate, appendages obsolete, rarely to twice as wide as gland, fifth gland linear, often equalling lobes, sinus shallow. Staminate flowers 8-16 per cyathium, androphores glabrous, 1 mm. long at maturity. Gynophore glabrous, to 4 mm. long at maturity, exerted, usually strongly nutant; calyx a triangular pad of tissue; ovary glabrous; styles upright, 0.2 - 0.3 mm. long, joined at base, bifid for 1/2 length, somewhat clavate. Capsule glabrous, broadly ovoid, wider than long, 1.8 - 2.1 x 2 - 2.4 mm., three-lobed, angles rounded. Seed ovoid, to 1.8 mm. long, 1.3 mm. diameter at equator, three-angled from apex, sometimes for only 1/3 length, ventral angle



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4 1 1 3 4 5 6 7 8 9 10 11 12 13 14 15

Plate 29. CHAMAESYCE AMMANNIOIDES (HBK.) Small

C. ammannioides (HBK.) Small, New Point Comfort, Charlotte County, Florida, 5 June 1964, Burch 349 (FLAS).

rounded, obscure, faces convex, plump, smooth, white.

Coastal sands, usually at or above the storm line, as far north as southern Virginia and west to Texas in the United States. Found in all coastal counties of Florida, in Cuba, and in northern South America, but not otherwise known from the Caribbean (Map 25).

Representative specimens seen: FLORIDA. Bay: Mexico Beach, 15 Oct. 1955, Godfrey & Kral 54205 (DUKE, FSU, NY). Brevard: Melbourne Beach, 16 July 1940, Crevasse s.n. (FLAS). Charlotte: New Point Comfort, 5 June 1964, Burch 349 (FLAS). Collier: Vanderbilt Beach, 13 Aug. 1963, Burch 183 (FLAS); Naples Beach, 20 Nov. 1964, Godfrey 65440 (FLAS, FSU). Dade: Miami, 7 Mar. 1915, Small & Small 5869 (DUKE, FLAS, FSU, NY). Duval: Little Talbot Island, 12 Oct. 1963, Burch 202 (FLAS); Pablo Beach, 25 July 1896, Lighthipe 427 (NY). Escambia: Pensacola, 24 Oct. 1964, Burch 479 (FLAS). Flagler: Flagler Beach, 10 Oct. 1940, West & Arnold s.n. (FLAS). Franklin: Alligator Harbor, 9 July 1951, Jackson 567 (FSU); Carabelle Beach, 20 Oct. 1963, Burch 335 (FLAS). Gulf: Port St. Joe, 20 Oct. 1963, Burch 330 (FLAS). Hillsborough: St. Petersburg, 5 Aug. 1894, Lewton s.n. (NY). Indian River: Verò Beach, 7 Aug. 1963, Burch 113 (FLAS). Lee: Sanibel Island, 29 Dec. 1953, Cooley 2489 (FLAS, NY); Ft. Myers Beach, 8 Aug. 1945, Brass 15481 (US). Levy: Seahorse Key, 1 Dec. 1962, Ward 3255 (FLAS). Manatee: Palmetto, 21-23 Aug. 1895, Nash 2448 (MO, US); Long Beach, 1 Aug. 1950, Wilbur & Webster 2511 (FSU); Bradenton, 28 Nov. 1901, Tracy 7427 (F). Martin: Jupiter Island, 7 Aug. 1963, Burch 127 (FLAS). Monroe: Bahia Honda, 13-14 Feb. 1945, Killip 31406 (NY). Nassau: Fernandina, 21 Aug. 1902, Biltmore 3838 (US). Okaloosa: Destin, 24 Oct. 1964, Burch 465 (FLAS). Pinellas: Long Key, 24-28 Dec. 1951, Thorne 10220

(FSU); Honeymoon Island, 31 May 1964, Taylor & Taylor s.n. (FLAS).
 St. Johns: 4 miles S. of Ponte Vedra, 11 Oct. 1964, Burch 441 (FLAS);
 Marineland, 2 July 1939, Murrill s.n. (FLAS). St. Lucie: Ft. Pierce,
 7 Aug. 1963, Burch 121 (FLAS). Santa Rosa: Navarre, 24 Oct. 1964,
 Burch 478 (FLAS). Sarasota: Venice Beach, 5 June 1964, Burch 352 (FLAS).
 Volusia: Mosquito Inlet, 28 Nov. 1929, Moldenke 5301 (NY); Daytona Beach,
 1 Sept. 1927, West s.n. (FLAS). Walton: 4 miles E. of Oyster Lake, 19
 Oct. 1963, Burch 216 (FLAS). CUBA. Habana: Playa de Guanabo, 21 June
 1924, Leon 11651 (NY); Jibacoa beach, 2 Jan. 1929, Leon & Roig 13761 (NY).

Small's action in setting up the new species C. ingallsii is hard to understand, particularly since his early annotations show that he was familiar with C. ammannioides as used by most authors, and since he himself included this species in his Flora of the Southeastern United States in 1903. Nothing in his later publications indicates why he must have decided that C. ammannioides was confined to the Caribbean.

Boissier in DC. Proc. 15(2); 28. 1862. includes Euphorbia bombensis Jacq., Enum. Pl. Carib., 22. 1760. in his synonymy for this species with the comment "lex descr.". He evidently hesitated to accept the name without seeing the specimens from which Jacquin worked, and, while there is no feature in the description which conflicts with characters observed from specimens assigned by recent workers to C. ammannioides, some firmer basis is needed before this well-understood name should be displaced. See the commentary under C. buxifolia for notes on another name proposed by Jacquin in the same publication.

23. CHAMAESYCE CUMULICOLA Small, Man. SE. Flora, 794. 1933.

Type: Caxambas Island, Florida, 11 May 1922, J. K. Small 10450 (Holotype:



Map 25. Distribution of *C. ammannioides*



Map 26. Distribution of *C. cumulicola*

NY !; Isotype: FLAS !, US !).

Annual or perennating; prostrate with several stems from crown of root forming diffuse mat to 20 cm. diameter. Stem 1-2 mm. thick, internodes to 3 cm. long; branching throughout length, somewhat flexuous, not rooting at nodes, glabrous, green or straw-colored. Leaves membranous; blades long elliptic to lanceolate, 4-8 x 1-2 mm., rather uniform in size on any plant, base oblique, obtuse or rounded, margin entire, apex obtuse to acute, somewhat mucronate, midrib prominent on underside, glabrous, green or red or with a broad green stripe down the center of an otherwise red leaf; petiole 0.5 - 1 mm. long; stipules joined, 0.5 - 1 mm. long, 3-7 parted into linear segments. Cyathia solitary at upper nodes; peduncles ca. 1 mm. long, involucre campanulate, 1 - 1.2 mm. diameter at mouth, lobes triangular, exceeding glands, glabrous on outside, pilose within, glands subcircular, to 0.1 mm. diameter, somewhat stipitate, appendages obsolete, fifth gland linear, about as long as lobes, sinus shallow. Staminate flowers 5-8 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, 1.5 - 2 mm. long at maturity, exserted, nutant; calyx a triangular pad; ovary glabrous; styles spreading, 0.2 - 0.3 mm. long, joined at base, bifid for 1/3 length. Capsule glabrous, ovoid or subspherical, 1.8 - 2 mm. long, 2 - 2.3 mm. wide close to equator, three-lobed, angles acute. Seed ovoid, to 1.3 mm. long, 1 mm. wide below equator, obscurely angled at apex, angles rounded below, faces convex, plump, white or gray-brown.

Known only from Florida, usually in sandy areas a little away from the beaches or far inland (Map 26).

Representative specimens seen: FLORIDA. Collier: Caximbas Inlet,



Plate 30. CHAMAESYCE CUMULICOLA Small

Holotype: *C. cumulicola* Small, Caxambas Island, Florida, 11 May 1922, Small 10490 (NY).

July, Curtiss 2468 (F, FLAS, MO, NY, UCWI, US). Escambia: Santa Rosa Island, 10 Dec. 1941, Blair 6 (FLAS). Highlands: north of Sebring, 16 Sept. 1948, Garrett s.n. (FLAS). Indian River: near Sebastian, 26 July 1924, Small, Small & DeWinkeler 11541 (DUKE, MO, NY). Pinellas: sandy area near Anclote River, 5 June 1964, Burch 361 (FLAS). St. Johns: 4 miles south of Ponte Vedra, 11 Oct. 1964, Burch 439 (FLAS).

The small seed and diffuse growth habit separate this species from the closely related C. ammannioides. The two are occasionally found together, but C. ammannioides is a shore plant, and C. cumulicola more often occurs in areas sheltered from continuous exposure to salt.

24. CHAMAESYCE PROSTRATA (Ait.) Small, Fl. SE. US., 713. 1903. Euphorbia prostrata Ait., Hort. Kew. 2: 139. 1789. Type: Nat[ive] of the West Indies. Cult. 1758, by Mr. Philip Miller (British Museum if extant). Anisophyllum prostratum Kl. & Gke., Abh. Acad. Berlin Phys. 1859: 26. 1860.

E. callitrichoides HBK., Nov. Gen. et Spec. 2: 52. 1817. Type: Vera Cruz, Mexico (herb. Mus. Paris, not seen; photograph G seen by Wheeler). Referred here by Boissier in DC. Prod. 15(2): 47. 1862.

E. tenella HBK., Nov. Gen. et Spec. 2: 53. 1817. Type: ad ripas Orinoci prope Maypures et Carichana, Venezuela (Herb. Mus. Paris, not seen; photograph G and fragment of isotype from Berlin at MO seen by Wheeler). Referred here by Boissier, loc. cit., with note that type specimen and description do not match in pubescence of capsule.

C. malaca Small, Fl. SE. US., 713. 1903. Type: Kerrville, Kerr County, Texas, 26-30 June 1894, A. A. Heller 1918 (NY, photograph G, isotypes F, G, MO, examined by Wheeler, 1941, who refers the name here).

Annual; prostrate to 2 dm. Stem 0.5 mm. diameter, internodes to 1.5 cm. long or congested; several from base, branching throughout length, sparsely short tomentose, sometimes only on upper surface, green, brown or purplish. Leaves membranous; blades obovate or broadly elliptic, 4-8 by 3-5 mm., base rounded, margin serrate, apex rounded, sparsely short tomentose, upper surface glabrate, green or suffused purple; petiole to 1 mm. long; stipules separate or united at base, triangular to 0.5 mm. long, toothed or somewhat lacerate. Cyathia solitary at nodes of somewhat congested laterals; peduncle ca. 0.5 mm., involucre tubular-campanulate, 0.4 - 0.5 mm. at mouth, lobes exceeding glands, triangular, often ciliate, strigose toward top on outside, glabrous within, glands transversely elliptic, 0.1 - 0.3 mm. long, somewhat cupped, rarely somewhat stipitate, appendages obsolete or a rim to the gland, fifth gland linear, short, sinus to a third of depth of cyathium. Staminate flowers rarely more than 6 per cyathium, androphores glabrous, 1 mm. long at maturity. Gynophore sparsely pilose, to 1.5 mm. long at maturity, exserted, nutant; calyx a three-lobed pad of tissue; ovary strigose; styles 0.2 - 0.3 mm. long, spreading, joined at base, bifid for more than 1/2 length; capsule ovoid 1.1 - 1.3 mm. long, 1.5 mm. wide above base, three-lobed, angles acute, with stiff spreading white hairs. Seed cuneate-ovoid, 0.9 x 0.5 mm., strongly four-angled, ventral angle more obtuse than others, faces flat or slightly concave, transversely ridged, the narrow ridges sometimes passing through the angles, ashen.

Waste places and disturbed ground in the southeast of the United States and west to Arizona. Poorly collected but probably widespread in Florida and the Bahamas, and of general occurrence in the remainder of the Caribbean (Map 27).



* 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 9 5 1 3 7 1

Plate 31. CHAMAESYCE PROSTRATA (Ait.) Small

C. prostrata (Ait.) Small, Bahia Honda Key, Monroe County, Florida,
 20 Nov. 1964, Ward 4307 (FLAS).

Representative specimens seen: FLORIDA. Alachua: University of Florida campus, Gainesville, 3 June 1963, Burch 2017 (FLAS). Citrus: Inverness, 15 Oct. 1964, Burch 444 (FLAS). Collier: Monroe Station, 19 Apr. 1964, Burch 315 (FLAS); Marco, 1900, Hitchcock 318 (F, MO, NY). Dade: Homestead, 18 Apr. 1964, Burch 308 (FLAS). Dixie: Shamrock, 24 Nov. 1964, Godfrey 65683 (FLAS, FSU). Duval: Jacksonville, 1880, Curtiss s.n. (MO). Jackson: Marianna, 19 Oct. 1963, Burch 212 (FLAS). Leon: Tallahassee, 5 Dec. 1964, Godfrey 65701 (FLAS, FSU); Tallahassee, 13 July 1926, Harper s.n. (NY). Monroe: Bahia Honda, 20 Nov. 1964, Ward, Burch & Avery 4307 (FLAS); Garden Key, 1904, Lansing 2502 (F, NY). Nassau: Fernandina, 29 Oct. 1890, Hitchcock s.n. (MO). Okaloosa: Wynnehaven Beach, 24 Oct. 1964, Burch 474 (FLAS). St. Johns: St. Augustine, 13 Sept. 1898, Curtiss 6426 (GH, MO, NY). Volusia: 5 miles south of Daytona Beach, 23 Aug. 1962, Small, Small & deWinkler 10568 (NY).

BAHAMAS. New Providence: Nassau and vicinity, Mar.-May 1903, Curtiss s.n. (F, NY). Grand Turk Island: Ponds and vicinity, 20 Feb.-24 Mar. 1911, Millsp. and Millsp. 8991 (F, NY). CUBA. Camaguey: Atalaya, 20 Mar. 1909, Shafer 999 (F, NY). Habana: Botanical Garden Havana, 22 Mar. 1905, Curtiss 690 (F, GH, MO, NY). Oriente: 1857, Wright 549 (F, GH, MO, NY). Pinar del Rio: Bay of Mariel, 21 Sept. 1910, Britton & Earle 7574 (F, NY). Santa Clara: Cienfuegos, 27 Oct. 1928, Jack 6567 (GH, MO).

CAYMAN ISLANDS. Grape Tree Point, 14 Apr. 1956, Proctor 11971 (IJ).

JAMAICA. Kingston: Race Course, 24 Oct. 1954, Proctor 9378 (IJ, PUR). St. Ann: Moneague, 22 Jan. 1952, Hunnewell 19765 (GH). Clarendon: Cockpit, 15 June 1959, Webster, Ellis & Miller. Portland: Port Antonio, 25 Sept. 1906, Britton 846 (F, NY). St. Andrew: Hope Gardens, 29 Oct.

1914, Harris 11803 (GH, MO, NY, UCWI); University of West Indies Campus, 9 June 1963, Crosby, Hesperheide & Anderson 82 (DUKE, F). St. Catherine: Bog Walk, 13 Jan. 1958, Yuncker 17950 (F, UCWI). St. Michael: Pine Estate, 4 Aug. 1901, Freeman 151 (UCWI). Trelawny: Good Hope, 29 Aug. 1956, Proctor 15771 (GH, IJ). HAITI. Navassa Island, 20-23 June 1956, Proctor 15458 (GH, IJ); La Tortue, La Vallee, 14 June 1925, Ekman H4316 (IJ); Port au Prince, 15 Oct. 1926, Ekman H9125 (A); St. Marc, 25-28 Feb. 1920, Leonard 2858 (GH, NY); St. Louis du Nord, 30 Mar.-7 Apr. 1929, Leonard & Leonard 14262 (NY). DOMINICAN REPUBLIC. Ciudad Trujillo, 5 Dec. 1945, Allard 13892 (F, MO); Barahona, Sept. 1911, Fuertes 996 (F, GH, NY); Azua, 20 Mar. 1913, Rose, Fitch & Russell 4076 (NY). PUERTO RICO. Near Soroco, N.E. of Fajardo, 3 July 1959, Webster, Miller & Ellis 8623 (PUR); Rio Piedras, 29 Apr. 1914, Stevenson s.n. (NY); Santurce, Bayamon, 31 Oct. 1937, Otero 178 (MO); San Juan, 26 Jan. 1899, Heller & Heller 326 (NY); Isabel Segunda, Vieques Island, 24-27 Jan. 1914, Shafer 2419 (F, NY); Culubrita Island, 11 Mar. 1906, Britton & Wheeler 277 (F, NY). LESSER ANTILLES. St. Thomas: Dec. 1880, Eggers 334 (GH). St. Croix: New Fort, 11 Nov. 1895, Ricksecker 63 (F, GH, MO, NY); Coakley Bay, 30 Sept. 1923, Thompson 332 (GH). St. Barthelme: Gustaria, 5 Jul. 1938, Questel 434 (NY). St. Kitts: Wingfield Estate, 8 Sept.-5 Oct. 1901, Britton & Cowell 578 (NY). Antigua: Ft. James, 7 Oct. 1937, Box 1144 (F, MO, NY). Guadeloupe: Basse Terre, 1894, Duss 3420 (F, GH, MO, NY). Gosier: Aug. 1898, Duss 2739 (NY). Dominica: Roseau, Aug. 1937, Hodge 393 (GH). Martinique: Casepilote, Aug. 1869, Hahn 1108 (GH, NY); St. Pierre, Aug. 1899, Duss 4056 (NY). St. Vincent: 17 Feb. 1922, Bailey 400 (NY). Barbados: St. John, July 1941, Gooding 276 (NY). Grenada:



Map 27. Distribution of C. prostrata



Map 28. Distribution of C. mendezii

St. Georges, Broadway 1865 (MO). Extra territorial specimens: BERMUDA, Flatts Inlet, Smiths Parish, 8 July 1905, Moore 2871 (GH); Devonshire, 13 Jan. 1912, Robinson 81 (GH).

Wheeler (1941) proposed the name E. chamaesyce for this species on the basis of a sheet (630-17) in the Linnaean Herbarium, which is annotated with this name and holds a specimen of the plant here called C. prostrata. He proposed this as type specimen for the name E. chamaesyce, but the sheet was one bought from Patrick Browne, and was not in Linnaeus' possession until some years after his publication of the name. The annotation by Linnaeus is a simple misidentification, and the name E. chamaesyce should be limited in its application to the Mediterranean species, quite distinct from our C. prostrata, for which he first used it.

Plants from Texas and Arizona differ from those of the West Indies in being more heavily pubescent, with the hairs on the capsule less rigidly confined to the angles. One specimen from west Florida, Burch 474, is of this form, but differs in no other respect from the usual characters of the species in the Caribbean. These plants do not merit recognition at even the varietal level.

25. CHAMAESYCE MENDEZII (Boiss.) Millsp., Field Mus. Bot. 2: 410. 1916. Euphorbia mendezii Boiss., Cent. Euph., 15. 1860. Type: ad Leon, prope Guanajuato, Mexico, Mendez s.n. (Herb Candolle, not seen).

E. dorsiventralis Urb., Symb. Antill., 5: 391. 1908. Type: Madruga, Cuba; 25 Nov. 1904, Curtiss 535, Batabano, Cuba; 3 Oct. 1904, Baker and Wilson 2227; Prope Habana ad Vivora, Torralbas 282 (Syntypes: Herb. Bot. Mus. Berlin, if extant. Duplicate specimens of Curtiss 535: F !, GH !, K !, NY !; Baker & Wilson 2227 NY !, F !, K !). C. dorsiventralis (Urb)

Millsp., Field Mus. Bot. 2: 409. 1916.

Perennial; prostrate to decumbent, forming mats to 4 dm. diameter. Stems to 2 mm., internodes to 2 cm. long or congested; branching throughout length, laterals short and compact near tip of stem, not rooting at nodes, upper surface and sides long-pilose, underside glabrate, green or reddish. Leaves membranous; blades broadly oblong-elliptic, 4-8 x 2-5 mm., base inequilateral, rounded or cuneate, margin serrate, apex rounded or truncate, glabrous or rarely with scattered long hairs, green, often orange-red with age. Cyathia solitary, appearing clumped on congested laterals; peduncle to 1.5 mm. long, involucre narrowly obconical, to 0.6 mm. diameter at mouth, lobes equalling glands, triangular, toothed or deeply cut, glabrous on outside, long-pilose at throat within, glands transversely elliptic, 0.2 x 0.1 mm., cupped purple, appendages as long as glands and 2-3 times as wide, rarely obsolete, white or pink, fifth gland linear, ciliate, short, sinus shallow. Staminate flowers 6-8 per cyathium, androphores glabrous, to 1.5 mm. long at maturity. Gynophore glabrous, to 2 mm. long at maturity, exerted, nutant; calyx vestigial; ovary strigose; styles spreading, 0.35 mm. long, minutely joined at base, bifid for 1/2 length, obscurely clavate. Capsule ovoid, truncate, 1.2 mm. long, 1.2 - 1.3 mm. wide below equator, three-lobed, angles acute to obtuse, sparsely long-pilose at angles and rarely over sides of capsule. Seed narrowly ovoid, to 1 mm. long, 0.5 mm. wide just below equator, strongly four-angled, ventral angle more obtuse than others, faces somewhat concave, obscurely wrinkled, dark tan or chestnut-brown.

A plant of waste places and disturbed ground in Mexico and Cuba, and a recent introduction to Florida (Map 28).



Plate 32. CHAMAESYCE MENDEZII (Boiss.) Millsp.

Duplicate Coll. of Syntype: *E. dorsiventralis* Urban, Madruga, Cuba,
25 Nov. 1904, Curtiss 535 (NY).

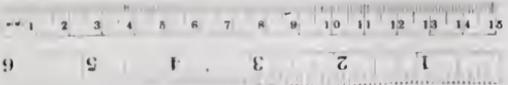
Representative specimens seen: FLORIDA. Collier: Goodland, 26 Sept. 1964, Burch 401 (FLAS, GH, US); Naples, 27 Sept. 1964, Burch 412 (BM, F, FLAS). Dade: Redlands, 5 July 1959, Atwater M-113 (FLAS); Old Cutler Rd., Miami, 29 Nov. 1963, Burch 219 (FLAS, NY, US); Homestead, 19 Apr. 1964, Godfrey 63361 (FLAS, FSU). Highlands: Lake Annie, 18 Nov. 1964, Burch & Ward 528 (FLAS, NY). Monroe: Flamingo, Everglades National Park, 17 Apr. 1964, Burch & Ward 288 (FLAS); Plantation Key, 21 Nov. 1964, Burch & Ward 563 (FLAS). Polk: Babson Park, 27 Nov. 1964, Burch 580 (FLAS). St. Lucie: Nigger Jim Scrub, 26 Oct. 1957, Brass 29046 (FLAS). CUBA. Habana: Chorrera near Havana, 22-23 Feb. 1911, Britton, Cowell & Leon 9585 (F, NY); Rio Almendares to Playa de Marianao, 22-23 Dec. 1910, Wilson 9457 (F, GH, NY); Estacion de Cristina, 7 Dec. 1905, Van Hernann 3386 (NY); El Morro to Cojimar, near sea, 8 Dec. 1910, Wilson 9125 (F, NY). Pinar del Rio: vicinity of Herradura, 4-5 Sept. 1910, Britton & Gager 6940 (F, NY); Bay of Mariel, 19-23 Sept. 1910, Britton & Gager 7675 (F, NY).

The first collection of C. mendezii in Florida was made in 1957 in St. Lucie County (Brass #29046), and it is now widespread in the southern part of the state. The plant is a strong grower, reaching full development in late summer, and, since it occupies the same general habitats as C. maculata and C. prostrata, it will be interesting to observe its spread in the face of competition from these two.

The species was named by Boissier from Mexican material, but Cuban collections correspond closely with this, and Urban was not justified in separating them as a distinct taxon.

26. CHAMAESYCE HEPATICA (Urb. & Ekman). comb. nov. E. hepatica Urb. & Ekman, Ark. f. Bot. Stockh. 22A(17): 113. 1929. Type: Navassa Island, Haiti, 17-25 Oct. 1928, E. L. Ekman H10809 (Holotype: Herb. Naturhistoriska Riksmuseum, Stockholm, not seen; Isotype: IJ !).

Perennial; prostrate, forming mats 10-15 cm. diameter. Stem wiry, 0.25 - 1 mm. diameter, internodes to 1.5 cm. long; many growing from crown of taproot, branching near base, but simple in upper part of stem, not rooting at nodes, sparsely tomentose, straw-color or darker brown. Leaves membranous; blades oblong to obcuneate, 3.5 - 6 x 1.5 - 3 mm., midrib sometimes prominent on underside, depressed above, base oblique, margin deeply and coarsely serrate, apex acute, sparsely tomentose, purplish-green above, lighter below; petiole 0.5 - 1 mm.; stipules joined on lower side of stem, triangular, 3-5 cleft, to 0.3 mm. long, ciliate, usually distinct on upper surface, subulate, to 0.1 mm. long. Cyathia solitary at upper nodes; peduncle short, broadening to tubular involucre, 0.3 mm. diameter at mouth, lobes truncate, scarcely equalling glands, sparsely tomentose outside, pilose within, glands transversely elliptic, 0.1 mm. long, deep red, appendages obsolete, fifth gland triangular equalling lobes, sinus shallow. Staminate flowers 3-5 per cyathium, androphores glabrous, 0.7 mm. long at maturity. Gynophore strigose, 0.5 mm. long at maturity, exerted, nutant; calyx minute or obsolete; ovary densely strigose; styles upright or spreading, minutely joined at base, 0.4 mm. long, bifid for 1/3 length. Capsule strigose, ovoid, 1.2 mm. long, to 1 mm. wide below equator, three-lobed, angles obtuse. Seed ovate, 0.8 mm. long, 0.4 mm. wide below equator, strongly four-angled, the ventral angle somewhat rounded, others very acute, faces



ISOTYPE (1)

Chamaesyce hepatica Urb. & Ekm.
Navassa Island, Haiti, Oct. 1928

Chamaesyce hepatica Urb. & Ekm.
Navassa Island, Haiti, Oct. 1928

Plate 33. CHAMAESYCE HEPATICA (Urb. & Ekm.) ined.

Isotype: *E. hepatica* Urb. & Ekm., Navassa Island, Haiti, 17-25 Oct. 1928, Ekman H10809 (IJ).

concave, obscurely wrinkled, dark red-brown overlaid with gray.

Known only from Navassa Island, Haiti, where it forms small mats in gravelly areas between limestone or in cracks in the rocks.

Specimens seen: HAITI. Near lighthouse, Navassa Island, 20-23 June 1956, Proctor 15457 (BM, GH, IJ).

The affinities of this species are with the group of wiry-stemmed species of Cuba and Hispaniola, but it is easily distinguished from them by its tiny holly-like leaves.

27. CHAMAESYCE HELWIGII (Urb. & Ekman) comb. nov. Euphorbia helwigii Urban & Ekman, Arkiv. Bot. Stockh. 22A(8): 65. 1929. Type: Road to Bassin, Les Gonaives, Presqu'île du Nord'ouest, Haiti, 24 Dec. 1927, E. L. Ekman H9546 (Holotype: Mus. Bot. Stockh., not seen; Isotypes: NY !, IJ !).

Annual; prostrate or decumbent to 1 dm. Stem to 1 mm. thick, internodes to 1 cm. long; sparsely branched, mostly from upper nodes, not rooting at nodes, pilose, straw-colored, becoming darker. Leaves membranous, or somewhat thickened; blades elliptical or oblong, 2-5 x 2-3 mm., base inequilateral, cuneate or rounded, margin coarsely serrate, somewhat revolute, sparsely long pilose, midrib prominent on underside, green suffused red; petiole to 0.5 mm. long; stipules joined only at base, deeply cleft, to 0.3 mm. long, light colored. Cyathia solitary at upper nodes; peduncle to 0.3 mm. long, or broadening to campanulate involucre to 0.7 mm. diameter at mouth, lobes equalling glands, triangular, entire or two to three parted, ciliate, glabrous or pilose near apex on outside, pilose within, glands subcircular, 0.1 mm. diameter, cupped, appendages slightly longer than and to twice as wide as glands, fifth gland deltoid,



Plantae Hispanicae Exp. in Regnum
N. 1146
Euphorbia helwigii
Rep. Haiti, Bassin.

Plate 34. CHAMAESYCE HELWIGII (Urb. & Ekm.) ined.

Isotype: *E. helwigii* Urb. & Ekm., Bassin, Haiti, 21 Dec. 1927,
Ekman H9456 (IJ).

short, sinus shallow. Staminate flowers 3-8 per cyathium, androphore glabrous, to 1 mm. long at maturity. Gynophore pilose, to 1.5 mm. long at maturity, exserted, nutant; calyx a triangular pad of tissue; ovary strigose; styles spreading, to 0.3 mm. long, minutely joined at base, bifid for 1/3 length. Capsule sparsely pilose, broadly ovoid, 1.5 - 1.8 mm. long, 1.8 - 2 mm. wide just below equator, roundly three-lobed, angles obtuse or rounded. Seed oblong-ovoid, base truncate, to 1.3 mm. long, dorsal face 0.8 mm. wide, strongly four-angled, dorsal angle acute, ventral angle somewhat rounded, faces flat or slightly convex, smooth, white or gray-brown.

Known only from type collection (Map 33).

This species is easily distinguished from *C. turpinii*, which it otherwise resembles closely, by the relatively large seed, with broad, smooth, light-colored dorsal faces.

28. CHAMAESYCE HIRTA (L.) Millsp., Field Mus. Bot. 2: 303. 1909.

Euphorbia hirta L., Sp. Pl. ed. 1: 454. 1753. Type: [*Euphorbia*] *hirta* 18 (Linn. sheet 630-7 !). *E. capitata* Lam., Encyc., 2: 422. 1786. substituted on the ground that *E. hirta* was a bad name. *E. hirta* L. var. *typica* L.C. Wheeler, Contr. Gray Herb. 127: 68. 1939.

E. globulifera HBK., Nov. Gen. et. Sp., 2: 56. 1817. Type:

Cumana, Venezuela, Bonpland 403 (Herb. Mus. Paris, not seen; fragment F !, fragment F and photograph of type GH seen by Wheeler, Contr. Gray Herb. 127: 68. 1939).

E. pilulifera L. *sensu* Jacquin, Icones Pl. Rar. 3: t. 478. 1986-

93; Boiss. in DC. Prod. 15(2): 21. 1862, and many other authors.

Annual; decumbent to 3 dm. Stems few, to 2 mm. diameter, internodes

to 3 cm. long; sparingly branched, tomentose and with abundant multicellular hairs which are often brown or purple, rarely merely tomentose, brown or red. Leaves membranous; blades ovate to lanceolate, often rhombiform, 5-35 x 3-15 mm., base rounded to cuneate, inequilateral, margin serrate, apex obtuse to acute, sometimes attenuate, strigose, glabrate on upper surface, green or red often with purple spot; petioles 1-2 mm. long; stipules distinct or joined at base, somewhat lacerate, to 1 mm. Cyathia in dense terminal and axillary glomerules formed of condensed leafless dichasia; peduncles short, involucre conical or tubular, to 0.3 mm. at mouth, lobes exceeding glands, attenuate, lacerate, strigose on outside, subglabrous within, glands minute, purple, stipitate, cupped, appendages obsolete to three times as wide as gland, fifth gland linear, shorter than lobes, sinus shallow. Staminate flowers 3-8 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, to 1 mm. long at maturity, exserted, upright or nutant; calyx a triangular pad of tissue or obsolete; ovary strigose; styles spreading, 0.2 mm. long, joined at base, bifid 1/2 to 2/3 length. Capsule strigose, ovate, to 1 mm. long, 1 mm. wide just above base, roundly three-lobed, angles obtuse. Seed cuneiform, 0.8 mm. long, 0.4 mm. wide above base, strongly four-angled, angles subequal, faces concave, obscurely transversely ridged or wrinkled, tan, red-brown or gray.

A common weed of cultivated or disturbed ground in Florida and throughout the West Indies and much of Central and South America (Map 29).

Representative specimens seen: FLORIDA. Alachua: University of Florida campus, Gainesville, 9 June 1936, Murrill s.n. (MO); University of Florida campus, Gainesville, 27 Apr. 1965, Wiggins & Wiggins 19833



88312



Plate 35. CHAMAESYCE HIRTA (L.) Millsp.

C. hirta (L.) Millsp., Homestead, Dade County, Florida, 16 April 1964,
Burch 269 (FLAS).

(FLAS). Brevard: Okeechobee region, 9 Sept. 1903, Fredholm 5994 (NY). Broward: Ft. Lauderdale, 12 Feb. 1946, Beck H-69 (FLAS). Charlotte: Charlotte Harbor, 21 Nov. 1964, Godfrey 65359 (FSU); Punta Gorda, 8 July 1948, Garrett s.n. (FLAS). Citrus: Crystal River, 19 Nov. 1964, Godfrey 65081 (FLAS, FSU); Pineola, 3 Dec. 1955, Kral 1891 (FSU). Clay: Gold Head Branch State Park, 1 Nov. 1964, Warren s.n. (FLAS). Collier: 7 mi. N. of Naples, 29 Dec. 1948, Deam 65587 (FSU); 2.5 miles S.E. of Naples, 22 Nov. 1964, Godfrey 65467 (FLAS, FSU). Dade: Buena Vista, 25 Dec. 1929, Moldenke 283 (DUKE, MO, NY); between Coconut Grove & Cutler, 31 Oct.-4 Nov. 1903, Small & Carter 1283 (F, NY); Deering Reservation, Buena Vista, 3 May 1918, Small 8571 (NY); Homestead, 23 June 1960, Webster & Samuel 10093 (DUKE, PUR). De Soto: 7 mi. W. of Arcadia, 29 Nov. 1962, Ward & Burch 3222 (FLAS). Dixie: Shamrock, 24 Nov. 1964, Godfrey 65681 (FSU). Glades: West side of Lake Okeechobee, 29 Nov. 1958, Ward & Ward 1145 (FLAS). Gulf: Port St. Joe, 20 Oct. 1963, Burch 333 (FLAS). Hardee: Wauchula, 26 Sept. 1964, Burch 390 (FLAS). Hendry: Clewiston, 2 Jan. 1964, Burch 240 (FLAS). Hernando: 4.5 mi. N. of Brooksville, 12 July 1958, Godfrey 57200 (FSU); June-July 1898, Hitchcock 1706 (F). Highlands: Sebring, 30 July 1934, McFarlin 8141 (DUKE, FLAS). Hillsborough: Tampa, 13 Aug. 1964, Burch 191 (FLAS). Indian River: Vero Beach, 7 Aug. 1963, Burch 114 (FLAS). Lake: Eustis, June-July 1894, Hitchcock 1705 (F); Eustis, 16-30 June 1894, Nash 997 (NSC, NY). Lee: Ft. Myers, July-Aug. 1900, Hitchcock 326 (F, NY); Sanibel Island, 30 Apr. 1954, Cooley 2645 (FLAS, NY). Manatee: Bradenton, 13 June 1916, Cuthbert 1313 (FLAS, NY); Bradenton, 9 June 1840, Simpson s.n. (F). Marion: Silver Springs, 1 Oct. 1963, Godfrey 63144 (FSU). Martin: Jensen, 22 Oct. 1898, Rolfs s.n. (FLAS);

Stuart, 5 Aug. 1962, Kral 15375 (FSU). Monroe: Everglades National Park, 15 Aug. 1960, Mitchell & Mitchell 660 (FSU); Key West, Stock Island, 12 Oct. 1950, Whitehouse 24020 (FSU, NSC); Upper Matecumbe Key, Curtiss 2496 (F, NY). Okeechobee: Okeechobee, 27 Dec. 1964, Burch 590 (FLAS). Orange: Orlando, 1 Aug. 1947, Schallert & Schallert 20768 (FLAS). Osceola: County line, FLA 60, 7 Aug. 1963, Burch 107 (FLAS). Palm Beach: Palm Beach, 18 May 1895, Curtiss 5395 (FLAS, NY); Palm Beach, 26 Dec.-11 Jan. 1896, Hitchcock 1708 (F). Pinellas: St. Petersburg, 23 Sept. 1907, Deam 2762 (F). Polk: Lakeland, 1 Aug. 1948, Garrett & Garrett (FLAS). St. Lucie: Ft. Pierce, 7 Aug. 1963, Burch 123 (FLAS). Sarasota: 2 miles S. of Venice, 30 Dec. 1956, Kral 3834 (FSU). Volusia: Crows Bluff, 29 June 1941, Hindery & Hindery s.n. (FLAS). Washington: Chipley, 25 Oct. 1964, Burch 501 (FLAS). BAHAMAS. Bimini: North Bimini, May 1948, Howard & Howard 10215 (NY). New Providence: Blue Hills, 14 July 1960, Webster, Samuel & Williams 10484 (DUKE, IJ); Farrington Road, 2 June 1909, Wilson 8333 (F, NY); Nassau, Nov. 1890, Hitchcock s.n. (MO). Andros: Mastic Point, 19-28 Mar. 1907, Brace 7035 (F, NY). Eleuthera: Gov. Harbor & vicinity, 19-20 Feb. 1907, Britton & Millspaugh 5471 (F, NY); Gov. Harbor, 14 Nov. 1890, Hitchcock s.n. (MO). CUBA. Isle of Pines: Caleta Cocodrilos, 8 Mar. 1916, Britton, Wilson & Leon 15252 (F, NY). Camaguey: La Gloria, 1 Feb. 1909, Shafer 183 (NY). Oriente: 1856-1857, Wright 550 (NY). Matanzas: Valley of San Juan, 21 Mar. 1916, Britton, Britton & Shafer 534 (NY). CAYMAN ISLANDS. Grand Cayman, Spot Bay, 13014 Feb. 1899, Millspaugh 1278 (F). JAMAICA. St. Andrew: U. of W. I. campus, 4 June 1963, Crosby, Hespenheide & Anderson 61 (DUKE, PUR); Constant Spring to Bardowie, 2 Aug. 1915, Harris 12111 (MO, UCWI). St. Michael: Waterford,

10 Aug. 1906, Dash 167 (UCWI). Clarendon: Kupuis, 23 June 1955, Proctor 10329 (IJ). St. Elizabeth: south of Gutters, 16 Sept. 1954, Howard & Proctor 13886 (IJ). HAITI. Port-de-Paix, 17 March 1928, Ekman H9716 (PUR); vicinity of St. Marc, 25-28 Feb. 1920, Leonard 2867 (NY); vicinity of Gros Morne, l'Artibonite, 17 Feb. 1926, Leonard 9797 (NY); vicinity of La Vallee, Tortue Island, 28 Dec.-9 Jan. 1929, Leonard & Leonard 11489 (NY). DOMINICAN REPUBLIC. Barahona: Barahona, July 1910, Fuertes 127 (F, NY). San Juan: El Cercado, Hondo Valle, 2 Sept. 1946, Howard & Howard 8737 (NY). PUERTO RICO. Soroco, Fajardo, 3 July 1959, Webster, Miller & Ellis 8620 (DUKE, IJ, PUR); Cibra Island, San Juan, Bayamon, 12 Oct. 1937, Otero 99 (MO); San Turce, 16 Jan. 1903, Heller 6405 (F, NY); Vieques Island, 24-27 Jan. 1914, Shafer 2513 (F, NY); Culebra Island, 3-12 Mar. 1906, Britton & Wheeler 173 (NY); Catano, 6-11 Jan. 1899, Millspaugh 1775 (F); Toa Baja, 6 July 1912, Johnston 460 (NY). LESSER ANTILLES. Tortola, 13 Oct. 1918, Fishlock 235 (NY); St. Thomas, Charlotte Amalie, 17-18 Jan. 1899, Millspaugh 426 (F); St. Croix, 18 Nov. 1895, Ricksecker 92 (NY); St. Barthelemy: Gustaria, 4 Dec. 1937, Questel 122 (NY); St. Jean, Nov. 1938, Questel 621 (NY). Antigua: 16-17 Jan. 1907, Shafer 21 (NY); Montserrat, 19 Jan. 1907, Shafer 15 (NY); Guadeloupe, 1833, Duss 2453 (NY); Dominica, 1903, Lloyd 229 (NY); Martinique, 29 July 1939, Egler 39-209 (NY); St. Lucia, 1 Dec. 1887, Lee s.n. (F); Carriacou, 7-25 Mar. 1950, Howard 10848 (IJ, NY); Grenada: Tufton Hall Estate, 30 Oct.-11 Dec. 1957, Proctor 17147 (IJ). Extra-territorial specimen: GEORGIA. Sapelo Island, McIntosh County, 16 July 1956, Duncan 20301 (NCU, NSC).

Linnaeus described E. hirta and E. pilulifera in Species Plantarum

edition 1 (1753) under the numbers 18 and 19, referring to an earlier description by Wiman (1752) and to illustrations by Burman (1737). There are specimens in the Linnaean Herbarium labelled by Linnaeus (sheet 630-5, 630-6 'hirta', 630-7 '18 hirta', 630-8 '19 pilulifera'), and Brown (1911) has pointed out the close correspondence between these and the descriptions. Burman's illustrations, on the other hand, appear to be merely two forms of the same species, so that if Linnaeus intended to describe two distinct species he was in error in citing Burman as an illustration of both types.

There is no doubt that the specimens in the herbarium represent two entities. The general appearance of the sheets is similar but sheet 630-8 '19 pilulifera' lacks the multicellular hairs that are so characteristic of E. hirta and which occur on all the other specimens. The plant on this sheet is glabrous in all parts except the capsules, and has leaves toothed only in the upper third, and more rounded at the apex than those of the other sheets.

Some workers have regarded the two species as conspecific, arguing that Burman's illustrations were the source of Linnaeus' information. Farwell (1936) has shown that, if one name is to be reduced to synonymy, this taxon must be called E. pilulifera. If, however, the herbarium sheets are taken as representative of the concept of these two species which Linnaeus held, as might well be the case in view of their close correspondence with the descriptive phrases, then E. hirta is clearly the name of the species under consideration. This second argument is accepted here, and the epithet hirta will be used for our species.

This species is uniform through the area in most features, but



Map 29. Distribution of *C. hirta*



Map 30. Distribution of *C. opthalmica*

occasional plants are found which lack the heavy orange-yellow hairs found in other specimens. These plants are strikingly different in the field, but correspond closely on all characters except this one, and probably do not merit recognition at even the varietal level. Specimens of this form have been seen from Florida, Jamaica, Puerto Rico and Guatemala.

29. CHAMAESYCE OPHTHALMICA (Pers.) comb. nov. E. ophthalmica Persoon, Syn. Pl., 2: 13. 1807. Type: Rio de Janeiro, Brazil, July 1767, Commerson 238 (Herb. Mus. Paris, not seen; fragment F seen by Wheeler). Referred to this entity by Boiss. in DC. Prod. 15(2): 21. 1862, and identity confirmed by Wheeler, Contr. Gray Herb. 127: 69. 1939 with comment "[fragment Field Mus. !] A small-leaved plant."

E. procumbens DC, Cat. Pl. Hort. Monsp., 111. 1813. Type: probably a plant from garden at Montpellier, France (Geneva if extant). E. pilulifera L. var. procumbens (DC.) Boiss., DC. Prod. 15(2): 21. 1862. C. pilulifera (L.) Small var. procumbens (DC.) Small, Fl. SE. US., 714. 1903. E. hirta L. var. procumbens (DC.) N.E. Brown in Thiselton-Dyer, Fl. Trop. Afr. 6(1): 497. 1911. C. hirta L. var. procumbens (DC.) Moldenke, Rev. Sudam. Bot. 6: 178. 1940. C. hirta L. ssp. procumbens (DC.) Croiz. in Moldenke, Lilloa 6: 299. 1941.

E. gemella Lag., Gen. et Spec. Nov., 17. 1816. Referred here by Boiss. in DC. Prod. 15(2): 21. 1862. C. gemella (Lag.) Small, Fl. Miami, 110. 1913.

Annual; prostrate or decumbent to 15 cm. Stem to 1 mm. at base, internodes to 3 cm. long; branched throughout, not rooting at nodes, densely tomentose, subglabrate, long multicellular hairs throughout,

particularly at tips, hairs often yellow or brown, stems green or red. Leaves membranous; blades elliptic, often markedly rhombic, 7-15 x 3-7 mm., base inequilateral, rounded to cuneate, margin sharply serrate, apex attenuate to acute, strigose, glabrate above, green or red; petioles to 1 mm.; stipules distinct or united at base, attenuate to 1 mm., short cleft or ciliate. Cyathia glomerate, in terminal leafless dichasia; peduncles short, involucre conical or tubular to 0.3 mm. at mouth, lobes exceeding glands, attenuate, lacerate, strigose on outside, subglabrous within, glands minute, purple, stipitate, cupped, exappendiculate, fifth gland linear, shorter than lobes, sinus shallow. Staminate flowers 3-8 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, to 1 mm. long at maturity, exerted, upright or nutant; calyx a triangular pad of tissue or obsolete; ovary strigose; styles spreading, 0.2 mm. long, joined at base, bifid 1/2 to 2/3 length. Capsule ovate, strigose, to 1 mm. long, 1 mm. wide just above base, roundly three-lobed, angles obtuse. Seed cuneiform, 0.8 mm. long, 0.4 mm. wide above base, strongly four-angled, angles subequal, faces concave, obscurely transversely ridged or wrinkled, tan, red-brown or gray.

A common weed of cultivated ground and disturbed areas, Bermuda, southern and central Florida, Bahamas, and probably through the Antilles although no specimens have been seen from Haiti or the southern part of the Antillean chain (Map 30).

Representative specimens seen: FLORIDA. Alachua: Gainesville, 30 June 1964, Burch 382 (FLAS). Brevard: Sebastian Inlet, 17 Apr. 1965, Burch 636 (FLAS). Charlotte: Charlotte Harbor, 21 Nov. 1964, Godfrey 65358 (FLAS, FSU). Collier: Monroe Station, 19 Apr. 1964, Burch 316



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Plant of Florida

Plate 36. CHAMAESYCE OPHTHALMICA (Pers.) ined.

C. ophthalmica (Pers.) Burch, Monroe Station, Collier County, Florida, 19 April 1964, Burch 316 (FLAS).

(FLAS); Goodland, 22 Nov. 1964, Godfrey 65529 (FLAS, FSU). Dade: Miami, 1 Apr. 1897, Curtiss 5849 (F, NY); Brickell Hammock, Feb. 1911, Small, Carter & Small 3274 (NY). Dixie: Shamrock, 24 Nov. 1964, Godfrey 65681a (FSU). Glades: Palmdale, 28 Dec. 1963, Burch 234 (FLAS). Highlands: Sebring, 23 Apr. 1948, Garrett 6 (FLAS). Indian River: Merritt's Island, July, Curtiss 2496 (F, NY). Lake: Lake Louisa, 18 Nov. 1964, Burch & Ward 525 (FLAS). Lee: Ft. Myers, 27 Sept. 1964, Burch 416 (FLAS). Levy: Cedar Key, Apr. 1876, Garber 8 (FLAS). Manatee: Long Boat Key, 27 Sept. 1964, Burch 430 (FLAS). Monroe: Pinecrest, 1 Apr. 1930, Moldenke 865 (DUKE, MO, NY); Big Pine Key, 10 May 1919, Cuthbert s.n. (FLAS); Soldiers Key, 30 Mar. 1904, Britton 332 (F, NY). Polk: Lake Wales, 18 Nov. 1964, Burch & Ward 526 (FLAS). Sarasota: Long Boat Key, 21 Nov. 1964, Godfrey 65238 (FLAS, FSU). BAHAMAS. Great Bahama: Eight Mile Rocks, 5-13 Feb. 1905, Britton & Millspaugh 2471 (F, NY). Berry Islands: Little Harbor Cay, 31 Jan. 1905, Britton & Millspaugh 2247 (F, NY). New Providence: Mt. Pleasant, 13 Sept. 1904, Britton & Brace 757 (F, NY); Grantstown, 28-29 May 1909, Wilson 8191 (F, NY). Exuma: Cave Cay, 19 Feb. 1905, Britton & Millspaugh 2817 (F, NY). Long Island: Clarendetown & vicinity, 16-19 Mar. 1907, Britton & Millspaugh 6313 (F, NY). Inagua: Nov. 1890, Hitchcock 32 (F, MO). South Caicos: Cockburn Harbour, 20 June 1954, Proctor 8900 (IJ). CUBA. Habana: Rio Almendaras to Playa de Mariano, 22-23 Dec. 1910, Wilson 9470 (F); Vedado, 29 Sept. 1914, Ekman 185 (NY); Batabano, 10 Apr. 1903, Shafer 515 (NY). Camaguey: Cayo Romano, 20 Oct. 1909, Shafer 2623 (NY). Oriente: Forest about Paso Estancia, 27 Apr. 1909, Shafer 1575 (NY). Pinar del Rio: Sierra de Anafe, 17 Dec. 1911, Wilson 11385 (NY). JAMAICA. St. Andrew: Hope Road Terrace, Kingston,

31 Oct. 1963, Adams 11810 (PUR, UCWI). St. Catherine: Sligoville, 16 June 1963, Adams 12556 (UCWI). St. Elizabeth: Malvern, 5 Sept. 1907, Britton 1182 (F, NY); Bethlehem, Sept. 1901, Harris 8291 (UCWI). Westmoreland: Torrington, 22 Feb. 1963, Adams 12288 (UCWI). DOMINICAN REPUBLIC. Santo Domingo City, 13 Jan. 1929, Ekman H11127 (PUR); San Pedro de Macoris, 31 Mar. 1913, Rose, Fitch & Russell 4300 (NY). PUERTO RICO. Station grounds, Rio Piedras, Bayamon, 2 Oct. 1937, Otero 120 (MO); Culebra Island, 3-12 Mar. 1906, Britton & Wheeler 155 (NY). LESSER ANTILLES. St. Barthelemy, Gustaria, 24 Nov. 1938, Questel 537 (NY); Antigua, Claremont, 2 Jan. 1938, Box 1332 (BM, F, NY). Extra-territorial specimens: BERMUDA. Harrington Sound, 4 Aug. 1913, Collins 337 (F, NY); North Shore, 31 Aug.-20 Sept. 1905, Brown & Britton 71 (F, NY); Kilderry Estates, Smith Parish, 26 July 1963, Manuel s.n. (A).

This taxon has often been considered no more than a variety of *C. hirta*, but is clearly distinguishable, differing in fundamental characters of branching and cyathial production, and will be accepted as a distinct species here.

Jacquin's name *E. obliterata*, Enum. Syst. Pl. Carib., 22. 1762. and Sel. Stirp. Am. Hist., 151. 1763., has been suggested as a synonym for this plant (Boiss. in DC. Prod. 15(2): 21. 1862. and successive authors), but this cannot be accepted. If this were the plant which Jacquin described his name would have to be adopted for it, but his description is not specific enough to be acceptable without authentic specimens to back it, and, in fact, has features such as "umbrella trifida" which make it unlikely that this is the plant to which he referred.

30. CHAMAESYCE BERTERIANA (Balb.) Millsp., Field Mus. Bot. 2: 303. 1909. Euphorbia berteriana Balbis in Spreng., Linnaeus' Syst. Veg. ed. 16, 3: 794. 1826. Type: ? "In ins. Guadeloupe et St. Domingue (Bertero !)" Boiss. in DC. Prod. 15(2): 21. 1862. Specimen probably in herb. Istituto Botanico della Universita, Torino, if extant.

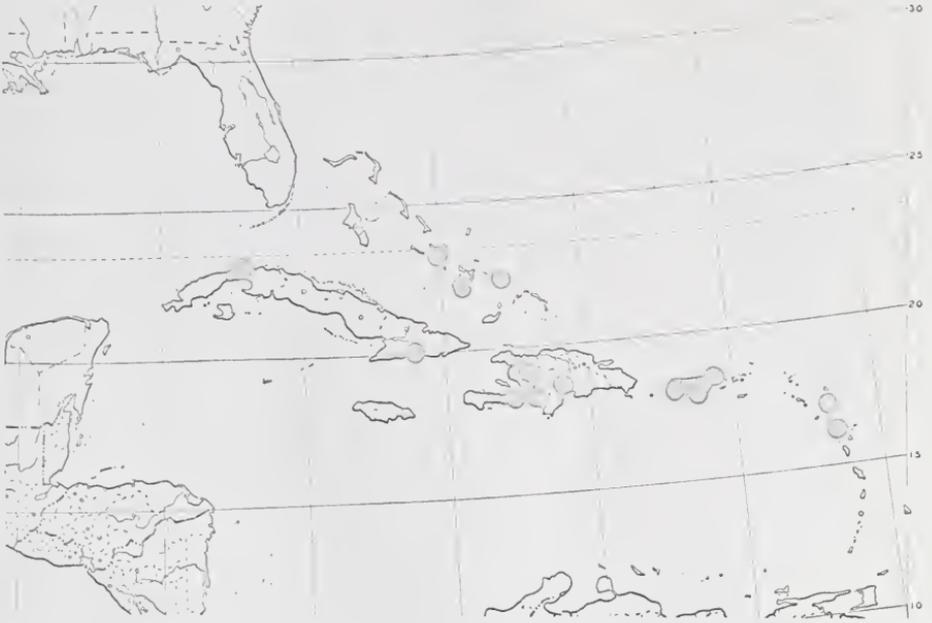
Euphorbia stipitata Millsp., Field Mus. Bot. 2: 65. 1900. Type: Guanica, Puerto Rico, 22 Jan. 1899, Millspaugh 1782 (Holotype: F, sheet 61782, not found; Isotype: F!).

Annual, decumbent to 2 dm. Stem 2 mm. thick, internodes to 3 cm. long; branching throughout length, short-tomentose, brown. Leaves membranous; blades ovate-elliptic or somewhat oblong, 5-15 x 3-8 mm., base rounded, margin crenulate or blunt-serrate, apex rounded, short pilose, yellowish green; petiole ca. 1 mm. long; stipules distinct or slightly joined, linear, toothed, to 1 mm. Cyathia in dense leafless dichasia; peduncle short, involucre narrowly campanulate, to 0.7 mm. diameter, lobes triangular exceeding glands, somewhat cleft, strigose on outside pilose within, glands subcircular, 0.2 mm. diameter, cupped, stipitate, appendages a rim to twice width of gland, fifth gland linear, shorter than lobes, sinus shallow. Staminate flowers 5-8 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore pilose, to 1 mm. long, exserted, nutant or upright; calyx obsolete; ovary pilose; styles upright, 0.4 - 0.6 mm. long, joined at base, bifid for 1/2 length. Capsule strigose, elliptic, 1.5 mm. long, 1.5 mm. wide at equator, shallowly three-lobed, angles acute. Seed long-cuneiform, to 0.9 mm. long, 0.4 mm. wide between base and equator, strongly four-angled, angles subequal, faces somewhat concave, transversely ridged, sometimes obscurely

so, brown, red-brown or gray.

Weeds of cultivated ground and pasture, Bahamas, Cuba, Hispaniola and Puerto Rico. Isolated collections from Antigua and Guadeloupe but absent from Florida, Jamaica, and the southern part of the Antilles chain (Map 31).

Representative specimens seen: BAHAMAS. New Providence: Nassau, Fort Charlotte, 6 July 1960, Webster, Samuel & Williams 10305 (PUR). Great Exuma: Hayne Road, 22-28 Feb. 1905, Britton & Millspaugh 3031 (F, NY). Long Island: Clarence Town & vicinity, 16-19 Mar. 1907, Britton & Millspaugh 6312 (F, MO, NY). Atwood Cay, 3-4 Dec. 1907, Wilson 7413 (F, MO, NY). Mariguana: Southeast Point, 10-12 Dec. 1907, Wilson 7587 (F, NY). Castle Island, 22 Dec. 1907, Wilson 7801 (F, NY). CUBA. Havana: between Rio Cojimar and Playa de Bacuranao, 26 Dec. 1910, Wilson 9540 (F, NY). Oriente: Guantanamo Bay, 17-30 Mar. 1909, Britton 2178 (MO, NY); El Morro, Santiago Bay, 10-11 Mar. 1912, Britton & Cowell 12588 (F, NY). HAITI. Massif de la Selle, 17 Nov. 1926, Ekman 6981 (PUR); Fond Parisien, Etang Saumatre, 5-13 May 1920, Leonard 4085 (F, NY); Cabare, Baie des Moustiques, 12-18 Jan. 1929, Leonard & Leonard 11944 (MO); Port au Prince, 1-2 Apr. 1920, Leonard 3458 (NY); Petionville, 15-28 June 1920, Leonard 4839 (NY); St. Michel de l'Atalay, 19 Nov. 1925, Leonard 7219 (NY). DOMINICAN REPUBLIC. Barahona: La Salinas, 17 Aug. 1946, Howard & Howard 8407 (NY); June 1911, Fuertes 1055 (F, MO, NY). PUERTO RICO. Prope Salinas de Cabo Rojo, 8 Feb. 1885, Sintenis 634 (F, NY); Guanica, 5-8 Mar. 1915, Britton, Cowell & Brown 4899 (F, MO, NY); Cayo Muertos, 9-12 Mar. 1915, Britton, Cowell & Brown 4967 (F, MO); Guayanilla, 10 Mar. 1913, Britton & Shafer 1820 (F, MO, NY);



Map 31. Distribution of C. berteriana



Map 32. Distribution of C. maculata

Ponce to Penuelas, 22 Mar. 1906, Britton & Cowell 1308 (F, NY); Yauco to Guayanilla, 14 June-22 July 1901, Underwood & Griggs 602 (F, NY); 8 miles west of Ponce, 1 Dec. 1902, Heller 6164 (F, MO, NY). LESSER ANTILLES. Antigua, 1849, Wulfschlaegel 518 (MO); Guadeloupe, ex herb. Grisebach, (MO); Guadeloupe, Desirade, 12 Jan. 1936, Stehle 290 (NY).

The species has clear affinities with C. hirta and C. ophthalmica, but has a somewhat more upright habit, rounder leaves with merely crenulate margins, and usually smaller glomerules of cyathia. These are terminal, and for this reason the species is felt to be closer to C. ophthalmica than to C. hirta.

31. CHAMAESYCE MACULATA (L.) Small, Fl. SE. US., 713. 1903. Euphorbia maculata L., Sp. Pl. ed. 1: 455. 1753. Type: Herb. Linn. sheet 630-11 !

E. supina Raf., Amer. Monthly Mag. 2: 119. 1817. Type: Unknown, probably not extant. C. supina (Raf.) Moldenke, An annotated and classified list of H. N. Moldenke's collection numbers from No. 1 to 11, 277 inclusive, 135. 1939.

C. tracyi Small, Fl. SE. US. 713. 1903. Type: Biloxi, Miss., 15 July 1894, Tracy 2913 (NY !).

C. mathewsii Small, Man. SE. Flora, 797. 1933. Type: Dunes opposite Miami, Florida, 26 Nov.-20 Dec. 1913, Small, J. K. & Small, G. J. 4556 (Holotype: NY !; Isotypes: DUKE !, FLAS !, FSU !, NCU !).

Annual; prostrate to decumbent forming loose mats to 5 dm. diameter. Stem 1-2 mm. thick, internodes to 2 cm. or congested, branching throughout length, subdichotomous near base, alternate above with short leafy laterals, not rooting at nodes, villous-pubescent or tomentose or rarely

velutinous, on all parts of stem, or lower surface glabrate or rarely entirely glabrous, green or red. Leaves membranous; blades ovate-elliptic or somewhat oblong or linear, 5-15 x 2-5 mm., base inequilateral, rounded or obtuse, margins serrate, rarely subentire, apex rounded or obtuse, villous-pubescent, often glabrate above, rarely completely glabrous, green or red, often with a red or purple spot in the middle of the upper surface; petioles 1- 1.5 mm. long; stipules distinct, linear, 0.7 - 1 mm. long, toothed or 2-3 parted. Cyathia solitary, appearing clustered when borne on short congested leafy laterals near the tip of the stem; peduncle 0.5 - 1 mm. long, cyathia obconical, 0.6 - 0.8 mm. diameter near mouth, lobes triangular, slightly exceeding glands, entire or minutely toothed, sparsely villous on outside, pilose within, glands transversely elliptic or lunate, 0.1 - 0.25 mm. long, appendages narrower than to twice as wide as gland, margin entire or lobed, white or pink, fifth gland linear, almost equalling glands, sinus deep. Staminate flowers rarely more than five per cyathium, androphores glabrous, 1 mm. long at maturity. Gynophore pilose, occasionally glabrous, 1 - 1.5 mm. long at maturity, barely exerted and bent to lie deep in sinus; calyx a triangular pad of tissue; ovary strigose, rarely subglabrous; styles spreading, 0.2 - 0.4 mm. long, minutely joined at base, bifid for 1/3 - 1/2 length. Capsule strigose, often glabrate, ovoid, to 1.5 mm. long, 1.5 mm. wide below equator, strongly three-lobed, angles acute. Seed oblong-ovoid, 0.8 - 1 mm. long, 0.6 mm. wide below equator, strongly four-angled, angles subequal, faces flat or somewhat convex, obscurely transversely ridged or almost smooth, ridges sometimes passing into angles, tan, red-brown or ashen.



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Plate 37. CHAMAESYCE MACULATA (L.) Small

C. maculata (L.) Small, Charlotte Harbor, Charlotte County, Florida,
27 Sept. 1964, Burch 418 (FLAS).



TYPE

Chamaesyce Mathewsii Small,
SE Fl., 797, 1505. 1933.
Louis C. Wheeler 1933

THE NEW YORK BOTANICAL GARDEN

Plate 38. CHAMAESYCE MACULATA (L.) Small

Holotype: *C. mathewsii* Small, sand dunes opposite Miami, Dade County, Florida, 26 Nov.-20 Dec. 1913, Small & Small 4556 (NY).

A common weedy plant of the United States. Found in disturbed habitats throughout Florida except on the Keys where C. blodgettii replaces it as the characteristic plant of sidewalk cracks and gas station forecourts. Present in Bermuda but not in the Bahamas or any part of the Caribbean. (Map 32).

Representative specimens seen: FLORIDA. Alachua: University of Florida campus, Gainesville, 9 Oct. 1956, Jackson 702 (FLAS, FSU). Bay: Gulf Resort Beach, 19 Oct. 1963, Burch 213 (FLAS). Bradford: Hampton, 29 July 1927, Wiegand and Manning 1816 (GH). Brevard: Canova Beach, 17 April 1965, Burch 630 (FLAS); Okeechobee region, 6 Sept. 1903, Fredholm 5990 (GH, NY). Broward: New River Sound, 18 Nov. 1903, Small & Carter 1163 (NY); Deerfield, 20 March 1965, Lakela 28291 (FLAS, USF). Calhoun: Blountstown, 25 Oct. 1964, Burch 508 (FLAS). Charlotte: New Point Comfort, 5 June 1964, Burch 351 (FLAS); Punta Gorda, 8 July 1948, Garrett s.n. (FLAS). Citrus: Hernando, 18 May 1965, Ward and Beckner 4676 (FLAS); Lake Tsala Apopka, 8 June 1961, Godfrey & Reinert 60884 (FSU). Collier: Cape Romano, 28 Aug. 1922, Small, Small & DeWinkeler 0620 (NY); Naples, 6 June 1964, Burch 367 (FLAS); Marco Island, 26 Sept. 1964, Burch 405 (FLAS). Dade: Sand dunes opposite Miami, 26 Nov.-20 Dec. 1913, Small & Small 4553 (DUKE, FLAS, NY); Border of Everglades, 7 March 1892, Simpson 557 (GH); Biscayne Bay, 1874, Palmer 7404 (MO); Key Biscayne, 6 May 1958, Atwater M-42 (FLAS). DeSoto: Arcadia, 29 Nov. 1962, Ward & Burch 3217 (FLAS). Dixie: Shamrock, 24 Nov. 1964, Godfrey 65684 (FLAS, FSU). Duval: Jacksonville, 11 October 1894, Curtiss 5118 (MO, NY); Jacksonville, 22 Dec. 1924, Small 11561 (NY). Escambia: Pensacola, 31 July 1941, Brinker 356 (MO). Flagler: Andalusia, 10 Oct. 1940, West &

Arnold s.n. (FLAS). Franklin: Lanark, 6 Oct. 1955, Godfrey 54128 (DUKE, FSU, GH, NY). Gadsden: Chattahoochee, 13 Sept. 1956, Kral & Godfrey 3554 (FSU, GH). Gilchrist: Trenton, 5 Oct. 1940, West & Arnold s.n. (FLAS). Gulf: Cape Sand Blas, 8 Nov. 1959, Godfrey 59163 (FSU). Hamilton: White Springs, 26 July 1946, West & Arnold 24 (FLAS). Hardee: Wauchula, 26 Sept. 1964, Burch 389 (FLAS). Hernando: Brooksville, 12 July 1958, Godfrey 57208i (FSU). Highlands: Sebring, 23 Apr. 1948, Garrett 7 (FLAS); Junction US 27 & FLA 64, 2 January 1963, Burch 60 (FLAS). Hillsborough: University of South Florida campus, Tampa, 13 Aug. 1964, Burch 192 (FLAS); 5 Nov. 1904, Fredholm 6469 (GH, MO, NY). Holmes: 9 miles E. of Walton County line, 25 Oct. 1964, Burch 494 (FLAS). Indian River: Vero Beach, 7 August 1963, Burch 115 (FLAS). Jackson: Marianna, 19 Oct. 1963, Burch 211 (FLAS). Jefferson: Monticello, 4 Oct. 1964, Elam s.n. (FLAS); Capps, 9 Oct. 1954, Godfrey & Morrill 52542 (FSU, GH). Lafayette: Dowling Park, 15 July 1961, Ramsey, Godfrey & Mitchell 247 (FSU). Lake: Eustis, 16-30 June 1894, Nash 1058 (GH, MO, NY). Lee: Alva, July-August 1900, Hitchcock 328 (GH, MO, NY); Sanibel, outer island, 20 July 1954, Cooley 2330 (USF). Leon: Tallahassee, 30 June 1955, Godfrey 53572 (DUKE, GH, FSU, NY). Levy: Seahorse Key, 1 Dec. 1962, Ward 3256 (FLAS). Liberty: Jackson Bluff, 30 Sept. 1964, Godfrey 64677 (FLAS, FSU). Manatee: Longboat Key, 27 Sept. 1964, Burch 443 (FLAS); Bradenton, 20 Nov. 1964, Godfrey 65192 (FLAS, FSU). Marion: Lake Kerr, 24 Sept. 1941, West & Arnold s.n. (FLAS). Martin: Jupiter Island, 7 Aug. 1963, Burch 126 (FLAS). Nassau: Fort Clinch State Park, 12 Oct. 1963, Burch 197 (FLAS). Okaloosa: Destin, 24 Oct. 1964, Burch 467 (FLAS). Okeechobee: Okeechobee, 27 Dec. 1964, Burch 588 (FLAS).

Orange: 6 Aug. 1902, Fredholm 5454 (GH, NY). Osceola: 4 miles E. of Polk County line on FLA 60, 7 Aug. 1963, Burch 106 (FLAS). Palm Beach: Jupiter Island, 27 July 1956, Cooley, West & Daggy 4778 (GH, USF); Boca Raton Lake, 19 Nov. 1903, Small & Carter 1146 (NY). Pasco: Land o'Lakes, 10 July 1958, Kral 7257 (FLAS, GH). Pinellas: Sunshine Skyway Bridge, St. Petersburg, 15 Oct. 1964, Burch 452 (FLAS); Fort DeSoto County Park, Mullet Key, 10 Sept. 1963, Thorne, Long & Lakela 26325 (USF). Polk: Timberlane, Lake Wales, 1 Oct. 1964, Conard s.n. (FLAS). Putnam: Welaka, 12 July 1940, Laessle s.n. (FLAS). St. Johns: North River, St. Augustine, 12 Oct. 1963, Burch 203 (FLAS). St. Lucie: South side Ft. Pierce, 7 Aug. 1963, Burch 124 (FLAS). Santa Rosa: Navarre, 24 Oct. 1964, Burch 477 (FLAS). Sarasota: Longboat Key, 21 Nov. 1964, Godfrey 65239 (FLAS, FSU). Sumter: Wildwood Exit from I-75, 18 Nov. 1964, Burch & Ward 523 (FLAS). Suwannee: East of Ellaville, 15 July 1961, Ramsey, Godfrey & Mitchell 286 (FSU). Taylor: Adams Beach, 21 Oct. 1960, Godfrey & Houk 60458 (FSU, GH). Union: Worthington, 24 Aug. 1964, Warren s.n. (FLAS). Volusia: Green Mound, south of Daytona Beach, 23 Aug. 1922, Small, Small & DeWinkeler 10571 (GH); Daytona Beach Shores, 3 Aug. 1962, Ray 11144 (USF). Wakulla: St. Marks Wildlife Refuge, 6 Oct. 1955, Godfrey & Kral 54104 (FSU, GH, USF). Washington: Careyville, 25 Oct. 1964, Burch 498 (FLAS). Extra-territorial specimens: BERMUDA. Old Ferry Road, 9 Aug. 1913, Collins 217 (GH, NY); North Shore, 31 Aug.-20 Sept. 1905, Brown & Britton 12 (GH, NY).

A very variable species in growth habit, color, pubescence and appearance of seed. The very similar Euphorbia humistrata, reported by Wheeler (1941) from Alabama, has not been found in Florida although

some collections are suggestive of this species in their pubescence and seed.

Small's species, C. tracyi and C. mathewsii are based on extreme forms of this species, and examination of a long series has shown a range of intermediates that span the differences.

Wheeler's rejection (1939, 1960) of the long-established name for this species has been mentioned in the commentary on C. nutans. His case was never proved, and the traditional application of the epithet to this prostrate species should be maintained. The matter is discussed at some length in Burch (1965), which also gives a list of contributions to the controversy stirred up by Wheeler's proposal.

32. CHAMAESYCE THYMIFOLIA (L.) Millsp., Field Mus. Bot. 2: 412. 1916. Euphorbia thymifolia L., Sp. Pl. ed. 1: 454. 1753. Type: not sheet 630-10 in Herb. Linn. No specimen known to have been seen by Linnaeus has been found. Anisophyllum thymifolium (L.) Haw., Syn. Pl. Succ., 160. 1812. "E. maculata L. (var. thymifolia L.)" Griseb., Fl. Brit. W. I. Islands, 53. 1859., cited in this form.

Annual; perhaps perennating by thick rootstock, prostrate, forming mats to 4 dm. diameter. Stem 1-2 mm. thick, internodes to 1.5 cm. long or congested; sparingly branched near base, and with short, congested laterals or unbranched at tips of stem, not rooting at nodes, villous-pubescent or tomentose on upper surface, often glabrate, naked on under surface, green or light brown. Leaves membranous; blades oblong-elliptic, often narrow and very uniform on side shoots, 4-10 x 2-5 mm., base oblique or subequilateral on side shoots, margin coarsely serrate, apex rounded to acute, upper surface usually glabrous, lower

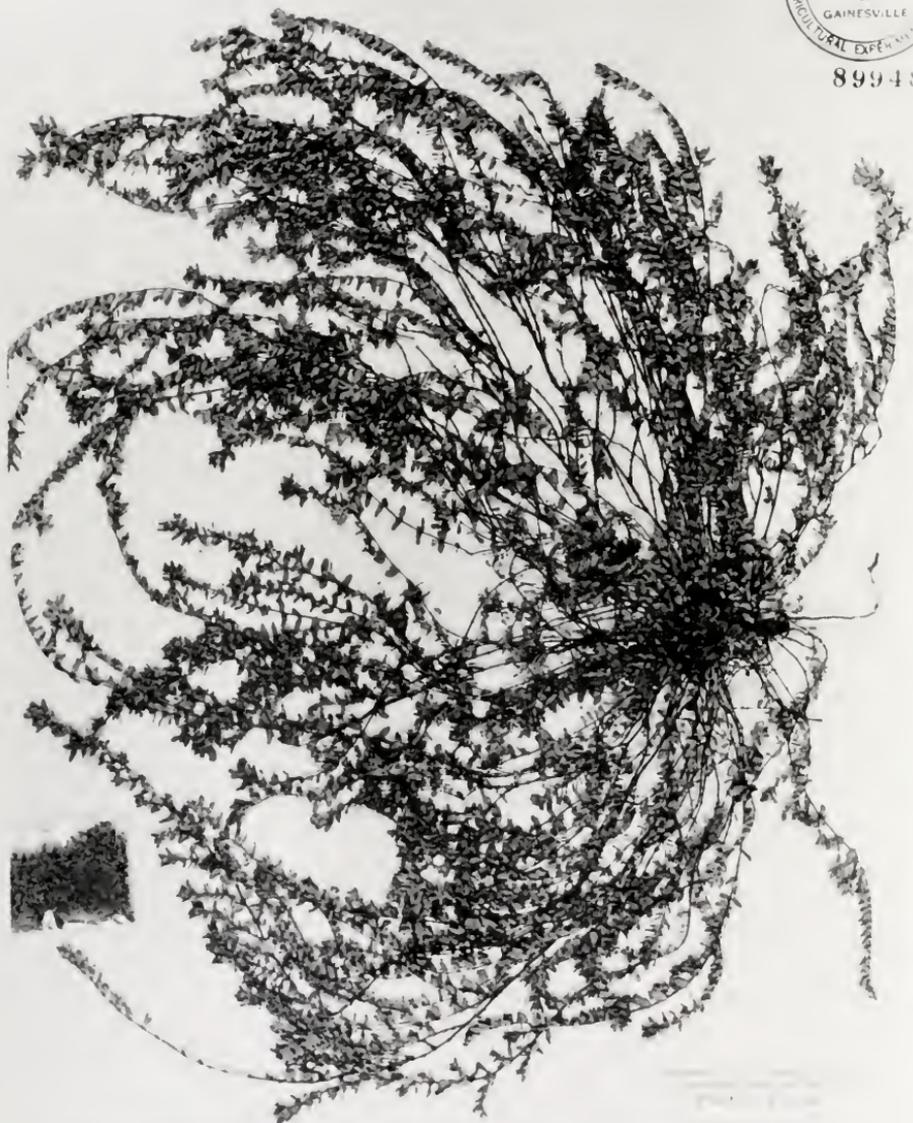
sparsely tomentose, glabrate, green or yellowish; petioles 0.5 - 1 mm. long; stipules distinct, sometimes partly joined on underside of stem near tip, linear and toothed or 2-3 parted, 0.7 - 1 mm. long. Cyathia solitary or in pairs or even few-flowered glomerules at nodes by reduction of branches, sometimes appearing clustered on congested laterals; peduncle short, involucre obconical, 0.4 - 0.6 mm. diameter, lobes triangular, shorter than or equalling the glands, strigose outside, glabrous inside, glands broadly elliptic or subcircular, 0.05 - 0.2 mm. long, pink or red, appendages small, rimming gland or to twice width, the pair nearest sinus sometimes extended in length toward sinus, pink, fifth gland absent, sinus extending almost depth of involucre. Staminate flowers rarely more than five per cyathium, androphores glabrous, 1 mm. long. Gynophore strigose, ca. 0.5 mm. long, not exerted but forcing cyathium apart as it bends to push capsule through sinus; calyx obsolete; ovary strigose; styles upright, 0.4 - 0.6 mm. long, minutely joined at base, bifid for 1/3 length. Capsule strigose, long-ovoid, 0.8 - 1 mm. long, 1 mm. wide below equator, three-lobed, angles acute. Seed conical-ovoid, to 0.9 mm. long, 0.5 mm. wide below equator, strongly four-angled, faces concave, obscurely transversely ridged, ridges extending somewhat into angles, tan-colored.

Present in three counties on the west coast of Florida. Not known from the Bahamas, and no specimens seen from Cuba, but a weed of waste places, often near salt water, through the remainder of the Antilles and in Central and South America (Map 34).

Representative specimens seen: FLORIDA. Charlotte: Charlotte Harbour, 27 Sept. 1964, Burch 417 (BM, FLAS, GH, NY, US). Lee: Fort Myers,

GAINESVILLE
AGRICULTURAL EXPERIMENT STATION

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Plate 39. CHAMAESYCE THYMIFOLIA (L.) Millsp.

C. thymifolia (L.) Millsp., Charlotte Harbor, Charlotte County, Florida,
27 Sept. 1964, Burch 417 (FLAS).

13 Aug. 1963, Burch 186a (FLAS); Fort Myers, 27 Sept. 1964, Burch 413 (BM, F, FLAS, FSU, GH, NY, US). Pinellas: Dunedin, 15 Oct. 1964, Burch 451 (FLAS). JAMAICA. St. Mary: Green Castle, 5 July 1963, Crosby, Hespeneheide & Anderson 476 (DUKE, PUR, UCWI); Sea Wall, 3 Sept. 1957, Robertson 3333 (UCWI). St. Andrew: Mona, 25 Mar. 1960, Adams 6598 (UCWI). DOMINICAN REPUBLIC. Peninsula de Samana, 28 Apr. 1930, Ekman H14792 (A, F); Higues, Seybo, 14 Apr. 1929, Ekman H12179 (PUR). PUERTO RICO. Catano, 1 Apr. 1930, Britton & Britton 9550 (NY); Mayaguez, 17 Oct. 1884, Sintenis 34b (GH, NY). LESSER ANTILLES. Guadeloupe, Desirade, 1893, Duss 2738 (NY); Dominica: Rosale Valley, 1903, Lloyd 739 (F); mouth of Pagoua River, 18 Apr. 1940, Hodge & Hodge 3061. Martinique: Ancien Riviera Blanche, 18 Feb. 1939, Stehle 3468 (A); Military Cemetery, St. Pierre, 1899, Duss 4056 (F, NY); Fort de France, Marigot, Aug. 1890, Duss 4455 (NY). St. Vincent: Byera, Charlotte Parish, 9 Mar. 1962, Cooley 8479 (GH). Grenada: vicinity of St. Georges, 30 Oct.-11 Dec. 1957, Proctor 16824 (A, IJ); The Bower, St. Georges, 26 Dec. 1904, Broadway s.n. (F).

It is not certain whether Linnaeus ever saw the plant to which his name E. thymifolia is usually applied, since the sheet labelled "20 E. thymifolia" in the Linnaean Herbarium is not that species but C. maculata. The descriptions to which he refers in synonymy are scarcely explicit enough to give a positive identification of the plant involved, but the application of the name is so uniform, at least in the New World, that it should be maintained unless it can be demonstrated that Linnaeus had some other intention.

The species is very close to the group of species with greatly



Map 33. Distribution of C. helwigii and C. paredonensis



Map 34. Distribution of C. thymifolia

enlarged glandular-appendages in two pairs of unequal size. It differs from them in having very small glands, and in its much smaller appendages, which are usually insignificant even when one pair can be seen to be larger than the other. The capsule in C. thymifolia is not exerted, but splits the cyathium as it enlarges. This is sometimes seen in other species, but not to the same degree as in C. thymifolia where the cyathium finishes life as a fringe at the lower end of one side of the mature capsule.

33. CHAMAESYCE ADENOPTERA (Bertol.) Small, Fl. SE. US., 714.

1903.

Perennial; prostrate or decumbent, forming tufted mats to 2 dm. diameter, or more open, to 3 dm. Stem ca. 1 mm. diameter, internodes to 2 cm. long or much shorter in Florida plants; sparsely branched, mostly from upper part of stem, not rooting at nodes, strigose or rarely pilose on upper surface, glabrous below, straw-colored or darker. Leaves membranous to coriaceous; blades oblong-elliptic or reniform, 4-10 x 2-6 mm., base oblique, rounded or cordate, margin serrate, sometimes recurved, apex obtuse, glabrous or strigose on lower or both surfaces, green, often suffused purple; petiole ca. 1 mm. long; stipules separate or joined at base, attenuate, to 1 mm. long. Cyathia solitary at nodes, often collected on short laterals; peduncle short, involucre campanulate, to 0.6 mm. diameter at mouth, lobes scarcely equalling glands, deltoid, strigose on outside, ciliate within, glands transversely elliptic, cupped, to 0.5 mm. long, the pair flanking the sinus longer than the other, appendages prominent, the pair by sinus larger, to 2 mm. long and three times width of gland, margin entire or crenulate, white, fifth gland short

or obsolete, sinus deep. Staminate flowers 8-18 per cyathium, androphore glabrous, to 1 mm. long at maturity. Gynophore strigose, to 1.2 mm. long at maturity, exerted, strongly nutant, capsule almost hidden by appendages; calyx obsolete; ovary strigose; styles upright, 0.6 mm. long, joined at base, bifid for 1/3 length. Capsule strigose, globose-ovoid, base truncate, to 1.2 mm. long, 1.4 mm. wide just above base, angles rounded. Seed ovoid, 1 mm. long, 0.4 - 0.6 mm. wide below equator, angular or with angles obscure, faces flat with transverse ridges or broadly convex with short transverse grooves, dark red or white.

Key to subspecies of C. adenoptera

1. Stems few, sparingly branched, usually ca. 1 mm. diameter, often strongly decumbent; leaves usually 5-10 mm. long; seed angular, faces flat with transverse ridges a. ssp. adenoptera.
1. Stems several to many, often branching freely in upper part, rarely exceeding 0.5 mm. diameter, usually prostrate; leaves rarely reaching 5 mm. long; seed plump, angles rounded, obscure, faces marked with short transverse grooves 2.
2. Stems several, internodes short forming a compact plant; appendages of glands prominent, larger pair usually more than 1 mm. long b. ssp. pergamena.
2. Stems many, internodes often long, giving plant an open appearance; appendages of glands prominent but larger pair usually less than 1 mm. long c. ssp. gundlachii.

33a. *C. ADENOPTERA* (Bertol.) Small ssp. *ADENOPTERA* Euphorbia adenoptera Bertol., Misc. Bot., 3: 20, t. 23. 1843.

Pinelands and dry rocky areas in the mountains of Hispaniola (Map 35).

Representative specimens seen: HAITI. Hinche, Artibonite, 23 Sept. 1955, Proctor 10931 (J); Bassin Bleu, 14-27 April 1929, Leonard & Leonard 15010 (GH, NY); Fond Parisien, Etang Saumatre, 5-13 May 1920, Leonard 4092 (NY); Marmelade, 25 Aug. 1903, Nash 799 (F, NY); Morne des Commissaires, 14 Sept. 1955, Proctor 10712 (IJ); Morne Rochelois, Miragoane, 17 Nov. 1926, Ekman H7242 (A, F); Port au Prince, 1-2 Apr. 1920, Leonard 3459 (NY); San Michel, 5 Aug. 1905, Nash & Taylor 1436 (F, NY). DOMINICAN REPUBLIC. Barahona: Trail between Pedernales and Aceitial, 8-12 Aug. 1946, Howard & Howard 8136 (GH, NY); 1912, Fuertes 693 (F, GH, NY). Constanza, February 1910, von Turckheim 2930 (F, GH, NY); Moncion, Monte Cristy, 9 June 1930, Valeur 92 (MO, NY); S. Jose, Santiago, 8 Apr. 1933, Valeur 970 (NY); Sabana de Santa Rosa, Santo Domingo, 11 Oct. 1947, Allard 15936 (MO, NY).

This is a stronger and much more diffuse plant than the other two subspecies. It is maintained at this level because some collections come close to ssp. pergamena in leaf shape and pubescence, but the seed differs so much that a good case could be made for separating it at the level of species.

33b. *C. ADENOPTERA* (Bertol.) Small ssp. *PERGAMENA* (Small) comb. nov. Euphorbia pergamena Small, Bull. Torr. Bot. Club 25: 615. 1898. Type: Miami, November 1878, A. P. Garber s.n.; Lemon City, 2 March 1892, J. H. Simpson 523 (Syntypes: NY !); duplicate collections Simpson 523:

F !, GH !, NY !, US !). Chamaesyce pergamena (Small) Small, Fl. SE. US., 713. 1903.

Euphorbia lindeniana A. Rich. in Sagra, Hist. Cub., 11: 197. 1850. Type: Cuba, 1843-44, Linden 1706 (Herb. Mus. Paris, not seen; Isotypes: F !, NY !). Anisophyllum lindenianum Kl. & Gke., Tricocc., 33. 1859.

Chamaesyce monensis Millsp., Field Mus. Bot. 2: 389. 1914. Type: Limestone Plateau, Ubero, Mona Island, 20-26 Feb. 1914, Britton, Cowell & Hess 1841 (Holotype: F !; Isotype: NY !).

Crevices in limestone rock or in sand, usually at low altitudes, Dade and Monroe counties of southern Florida, Cuba, Hispaniola and Mona Island (Map 36).

Representative specimens seen: FLORIDA. Dade: Campbell Drive, Homestead, 23 June 1960, Webster and Samuel 10094 (DUKE, PUR); Arch Creek Prairie, 3 July 1915, Small, Mosier & Small 6809 (DUKE, FLAS, NY); Lemon City, 30 July 1910, Harper 83 (MO, NY); Miami, 17 March 1930, Moldenke 5827 (NY); Between Coconut Grove and Cutler, 31 Oct.-4 Nov. 1903, Small & Carter 757 (NY); Long Pine Island between Camp Jackson and Long Key, Everglades, 9 Jan. 1909, Small & Carter 3189 (NY); Pinelands south of the Miami River, 20 Nov. 1912, Small 3851 (NY). Monroe: Big Pine Key, 4 Feb. 1952, Killip 41882 (F); Big Pine Key, 4 Sept. 1957, Brass 28985 (FLAS); Big Pine Key, 2 Dec. 1912, Small 3980 (NY). HAITI. Jean Rabel, 27 Jan.-9 Feb. 1929, Leonard & Leonard 12867 (NY).

This subspecies is very close to the next, and is separated mostly because the Florida plants form such a homogeneous group. They differ on the size of appendages and in having a more compact growth

habit than ssp. gundlachii.

C. monensis is known only from the type collection, and is included here until it can be shown that the lack of appendages on the glands is a constant character.

33c. *C. ADENOPTERA* (Bertol.) Small ssp. GUNDLACHII (Urban) comb. nov. Euphorbia gundlachii Urban, Symb. Ant., 5: 392. 1908. Type: Cuba, 1865, Wright s.n. (Herb. Mus. Bot., Berlin, if extant).

In sand or rocky places, often at the coast, Cuba (Map 37).

Representative specimens seen: CUBA, Havana: Cojimar, 24 Aug. 1910, Britton, Earle & Gager 6281 (F, NY); Guanabo, August 1916, Cazanias 340 (F, NY); Between Rio de Cojimar and Playa de Bacuranao, 26 Dec. 1910, Wilson 9532 (F, NY). Isle of Pines: Caleta cocodrilos, 8 March 1916, Britton, Wilson & Leon 15250 (F, NY); Pedernales Point, 16 Feb. 1899, Millspaugh 1436 (F). Pinar del Rio: Laguna Jovero and vicinity, 5-7 Dec. 1911, Shafer 10840 (F, NY); Las Martinas to the coast, 19 Dec. 1911, Shafer 11093 (F, NY). Oriente: Baracoa, 26 Jan. 1915, Ekman 4436 (NY). Santa Clara: Castillo de Jagua, Sept. 1911, Cuesta 248 (F, NY); Cienfuegos, Aug. 1913, Cuesta 746 (F, NY); Playa de Buenaventura, Bahía de Cochinos, 14 Aug. 1920, Leon & Loustalot 9547 (F, NY).

The application of this name seems to be well-understood, and has been followed here although no type material has been seen. The usual appearance of the plant is very diffuse with many fine wiry stems, and long internodes holding the small leaves well apart. Other specimens approach ssp. pergamena in general appearance, but have much smaller appendages to the glands than is typically found in that taxon.

These subspecies were combined as a single species, *C. adenoptera*,

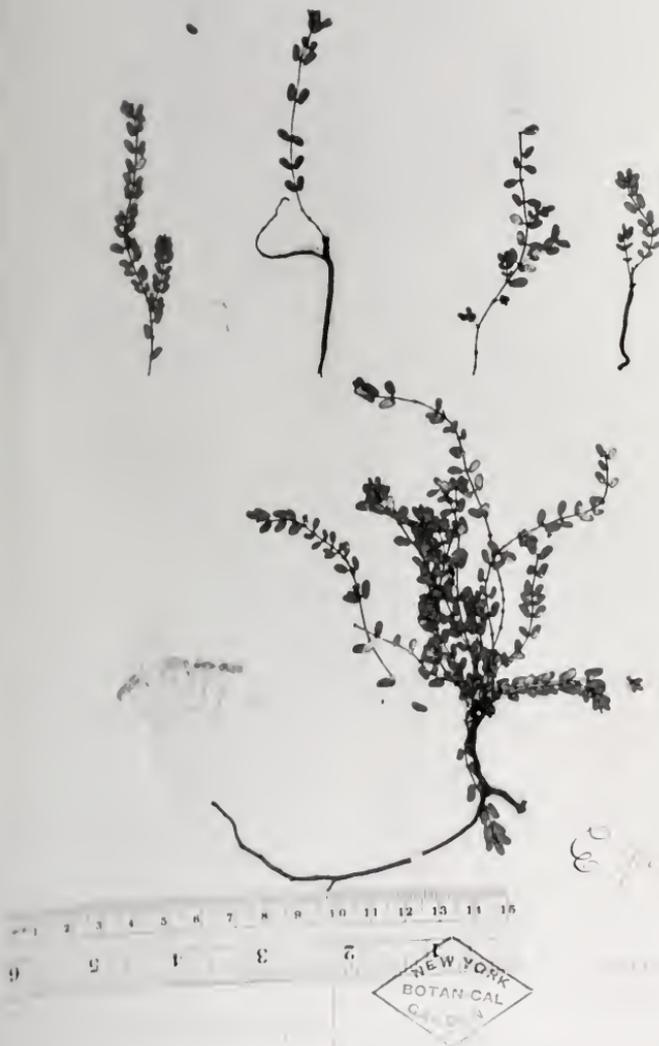
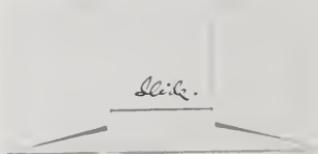


Plate 40. *C. ADONOPTERA* (Bertol.) Small var. *PERGAMENA* (Small) ined.

Syntype: *E. pergamena* Small, Miami, Florida, Nov. 1878, Garber s.n. (NY).



11-11-14
THE NEW YORK BOTANICAL GARDEN
HERBARIUM
11-11-14
C. monensis Millsp.

Plate 41. *C. ADENOPTERA* (Bertol.) Small var. *PERGAMENA* (Small) ined.

Isotype: *C. monensis* Millsp., Mona Island, Porto Rico, 20-26 Feb. 1914, Britton, Cowell & Hess 1841 (NY).



Plate 42. *C. ADENOPTERA* (Bertol.) Small var. *GUNDLACHII* (Urban) ined.

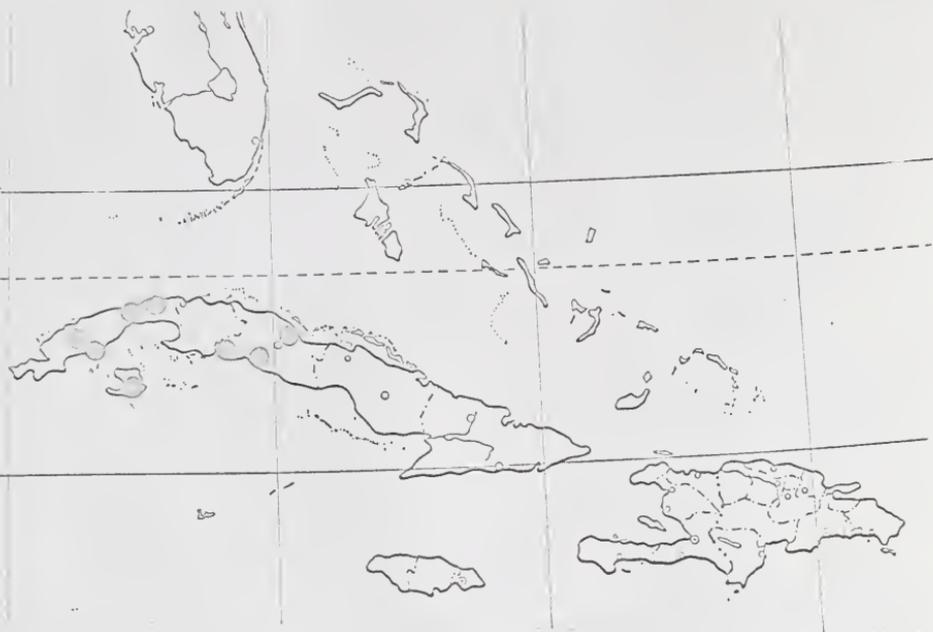
C. adenopectera (Bertol.) Small, between Rio Cojimar and Playa de Bacuranao, Prov. of Havana, Cuba, 26 Dec. 1910, Wilson 9532 (NY).



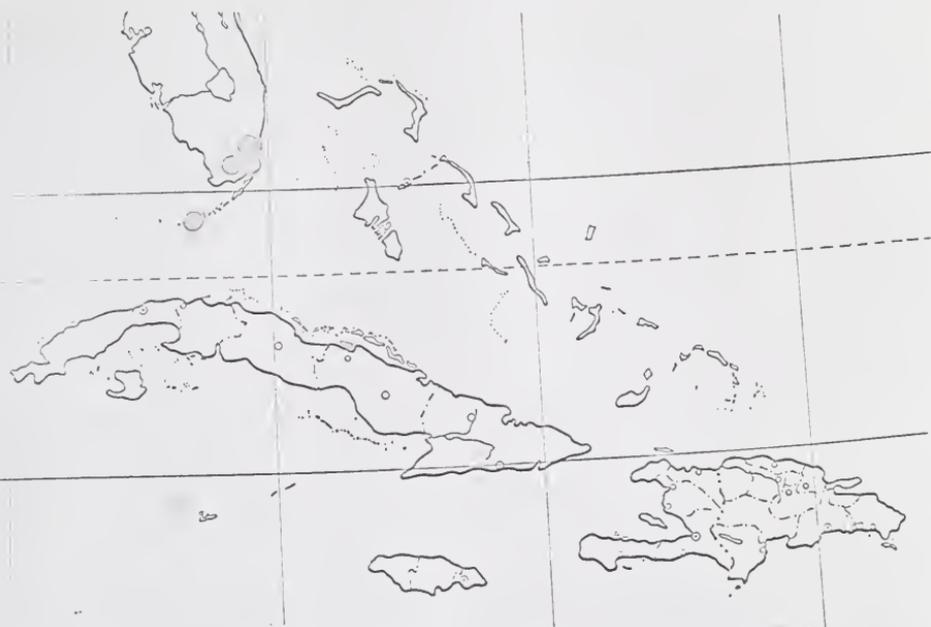
Map 35. Distribution of C. adenoptera ssp. adenoptera



Map 36. Distribution of C. adenoptera ssp. pergamena



Map 37. Distribution of *C. adenoptera* ssp. *gundlachii*



Map 38. Distribution of *C. conferta*

by Millspaugh, Field Mus. Bot. 2: 388. 1914. In this he followed Boissier in DC. Prod. 15(2): 49. 1862., but differed in accepting E. dioica Kunth as a distinct species, while Boissier rejected even the name on the grounds that the plants were monoecious. Millspaugh's treatment was, perhaps, too sweeping in the combination of taxa, although the three separated as subspecies here are certainly too close to be considered distinct at the specific level.

34. CHAMAESYCE CONFERTA Small, Fl. SE. US., 713. 1903. Type: Coconut Grove, Florida, 2 & 5 Nov. 1901, J. K. Small & G. V. Nash s.n. (Lectotype: lower RH plant on sheet, NY !; Isotypes: NY !, F !). Euphorbia conferta (Small) B. E. Smith, J. Elisha Mitchell Sci. Soc. 62: 82. 1946.

Annual or perennating; prostrate or decumbent, one to several stems from crown of root, to 2 dm. long. Stem to 1.5 mm. diameter, nodes to 1.5 cm. or congested; branched throughout length, upper laterals short and congested, villous on upper surface, naked below, red or rarely green. Leaves membranous, somewhat coriaceous; blades oblong-ob lanceolate, 5-10 x 3-5 mm., base markedly oblique, margin serrate, somewhat thickened, apex acute to obtuse, sparsely pilose, quickly glabrate, red or rarely green; petiole 0.5 - 1 mm. long; stipules distinct or minutely joined at base, subulate, to 1 mm. long, sometimes toothed or slightly parted. Cyathia solitary at nodes of congested laterals in upper part of stem; peduncles short, involucre narrowly campanulate, 0.7 mm. diameter at mouth, lobes scarcely equalling glands, deltoid, strigose on outside, pilose within, glands transversely elliptic, to 0.3 mm. long, curved to follow rim of cyathium, cupped, dark red, appendages unequal, the pair near the sinus twice as wide as gland and elongated in length toward sinus concealing

the cyathium, the other pair to twice as wide as gland but not elongated, margin crenate, pink or red, rarely white, fifth gland obsolete or small, sinus deep. Staminate flowers 5-8 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore pilose, to 0.8 mm. long, bent and short exerted through sinus but not distorting cyathium; calyx a triangular pad of tissue; ovary strigose; styles upright to 0.6 mm. long, joined at base, bifid for 1/3 length; capsule strigose, conical or truncate-ovoid, 1.2 mm. long, 1.2 mm. wide above base, three-sided, angles obtuse. Seed ovoid, 1 mm. long, 0.4 - 0.6 mm. wide between base and equator, angular, faces flat or convex with transverse ridges, sometimes very plump and faces grooved rather than ridged, red or white.

Pinelands and oolitic limestone of Everglades Keys and lower Florida Keys (Map 38).

Representative specimens seen: FLORIDA. Dade: Pinelands about Sykes Hammock, 4 Mar. 1915, Small, Mosier, & Small 5655 (DUKE, FLAS, GH, NY); Biscayne Bay, 19 June 1895, Curtiss 5486 (FLAS, GH, MO, NY); Jenkins to Everglades, 10 Nov. 1903, Eaton 206 (F); Pinelands near Long Prairie, 24 Mar. 1904, Britton 211 (F, NY); Florida City, 23 Nov. 1964, Godfrey 65653 (FLAS, FSU); Long Pine Key, 9 Mar. 1956, Craighead s.n. (FLAS); Junction of Old Cutler Road and Red Road, 11 Aug. 1963, Burch 156 (FLAS); Brickell Hammock, Feb. 1911, Small, Carter & Small 3277 (NY). Monroe: Big Pine Key, 25 Mar.-7 Apr. 1950, Killip & Swallen 40467 (BUS); Big Pine Key, 1 Sept. 1954, Thorne 15085 (IJ); Big Pine Key, 20 Nov. 1964, Burch & Ward 539 (FLAS).

This taxon may prove to be referable to Chamaesyce dioica (HBK.) Millsp., Field Mus. Bot. 2: 384. 1914. In making the combination



Plate 43. CHAMAESYCE CONFERTA Small

Lectotype: *C. conferta* Small, Cocoanut Grove, Florida, 2 & 5 Nov. 1901, Small & Nash s.n. (NY).

Millspaugh gives the range of the species as Brazil to Colombia and through Central America to Lower California, and also cites a single collection from Santo Domingo. No authentic material of the species has been seen, but the description suggests that it has a strong morphological resemblance to the plants here carried under Small's name C. conferta, and the possibility that the two are conspecific cannot be ignored.

Some collections of C. thymifolia come very close to this species, but can usually be distinguished by the marked splitting and distortion of the cyathium as their capsules enlarge, the smaller appendages to the glands, and the small glands which rarely show any of the cupping or enlargement to outline the rim of the cyathium that is found in C. conferta. The phylogenetic relationship of the two species is a matter for conjecture, and an examination of C. dioica and the other species of Central and South America discussed by Millspaugh (loc. cit.) might be illuminating in this respect.

35. CHAMAESYCE GARBERI (Engelm. ex Chapm.) Small, Fl. SE. US., 710. 1903. Euphorbia garberi Engelm. ex Chapm., Fl. Southern US. ed. 2, 646. 1883. Type: Coast of South Florida, undated, Garber (Lectotype: MO !; Isotype: MO !, F !).

Chamaesyce adicioides Small, Fl. SE. US., 710. 1903. Type: E. of Bahia Honda, Monroe County, Florida, 20 Jan. 1920, J. H. Simpson 464 (Holotype: NY !; Isotypes: F ! US !).

Chamaesyce brachypoda Small, Fl. SE. US., 709. 1903. Type: Miami, Dade County, Florida, 4-7 Apr. 1898, C. L. Pollard and G. N. Collins 244 (Holotype: NY !; Isotype: US !).

Chamaesyce mosieri Small, *Torreyia* 27: 93. 1927. Type: Pine-

lands about Brogdon Hammock, Dade County, Florida, 19 June 1915, J. K. Small and C. A. Mosier 6347 (Holotype: NY!).

Annual or perennating; prostrate to strongly decumbent, forming mats to 4 dm. diameter. Stems few to several from root stock, to 2 mm. diameter, internodes to 3 cm. long or congested on laterals; branching throughout length with few, subequal branches near base and small congested laterals near tip, not rooting at nodes but occasionally acting as runners to form new plants, strigose to long-pilose, sometimes woolly and canescent, tan or purple-brown. Leaves membranous; blades ovate to oblong-elliptic, 4-9 x 3-6 mm., base inequilateral, obtuse or rounded, margin entire or rarely obscurely toothed near apex, apex rounded or obtuse, sometimes minutely apiculate, midrib sometimes prominent on under surface, strigose or long-pilose, sometimes glabrate, yellow-green or suffused with red or purple; petiole 0.5 to 1 mm. long; stipules joined, deeply bifid, toothed, to 0.6 mm. long. Cyathia solitary, collected on congested laterals; peduncle short, involucre campanulate, to 1 mm. diameter at mouth, lobes exceeding glands, deltoid, somewhat attenuate, entire or few-toothed, strigose, sometimes glabrate on outside, ciliate within, glands broadly transversely elliptic, 0.3 x 0.2 mm., appendages minute to approximately equalling glands, margin entire or crenulate, fifth gland obsolete, sinus narrow, to half depth of cyathium. Staminate flowers 8-20 per cyathium, androphores glabrous, to 0.8 mm. long at maturity. Gynophores glabrous, to 1.5 mm. long at maturity, exserted, upright or nutant; calyx a triangular pad of tissue; ovary strigose; styles spreading, to 0.4 mm. long, joined at base, bifid for half length. Capsule

strigose or pilose, broadly ovate, to 1.6 mm. long, 2.1 mm. wide below equator, broadly three-lobed, angles acute to obtuse. Seed oblong-ovoid, to 1.2 mm. long, 0.6 to 0.8 mm. wide between base and equator, four-angled, angles subequal, ventral faces slightly concave, smooth, dorsal faces flat or convex, obscurely wrinkled, red-brown or ashen.

Restricted to pinelands and coastal sands of Dade and Monroe counties, Florida (Map 39).

Representative specimens seen: FLORIDA. Dade: Pineland south of Miami River, 26 Nov.-20 Dec. 1913, Small and Small 4752 (NY); Between Miami and Kendall Station, 5 Nov. 1906, Small & Carter 2508 (NY); Between Homestead and Camp Jackson, 1 Nov. 1906, Small & Carter 2517 (NY). Monroe: Middle Cape Sable, 18 Apr. 1964, Burch 306 (BM, DUKE, E, F, FLAS, GH, IJ, MO, NCU, NSC, NY, PUR, UCWI, US, USF); Middle Cape, Cape Sable, 2 Apr. 1960, Small 7687 (DUKE, FLAS, MO, NY); Upper Matecumbe Key, 26 Nov. 1912, Small 3900 (NY); No Name Key, 30 July 1895, Curtiss 5511 (F, GH, MO, NY); Long Key, 28 Feb. 1921, Hunnewell 7316 (GH); Grassy Key, 28-29 Jan. 1909, Small & Carter 3195 (F, NY); Vacca Keys, 28-29 Jan. 1909, Small & Carter 3145 (F, NY); Big Pine Key, 27 Feb. 1911, Small, Carter and Small 3568 (NY); Summerland Key, 28 Feb. 1911, Small, Carter and Small 3591 (NY); Key West, 28-30 Mar. 1906, Hitchcock s.n. (F); Boca Grande Key, Marquesas Group, 13 Mar. 1904, Lansing 2271 (F, NY).

Chapman gives little help in typifying this species since his Flora gives no collector and only "Sandy coast, South Florida" as the locality. There are a number of collections extant which come from such an area. Curtiss distributed (#2479) a plant labelled "E. garberi, Chapm. n.sp. Sandy Field at Cape Sable, Florida". The date of distribution of



Euphorbia Garberi.

Plate 44. CHAMAESYCE GARBERI (Engelm. ex Chapm.) Small

E. garberi Engelm. ex Chapm., Cape Sable, Florida, undated, Garber
2479* (MO).



Plate 45. CHAMAESYCE GARBERI (Engelm. ex Chapm.) Small

Holotype: *C. adicioides* Small, E. of Bahia Honda, Monroe County, Florida, 20 Jan. 1920, Simpson 464 (NY).

...: leaves numerous; blades
 ...: acute or acutish, entire, hir-
 ...: involucre approximate
 ...: glands
 ...: capsules
 ...: seeds ovoid, 1 mm. long, reddish, the angles obtuse,
 the base scarcely wrinkled.

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...: southern peninsular Florida.



Plate 46. CHAMAESYCE GARBERI (Engelm. ex Chapm.) Small

Holotype: *C. brachypoda* Small, Miami, Dade County, Florida, 4-7 Apr. 1898, Pollard & Collins 244 (NY).



Plate 47. CHAMAESYCE GARBERI (Engelm. ex Chapm.) Small

Holotype: *C. mosieri* Small, pinelands about Brogdon Hammock, Dade County, Florida, 19 June 1915, Small & Mosier 6347 (NY).

this number has not yet been established, but he is known to have collected Cape Sable before 1880 (Rodgers, 1944). There is a sheet from Herb. Engelmann, now in MO, which may well be from this same collection although labelled only "Florida, A. H. Curtiss". This sheet is named E. garberi Engelm. ap Chapm. and dated 1880.

There are sheets in F and MO (ex herb. Engelmann) collected on Cape Sable by Garber in October 1878 (misread by Millspaugh as 1888), and also an undated sheet by Garber from "Coast of South Florida" which was bought by MO as part of Chapman's herbarium. The name on this is E. garberi Engelm.. A comment on Garber's Cape Sable sheet "nowhere else seen" might indicate that these three were part of one collection.

The presence of these plants in their private herbaria seems to indicate that both Chapman and Engelmann were familiar with this species, and that Chapman was given the name in correspondence probably on the basis of the Garber material. In any case, since Garber died in 1881 his specimen was probably in Chapman's hands before this time and during the preparation of the supplementary list that constitutes the changes in second edition of the Flora. The description in the Flora was probably based at least in part on this specimen and it is possible that only the name should be credited to Engelmann. It is for this reason that authorship will be cited in the form used. The same argument governs the choice of type specimen. Chapman is assumed to have used the specimen in his herbarium in writing the description, making this the obvious choice as lectotype. The specimen of Garber's in the possession of Engelmann is an isotype on the assumption that it is part of the same collection. The specimens distributed by Curtiss may never have been available to Chapman, and cannot be allowed any status as types.

Chamaesyce garberi, as here delimited, shows a wide range of pubescence and branching characters. Examination of herbarium material and observations in the field do not support Small's separation of the group into three or four species, although his type specimens represent rather distinctive portions of the spectrum of variation. The name E. garberi was applied by Engelmann and Chapman to a plant from the coast of south Florida, and specimens that show the same characters have been collected at intervals from various dry areas behind the beach on Cape Sable at the southwestern extremity of the Everglades. The branching of these plants rarely goes beyond the production of laterals from the main branches, with the cyathia developed at the upper nodes of these, in contrast with specimens from other parts of south Florida where the laterals themselves often carry congested sideshoots on which most of the cyathia form.

Pubescence on the plants from Cape Sable is of long, somewhat velutinous hairs, while in the plants recognized as C. adicioides by Small the pubescence is short and more appressed. Small's C. brachypoda and C. mosieri have straight pubescence even longer, stiffer, and more erect than that of the Cape Sable plants. This type of pubescence is almost confined to collections from the pinelands immediately south of Miami, but is occasionally found in plants from the Lower Keys. The close-appressed pubescence occurs on plants from all parts of the Keys and from pinelands south of Miami, together with plants whose pubescence falls between the three types described. Small's C. brachypoda and C. mosieri sometimes have a tendency towards a wiriness of stem, particularly when sprouting back after a fire, but plants occur which show grades of



Map 39. Distribution of C. garberi



Map 40. Distribution of C. turpinii

heaviness of stem between this and the stouter, less brittle type which is more common on the Keys.

The plants do not root at the node, but instances were noted on Cape Sable of stems acting as runners with the buried tips rooting to produce new plants. This has not been observed in any other species treated in this study.

The type specimen of C. adicioides appears to be a single-stemmed, erect plant, but closer examination suggests that it may simply be a very old specimen of a decumbent plant, from which any other branches which were present have been lost.

36. CHAMAESYCE MULTINODIS (Urb.) Millsp., Field Mus. Bot. 2: 410. 1916. Euphorbia multinodis Urban, Symb. Ant., 1: 341. 1899. Type: prope Vieux-Fort, Guadeloupe, 1895, Duss 2740 (Herb. Mus. Bot., Berlin, if extant; Isotypes: GH !, NY !).

Perennial; prostrate, forming mats to 15 cm. diameter. Stem to 1 mm. diameter, internodes to 1 cm. long; branched throughout length or mostly from upper part, not rooting at nodes, glabrous on lower surface, tomentose or short-pilose above, green or brown. Leaves membranous or of somewhat heavier texture; blades broadly ovate to orbicular 3-5 x 3-5 mm., base oblique, subcordate, margin obscurely serrate in upper half, apex blunt or emarginate, scattered long white hairs on both surfaces, green; petiole 0.5 - 1 mm. long; stipules joined, short 3 to 5-cleft, often longer on lower surface of stem and merely toothed, ciliate on surface toward stem. Cyathia solitary at upper nodes; peduncle to 0.5 mm. long, involucre campanulate, to 1 mm. diameter at mouth, lobes barely exceeding glands, deltoid, strigose on outside, ciliate within, glands transversely

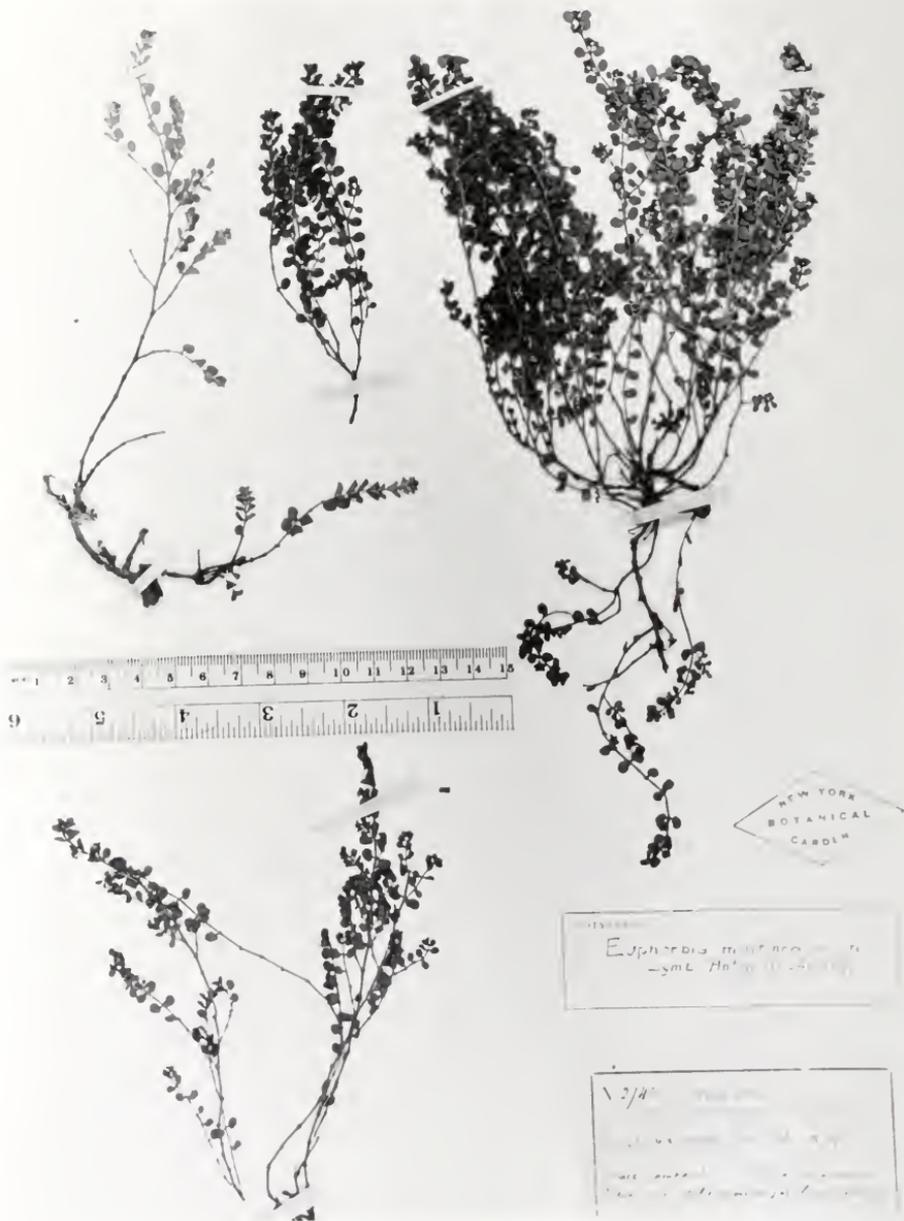


Plate 48. CHAMAESYCE MULTINODIS (Urb.) Millsp.

Isotype: *E. multinodis* Urb., prope Vieux-Fort, Guadeloupe, 1895, Duss 2740 (NY).

elliptic, 0.3 mm. long, dark and fleshy, appendages a crenulate rim or as wide as gland, light-colored, fifth gland linear, short, sinus shallow. Staminate flowers 5-16 per cyathium, androphore glabrous, 0.7 mm. long at maturity. Gynophore pilose, to 1 mm. long at maturity, exserted, nutant; calyx a triangular pad of tissue, to 0.6 mm. broad; ovary pilose; styles upright or spreading, 0.3 mm. long, joined at base, bifid for half length. Capsule sparsely pilose, ovoid, 1.6 mm. long, 1.8 - 2 mm. wide just below equator, broadly three-lobed, angles rounded. Seed oblong-ovoid, 1.1 mm. long, 0.6 mm. wide below equator, strongly four-angled, angles subequal, dorsal more acute than ventral, faces almost flat or slightly sunken, obscurely wrinkled, chestnut brown.

Known only from type locality on Guadeloupe, by type specimens, and by a collection from IJ (Vieux Fort, Basse-Terre, Guadeloupe, 30 Nov. 1959, Proctor 20204).

The species is distinct from others encountered in the Caribbean, and has no obvious close affinities with them; but bears a general resemblance to C. brittonii, C. cowellii and C. centunculoides. It will be carried under Urban's name unless it can be shown later that it is an introduction from some other area.

37. CHAMAESYCE MINUTULA (Boiss.) comb. nov. Euphorbia minutula Boissier in DC. Prod. 15(2): 1263. 1862. Type: Cuba, 1864-65, Wright 2013 (Herb. Conserv. et Jard. Bot., Geneva, not seen; Isotype: GH !). The specimen examined has, in addition to Wright's standard label, a handwritten annotation "Euphorbia liliputiana. On rocks in river San Sebastian, Lagunillas, Jurisdiccion Pinar del Rio, Dec. 14" (punctuation added).

Known only from collections by Wright (type and #3707) from the same locality in Pinar del Rio, Cuba.

The glabrous, entire leaves separate these plants from depauperate specimens of C. thymifolia or C. adnoptera ssp. qundlachii, and the stems pubescent on the upper surface, and the pubescent capsules distinguish between this and the glabrous C. centunculoides. The species is accepted here, with some hesitation, on the basis of Wright's material.

The name E. liliputiana Wr. has not been validly published. It appears on the herbarium sheets, and is mentioned in a note by Urban (Symb. Ant., 1: 342. 1899), as a presumed synonym for E. minutula Boiss., but has no standing beyond this.

Perennial, ascending to 5 cm. Stems tufted, wiry, 0.3 mm. diameter, internodes to 5 mm. long; almost unbranched, tomentose on upper surface, glabrous below, brown. Leaves membranous; blades ovate, 2-3 x 1-2 mm., base oblique, rounded, margin entire or obscurely toothed, apex rounded, midrib sometimes prominent on lower surface, glabrous, green; petiole 0.3 mm. long; stipules joined, deltoid, toothed, 0.3 mm. long on upper nodes; peduncle 0.2 mm. long, involucre obconical, 0.6 mm. diameter at mouth, lobes equalling glands, deltoid, strigose on outside, ciliate within, glands transversely elliptic, 0.2 mm. long, appendages to twice as wide as gland and longer, pairs perhaps of unequal size, fifth gland linear, short, sinus deep. Staminate flowers ca. 5 per cyathium, androphores glabrous, to 0.5 mm. long at maturity. Gynophore glabrous, to 0.5 mm. long at maturity, scarcely exerted, bent through sinus; calyx obsolete, ovary strigose; styles spreading, 0.2 mm. long, joined at base, bifid at apex. Capsule not seen, described by Boissier as "adresse hirtula". Seed not seen, "obsolete ruguloso".

38. CHAMAESYCE TURPINII (Boiss.) Millsp., Field Mus. Bot., 2:

412. 1916. Euphorbia turpinii Boissier, Cent. Euph. 12. 1860. Type: in Ins. Santo Domingo, Turpin (Herb. Lenormand, not seen).

E. garkeana Boiss. in DC. Prod. 15(2): 38. 1862. Type: in Santo Domingo, Schomb. 167 (Herb. Bot. Mus., Berlin, if extant). Chamaesyce garkeana (Boiss.) Millsp., Field Mus. Bot., 2: 409. 1916.

E. portoricensis Urban, Symb. Ant., 1: 338. 1899. E. portoricensis Urb. var. genuina Urb., loc. cit. 339. Type: in Portorico prope Ponce, prope Guanica, prope Salinas de Cabo-Rojo, et ad Los Morillos, Sintenis 635, 637, 3459, 3492b, 4807 (Syntypes: Herb. Mus. Bot., Berlin, if extant; duplicate coll., Sintenis 637, F !, NY !; Sintenis 3492b, F !).

E. portoricensis Urb. var. albescens Urb., loc. cit. 399. Type: in Portorico prope Guanica, Sintenis 3439 (Herb. Mus. Bot., Berlin, if extant; Isotype: F !, GH !). C. portoricensis (Urb.) Millsp., Field Mus. Bot. 2: 394. 1914. C. albescens (Urb.) Millsp., Field Mus. Bot. 2: 408. 1916.

Chamaesyce anegadensis Millsp., Field Mus. Bot. 2: 394. 1914.

Type: near settlement, Anegada, Dutch West Indies, 19-20 Feb. 1913, N. L. Britton & W. C. Fishlock 998 (Holotype: F !; Isotypes: GH !, MO !, NY !).

Dry sites, often among rocks, at low altitudes, Cuba, Haiti, Puerto Rico and Anagada (Map 40).

Representative specimens seen: CUBA. Guantanamo, Oriente province, 24 Sept. 1914, Ekman 2901 (NY). HAITI. Les Gonaives, 24 Dec. 1927, Ekman H9455 (A); Passe David, May 1900, Buch 392 (IJ); Ennery, Artibonite, 13 Jan. 1926, Leonard 8806 (NY). PUERTO RICO. Salinas de Cabo Rojo, 27 Feb. 1915, Britton, Cowell and Brown 4703 (F, GH, MO, NY); Los Morillos, Cabo Rojo, 14 Feb. 1885, Sintenis 636 (A, F, GH, K, MO, NY); Guanica,

5-18 Mar. 1915, Britton, Cowell and Brown 4914 (F, NY); Guanica, 19 Sept. 1913, Stevens and Hess 3034 (F, NY); Guanica State Forest, 23 June 1962, Alain 9138 (IJ); Mona Island, 20-26 Feb. 1914, Britton, Cowell and Hess 1844 (F, NY); Punta Aguila, 27 Feb. 1915, Britton, Cowell and Brown 4692 (F, NY).

Perennial; erect or sprawling to 1 dm. Stems several to many from heavy rootstock, to 1 mm. diameter, internodes to 1 cm. long; branching from base and heavily in upper part of stem, sparsely or densely short-pilose on all surfaces, sometimes canescent at tips, brown. Leaves somewhat chartaceous or thickened; blades long-ovate or lanceolate, 2-6 x 1-3 mm., base inequilateral, cordate to obtuse, margin entire, somewhat recurved, apex obtuse, midrib sometimes prominent on lower surface, both surfaces pilose or tomentose, sometimes sparsely so, sometimes almost woolly-pubescent, green, often suffused red or gray; petiole 0.5 - 1 mm. long; stipules separate or joined at base, to 0.3 mm. long, toothed. Cyathia solitary at upper nodes; peduncle to 0.5 mm. long, involucre obconical, to 0.6 mm. diameter at mouth, lobes scarcely exceeding glands, deltoid, toothed, glabrous or sparsely pilose on outside, ciliate within, glands transversely elliptic, 0.1 mm. long, appendages obsolete to as wide as gland, fifth gland linear or obsolete, sinus shallow. Staminate flowers 5-12 per cyathium, androphores glabrous, to 0.8 mm. at maturity. Gynophore glabrous, to 1 mm. at maturity, exerted, nutant; calyx a triangular pad of tissue; ovary strigose; styles spreading, 0.3 mm. long, minutely joined at base, bifid for 1/2 - 2/3 length. Capsule broadly ovoid, base truncate, 1.2 mm. long, 1.8 mm. wide just above base, broadly three-lobed, angles obtuse. Seed ovoid, 0.8 - 1 mm.



P. SIMONS: PLANTAE PORTORICENSIS.

Chamaesyce turpinii Boiss. et Heldr.
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 ————
 ————

Plate 49. CHAMAESYCE TURPINII (Boiss.) Millsp.

Duplicate Coll. of Syntype: *E. portoricensis* Urban, Salinas de Cabo-Rojo, Porto Rico, 17 Feb. 1885, Sitenis 637 (NY).

long, 0.5 mm. wide below equator, strongly four-angled, dorsal angles more prominent than others, faces flat or convex, sometimes slightly sunken, obscurely ridged, brown.

The variation in degree of pubescence of this species was recognized by Urban in setting up the two varieties which he published. The range of material examined in the present study showed no point at which to make such a separation consistently, but confirmed that a wide range of pubescence states exists. No authentic material of C. turpinii was seen, but specimens given this name by Urban appear to fall within the variation of his E. portoricensis. There is an overall similarity between the plants given these names, and it seemed more reasonable to combine them as one species than to formulate diagnostic characters which would separate only the extremes of the range.

39. CHAMAESYCE PAREDONENSIS Millsp., Field Mus. Bot. 2: 393. 1914.

Type: Cayo Paredon Grande, Cuba, 25 Oct. 1909, J. A. Shafer 2763 (Holotype: NY !, Isotype: F !).

Perennial; prostrate forming dense mat to 2 dm. Stems wiry, many from crown of root, to 1 mm. diameter, internodes to 1 cm. long; branching throughout length, not rooting at nodes, tomentose, brown. Leaves membranous or slightly coriaceous; blades elliptic to obovate, 2-4 x 1.5 - 2.5 mm., base strongly inequilateral, rounded to cuneate, margin coarsely serrate, somewhat revolute, apex blunt, tomentose, green or reddish; petiole to 0.5 mm.; stipules joined at least at base, broadly triangular, margin toothed or lacerate, inner surface densely ciliate. Cyathia solitary at uppermost nodes; peduncle to 0.3 mm. long, involucre obconical, to 0.8 mm. diameter at mouth, lobes triangular, equalling glands, sparsely

pilose outside, densely ciliate within, glands transversely elliptic, 0.45 x 0.1 mm., dark brown, cupped, appendages longer than glands and to twice as wide, white, margin entire or somewhat crenate, fifth gland tiny or obsolete, sinus shallow. Staminate flowers rarely more than 8 per cyathium, sometimes absent, androphores glabrous, to 0.5 mm. long at maturity. Gynophores glabrous, to 1.5 mm. long at maturity, exerted, upright; calyx a triangular pad of tissue; ovary densely pilose; styles spreading, to 0.3 mm. long, joined at base, bifid for more than half length, somewhat clavate. Capsule sparsely pubescent, glabrate, ovoid, 1.3 mm. long, 1.6 mm. wide just above base, three-lobed, angles acute. Seed not seen, described by Millspaugh as "seed pink, farinose, ovoid-triangular, 1.2 x 0.8 mm., acute, the dorsal angle very sharp, the facets smooth, the two ventral about equal to one dorsal".

Chamaesyce helwigi from Haiti, and this species are very similar, and, to judge by Millspaugh's description, share a very distinctive type of seed. The type specimens differ in several respects - stems of C. helwigi fractionally stouter than those of C. paredonensis, leaves of the former apiculate-toothed near the apex and sparsely long-pilose while the latter has leaves with serrate edges which are sparsely tomentose, ciliate stipules are not as evident in C. helwigi as in C. paredonensis, and the appendages of the glands are less prominent. Only the type collections have been seen, and a wider range of material might indicate that these two taxa would be better considered one species, but, until further evidence is available, they will be maintained under the separate names used here (Map 33).



Plate 50. CHAMAESYCE PAREDONENSIS Millsp.

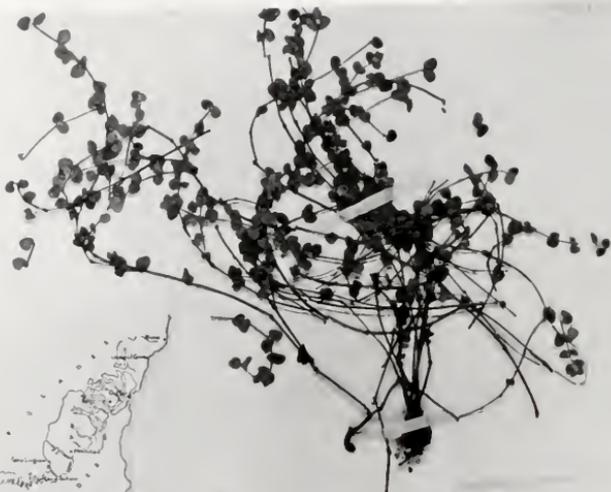
Holotype: *C. paredonensis* Millsp., Cayo Paredon Grande, Camaguey, Cuba, 25 Oct. 1909, Shafer 2763 (NY).

40. CHAMAESYCE PINETORUM Small, Bull. N.Y. Bot. Gard., 3:

429. 1905. Type: Homestead trail between Cutler and Camp Longview, Dade County, Florida, 9-12 Nov. 1903, J. K. Small & J. J. Carter 836 (Holotype: NY !).

Perennial from root stock to 5 mm. diameter; erect or decumbent to 10 cm. Stems wiry, to 0.5 mm. diameter, internodes to 2 cm. long; branching sparse throughout, villous-hirsute, tips canescent, dark brown. Leaves membranous or slightly thickened; blades reniform to ovate 2-5 x 2-4 mm., base inequilateral, cordate to rounded, margin entire, somewhat revolute, apex obtuse or rounded, villous-hirsute, gray-green above, suffused red-brown below; petioles 1 mm. long; stipules distinct, to 0.3 mm., deltoid, sometimes deep-cleft, ciliate, light-colored. Cyathia solitary at upper nodes; peduncle to 1.5 mm., involucre campanulate to 1.3 mm. diameter at mouth, lobes triangular equalling glands, sparsely pilose on outside, densely hairy within, glands sub-circular, 0.4 by 0.3 mm., appendages a rim to slightly wider than glands, fifth gland triangular, short, sinus broad and shallow. Staminate flowers 8-14 per cyathium, androphores glabrous, to 0.5 mm. long at maturity. Gynophore sparsely pilose, to 1.5 mm. at maturity, exerted, upright; calyx a triangular pad of tissue; ovary strigose; styles spreading, to 0.4 mm. long, bifid for 1/2 length, minutely joined at base, obscurely clavate at tips. Capsule tomentose, reniform, to 1.5 mm. long, 2 mm. wide just above base, sharply three-lobed, angles acute. Seed ovoid, 0.8 mm. long, 0.5 - 0.6 mm. wide above base, strongly angled, ventral angle usually obscure, faces convex, obscurely wrinkled, red-brown.

Found only in the pinelands on oolitic limestone of Dade County, Florida (Map 41).



MAP
of the
EVERGLADE KEYS



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 *Chamaesyce pinetorum* Small

Plate 51. CHAMAESYCE PINETORUM Small

Holotype: *C. pinetorum* Small, between Cutler and Longview Camp, Florida, 9-12 Nov. 1903, Small & Carter 836 (NY).



Map 41. Distribution of *C. pinetorum*



Map 42. Distribution of *C. deltoidea* ssp. *serpyllum*

Representative specimens seen: FLORIDA. Dade; Coral Gables, 25 June 1960, Webster & Williams 10154 (DUKE, IJ); Everglades National Park on FLA 27, 11 Aug. 1963, Burch 176 (FLAS); Florida City, 29 Nov. 1963, Burch 223 (FLAS); Hammer Key, Everglades, 12 May 1918, Small 8605 (NY, US); Homestead, 18 May 1954, Killip 44241 (US); Long Key, Everglades, 18-26 Jan. 1909, Small & Carter 2930 (NY); near Long Prairie, 24 Mar. 1904, Britton 193 (NY); near Murden Hammock, 22 June 1915, Small, Mosier & Small 6451 (FLAS, NY); pinelands about Sykes Hammock, 2 July 1915, Small, Mosier & Small 6761 (FLAS, NY).

The strongly decumbent or ascending habit of this species together with its overall villous-pubescence, distinguish it from the prostrate and glabrous or tomentose C. deltoidea. In most other respects the species are very close, but maintain their integrity although sympatric over the whole range of C. pinetorum.

Some collections of C. mosieri (here placed under C. garberi), perhaps even the type sheet, should be referred to this C. pinetorum.

41. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small, Fl. SE. US., 710. 1903.

Perennial with swollen rootstock to 1.5 cm. diameter, 4 cm. long; prostrate forming dense mats to 3 dm. diameter. Stems many from crown of root, wiry, 0.3 - 0.6 mm. thick, internodes to 1 cm. long; sparingly or much branched throughout length, not rooting at nodes, glabrous to sparsely or densely tomentose, light or dark brown. Leaves membranous, somewhat thickened; blades reniform, orbicular or ovate, 2-4 x 1-4 mm., base inequilateral, cordate or subcordate, margins entire or rarely isolated leaves deeply and coarsely serrate, somewhat revolute or plane,

apex rounded to obtuse, glabrous to sparsely or densely tomentose, young leaves and stem tip sometimes canescent, yellowish-green or gray; petiole 0.5 - 1 mm. long; stipules joined 0.2 - 0.3 mm. long, subentire or several times parted almost to base, the linear segments sometimes dark-colored. Cyathia solitary at tips of branches; peduncles 1 - 1.5 mm. long, involucre broadly campanulate, 1.5 mm. diameter, lobes triangular, equalling or slightly exceeding glands, pilose on outside, sometimes sparsely so or glabrous, densely hairy within, glands fleshy, yellow-green or occasionally drying black, transversely elliptic, 0.4 mm. long, 0.3 mm. wide, appendages obsolete or a rim to gland, fifth gland linear, shorter than lobes, sinus up to 1/3 depth of cyathium. Staminate flowers 8-14 per cyathium, androphores glabrous, to 1 mm. long at maturity. Gynophore glabrous, 1 mm. long at maturity, exserted, nutant; calyx a subcircular pad of tissue; ovary sparsely to densely strigose; styles upright or spreading, 0.4 mm. long, joined at base, bifid for 1/3 length, somewhat flattened at tip; capsule pilose, glabrate, broadly deltoid or reniform, 1.2 mm. long, 1.5 mm. wide just above base, sharply and narrowly three-angled. Seed oblong-ovoid, 0.8 - 1 mm. long, 0.4 - 0.6 mm. wide below base, three angles prominent, obtuse, ventral angle rounded, faces convex, plump, obscurely wrinkled, brown or deep red-brown.

Key to subspecies of C. deltoidea

1. Plants forming mats, but becoming diffuse with age; leaves much longer than wide a. ssp. serpyllum.
1. Plants maintaining tight mat form with age; leaves about as long as wide b. ssp. deltoidea.

41a. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small ssp. SERPYLLUM (Small) comb. nov. Chamaesyce serpyllum Small, Fl. Florida Keys, 81. 1913. Type: Big Pine Key, Monroe County, Florida, 17 Nov. 1912, J. K. Small 3811 (Holotype: NY!).

Found only in pinelands on oolitic limestone on Big Pine Key, Monroe County Florida (Map 42).

Representative specimens seen: FLORIDA. Monroe: Pinelands, Big Pine Key, 17 Dec. 1913, Small & Small 5027 (DUKE, FLAS, NY); Pinewoods, Big Pine Key, 30 Jan.-4 Feb. 1940, Martin 1368 (DUKE, NY); near Watson Hammock, Big Pine Key, 1 Sept. 1954, Thorne 15011 (IJ); Big Pine Key, 10 Dec. 1921, Small, Small & Matthews 10196 (NY); Big Pine Key, 4 Sept. 1957, Brass 28978 (FLAS); bridge over Pine Channel, Big Pine Key, 10 Aug. 1963, Burch 139 (FLAS).

The diffuse habit distinguishes this from the other subspecies, which also has much broader leaves on young parts of the stems. The seed of this subspecies is usually somewhat plumper, and sometimes longer, than that of ssp. deltoidea.

41b. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small ssp. DELTOIDEA

Key to varieties of ssp. deltoidea

1. Stems and leaves glabrous or with a few tiny hairs on underside of leaves I. var. deltoidea.
1. All parts of plant tomentose, often densely so, and young shoots canescent II. var. adhaerens.

41b. I. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small ssp. DELTOIDEA var. DELTOIDEA Euphorbia deltoidea Engelm. ex Chapm., Fl. Southern U.S. ed. 2: 647. 1883. Type: Biscayne Bay, Florida, June, Curtiss 2474

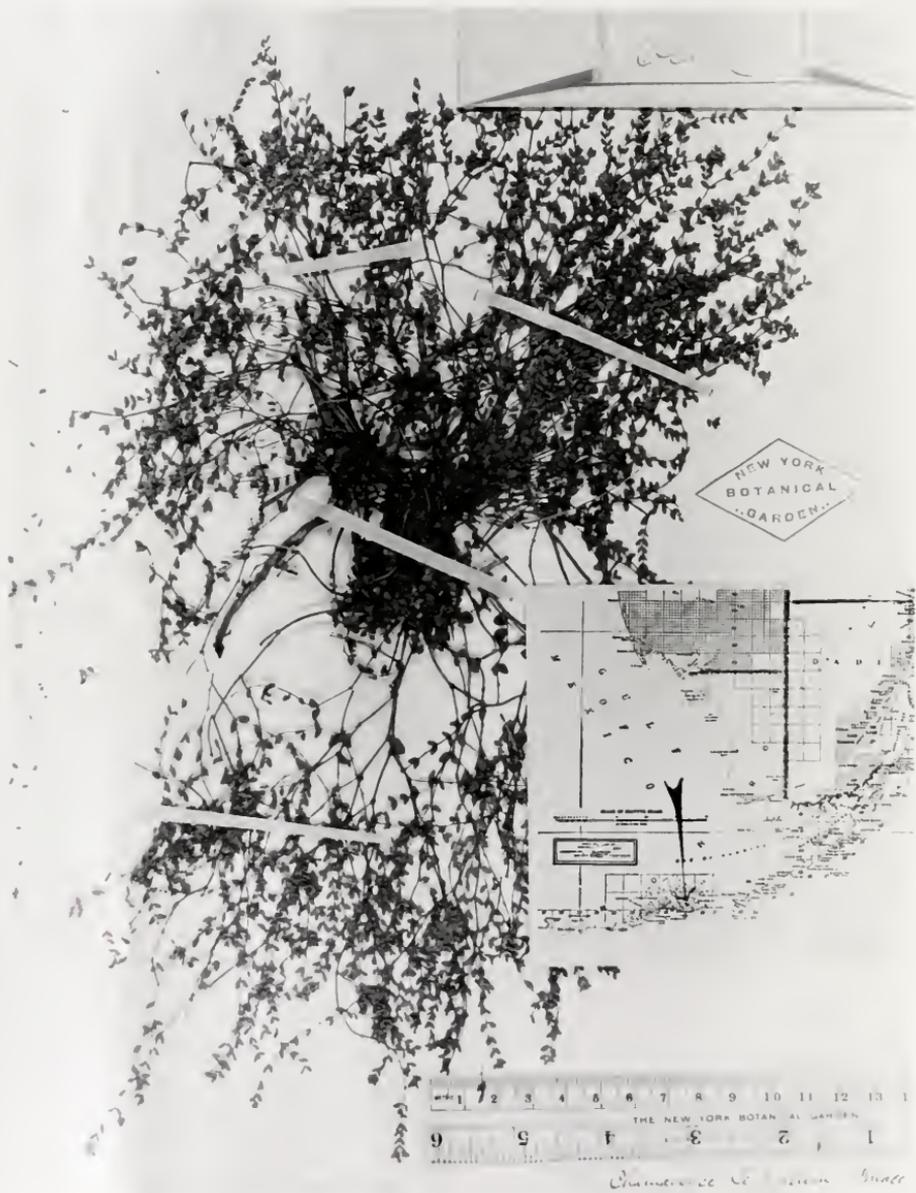


Plate 52. *CHAMAESYCE DELTOIDEA* (Engelm. ex Chapm.) Small
ssp. *SERPYLLUM* (Small) ined.

Holotype: *C. serpyllum* Small, Big Pine Key, Monroe County, Florida,
17 Nov. 1912, Small 3811 (NY).

(Lectotype: MO !; Isotypes: F !, NY !). C. deltoidea (Engelm. ex Chapm.)
Small, Fl. SE. US., 710. 1903.

Locally frequent on oolitic limestone of pinelands and Everglades
Keys of Dade County, Florida (Map 43).

Representative specimens seen: FLORIDA. Dade: Pinelands south
of the Miami River, 20 Nov. 1912, Small 3850 (NY); rocky pine woods near
Miami, 11 July 1895, Curtiss 5468 (F, FLAS, GH, MO, NY); Miami, 13 May
1904, Tracy 9114 (F, MO, NY); Buena Vista, 26 Dec. 1929, Moldenke 291
(MO, NY); Miami, 28 Oct.-28 Nov. 1903, Small & Carter 520 (F, NY);
Perrine, 23 Mar. 1904, Britton 145 (F, NY); between Cocoonut Grove and
Cutler, 31 Oct.-4 Nov. 1903, Small & Carter 755 (F, NY); N.E. of Perrine,
7 June 1964, Burch 376 (FLAS).

Often found growing with the next variety and resembling it
closely in all features except its pubescence and rather more compact
growth habit.

41b. 11. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small ssp.
DELTOIDEA var. ADHAERENS (Small) comb. nov. Chamaesyce adhaerens Small,
Torreya 27: 104. 1927. Type: Pinelands between Peter's Prairie and
Homestead, Florida, 10 Nov. 1906, J. K. Small & J. J. Carter 2531 (Holo-
type: NY !).

Locally frequent on oolitic limestone of pinelands and Everglades
Keys of Dade County, Florida (Map 44).

Representative specimens seen: FLORIDA. Dade: 2 miles south of
Florida City, 30 Aug. 1954, Thorne 14868 (1J); north of Goulds, 10 Aug.
1963, Burch 144a (FLAS); Homestead, 22 Nov. 1964, Godfrey 65587 (FLAS,
FSU); Naranja, 23 June 1960, Webster & Williams 10107 (PUR); between

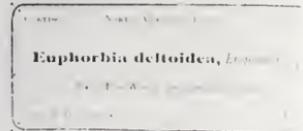


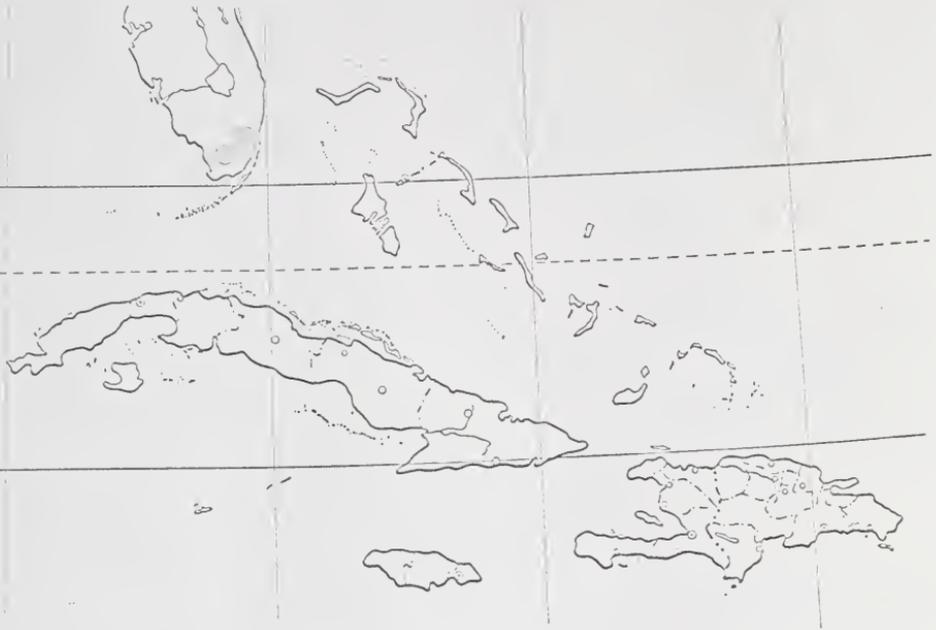
Plate 53. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small
ssp. DELTOIDEA var. DELTOIDEA

Isotype: E. deltoidea Engelm. ex Chapm., Bay Biscayne, Florida,
undated, Curtiss 2474* (NY).

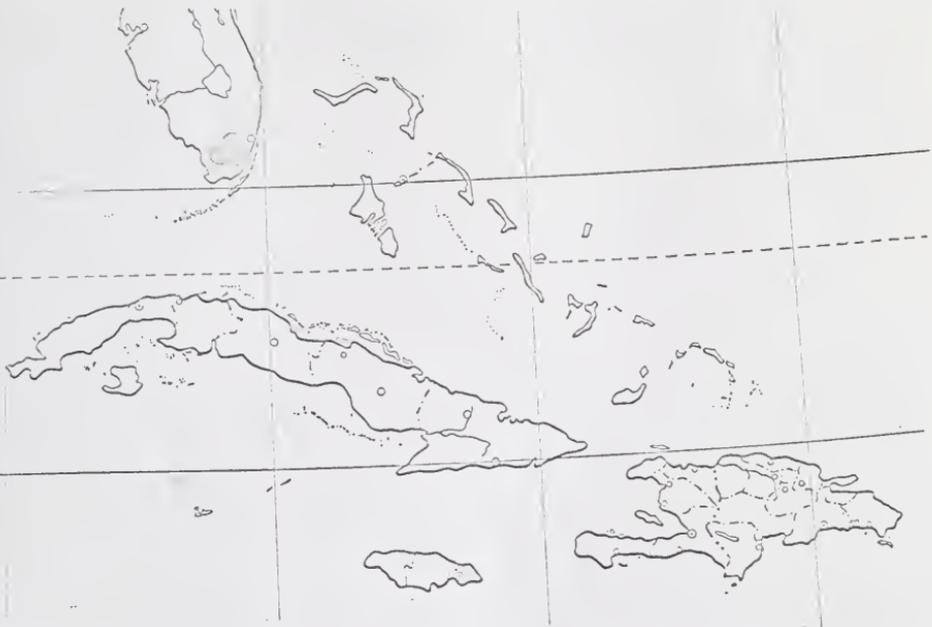


Plate 54. CHAMAESYCE DELTOIDEA (Engelm. ex Chapm.) Small
 ssp. DELTOIDEA var. ADHAERENS (Small) ined.

Holotype: C. adhaerens Small, Pinelands between Peter's Prairie and
 Homestead, Florida, 10 Nov. 1906, Small & Carter 2531 (NY).



Map 43. Distribution of C. deltoidea ssp. deltoidea var. deltoidea



Map 44. Distribution of C. deltoidea ssp. deltoidea var. adhaerens

Peter's Prairie and Homestead, 10 Nov. 1906, Small & Carter 2530 (NY); near Shields Hammock, 10 July 1915, Small, Mosier & Small 6948 (DUKE, NY). Between Homestead and Naranja, 29 Nov. 1963, Burch 226 (FLAS).

The type specimens of these two varieties represent the two extremes of pubescence, and could stand convincingly as the types of two distinct species. Examination of a long series of collections, however, has shown a range of intermediates, and it is more consistent with observations of pubescence difference within other species of the genus to consider the presence or absence of hairs as no more than a varietal characteristic.

Chapman refers only to Curtiss as the collector of this species, but his collection (#2474) has been generally accepted as the type. The sheet in Missouri Botanical Garden is designated lectotype because it is from Engelmann's herbarium, and because no other sheet seen is in better condition or seems to have any stronger claim to be selected.

Merrill (1948) discusses the pagination and dates of publication of Chapman's Flora. Author citation is made in this form since there is no reason to suppose that Engelmann supplied more than the name to Chapman.

This species has a strong resemblance to C. turpinii, C. paredonensis, and C. helwigii of the Greater Antilles, but differs in having fleshy glands with appendages much reduced, and in the deltoid-reniform capsule with three narrow lobes.

42. CHAMAESYCE TUMISTYLA sp. nov. Type: aviation field north of city, Mole St. Nicholas, Haiti, 13-19 Feb. 1929, E. C. & G. M. Leonard 13146 (Holotype: NY !; Isotype: GH !).

Annual or perennating; prostrate, forming mats to 2 dm. diameter. Stem to 0.5 mm. diameter, internodes to 5 mm. long; branched freely in upper part, rooting at nodes, nodes thickened, sparsely strigose on upper surface, glabrous beneath, light-colored. Leaves membranous, somewhat thickened; blades ovate-orbicular, 2-3 x 2-3 mm., base oblique, rounded or obtuse, margin entire or somewhat erose in drying, apex rounded, glabrous, green; petiole 0.3 mm. long; stipules joined at base, sheathing parted into linear segments 0.1 mm. long. Cyathia solitary at upper nodes; sessile or minutely peduncled, broadly campanulate, to 0.6 mm. diameter at mouth, lobes scarcely equalling glands, deltoid, glabrous on outside, sparsely hairy within, glands transversely elliptic, fleshy, 0.3 mm. long, appendages obsolete, fifth gland short, deltoid, sinus shallow. Staminate flowers 5-12 per cyathium, androphores glabrous, to 0.4 mm. long at maturity. Gynophore glabrous, to 1.2 mm. long at maturity, exserted, upright; calyx obsolete or a rim of tissue; ovary glabrous; styles upright or spreading, 0.3 mm. long, joined at base, swollen at apex, undivided. Capsule glabrous, broadly ovoid, 0.6 mm. long, 0.7 mm. wide below equator, broadly three-lobed, angles rounded. Seed ovoid, 0.4 mm. long, 0.2 mm. wide below equator, four-angled, ventral angle sometimes obscure, others rounded, faces convex, plump, smooth, dark tan.

Known only from the type collection, Haiti.

There are marked differences between this tiny plant and any other species examined. The prostrate habit with stems rooting at the enlarged nodes is reminiscent of C. serpens, but the stems are tomentose on one surface, and are threadlike and much more slender than those of that

glabrous species. The stipules differ, too, in being somewhat sheathing and yellow, rather than simply fused in pairs and white.

The sessile cyathium has not been seen elsewhere, but the most distinctive feature is the undivided style, swollen for the upper third of its length.

This is considered to be a distinct species on the basis of these characters, and will be published as such under an appropriate name. The epithet "tumistyla" (which is used here for purposes of identification within the work, and not in any sense as an attempt at publication) refers to the enlarged apical portion of the undivided style and stigma.

43. CHAMAESYCE LEONARDII sp. nov. Type: bluff east of Bord de Mer, vicinity of Jean Rabel, Haiti, 27 Jan.-9 Feb. 1929, E. C. & G. M. Leonard 12888 (Holotype: NY !; Isotypes: GH !, K !).

Annual; prostrate, fruiting when stems 2-3 cm. long. Stem to 0.5 mm. diameter at base, internodes to 5 mm.; branches reduced to groups of cyathia, not rooting at nodes, tomentose on all surfaces, greenish-yellow suffused purple. Leaves membranous or of a heavier texture; blades ovate-elliptic, 5-8 x 2.5-4, base oblique, subcordate or rounded, margin obscurely serrated, thickened, apex obtuse, midrib prominent on lower surface, both surfaces strigose or sparsely tomentose, upper surface glabrate, lower surface minutely papillose, green suffused purple; petiole ca. 1 mm. long; stipules joined at base, 0.3 mm. long, deeply bifid, strigose. Cyathia in leafless clusters of 2-5 at nodes; peduncle 0.3 mm. long, involucre obconical, to 0.6 mm. diameter at mouth, lobes equalling glands, deltoid, strigose on outside, densely ciliate within, glands transversely elliptic, 0.05 mm. long, somewhat

stipitate, appendages obsolete, fifth gland short, deltoid, sinus broad, shallow. Staminate flowers 3-10 per cyathia, androphores glabrous, to 0.6 mm. long at maturity. Gynophore strigose, to 1 mm. long at maturity, exserted, upright or nutant; calyx a triangular pad of tissue; ovary densely white-strigose; styles spreading, 0.4 mm. long, joined at base, bifid for half to two-thirds length. Capsule densely white-strigose, broadly ovoid, 1 mm. long, 1.2 mm. wide at equator, broadly three-lobed, angles rounded. Seed ovoid, 0.7 mm. long, 0.4 mm. wide, strongly angled, ventral angle rounded, faces convex, strongly wrinkled, red-brown or ashen, angles often lighter.

Known only from type collection, Haiti.

The cyathia of this species are borne in a manner not encountered in other species examined. The laterals near the tip of the stem are given over entirely to cyathia production, and consist of a group of one to a few cyathia congested on a stem a few millimeters long. This probably represents an extreme reduction of the type shown by C. maculata or C. thymifolia, in which cyathia are formed on congested leafy laterals in the upper part of the stem, rather than a further reduction from the glomerules of C. berteriana or C. hirta, since close observation shows that these cyathia alternate on the short stems, while in glomerules they fall at the nodes of a dichasium.

The white, strigose-pubesence of the capsules and the prominent midrib below the purple-flushed leaves are further distinctive features of the plant, and the wrinkled seed is also unusual. The epithet "leonardii" in honor of the very active collector of the Haitian flora, will be used here for identification, and not in an attempt to publish the name.

No close affinities among species of the area are apparent for this species, but more mature plants may show features which suggest possible relationships.

DOUBTFUL SPECIES

CHAMAESYCE GYMNADENIA (Urb.) Millsp., Field Mus. Bot. 2:

409. 1916. Euphorbia gymnadenia Urban, Symb. Ant., 5: 390. 1908.

Type: Cuba, Wright 3706 (Herb. Mus. Bot., Berlin, if extant; Isotypes: GH !).

The sheet from GH which was seen holds three plants; one is C. gundlachii, and the other two are referable to C. minutula as understood here. Urban makes comparisons with these two species in his notes, but the points of difference are not apparent on the specimens. The name will probably fall into the synonymy of one of these two species, but, until the original material has been seen, cannot be assigned to either one with confidence.

CHAMAESYCE INFLEXA (Urb. & Ekm.) comb. nov. Euphorbia inflexa

Urban & Ekman, Arkiv. Bot., Stockh. 22A (8): 64. 1929. Type: Pineland toward Peu-de-Temps, Morne Vincent, Gauthier, Massif de la Selle, Haiti, 3 Mar. 1927, E. L. Ekman H7764 (Holotype: Herb. Naturhistoriska Riksmuseum, Stockholm, not seen; Isotype: K !).

No fruiting material of this species has been seen. The vegetative plants seen at K were suggestive of the Cuban species C. camagueyensis, but cyathial characters must be checked before any decision on the distinctness of the species can be made.

CHAMAESYCE URBANII Millsp., Field Mus. Bot. 2: 412. 1916. Euphorbia villosula Urban, Symb. Ant., 1: 340. 1899. Type: in Ste. Domingo, prope Tamboril, May, Eggers 1944c (Herb. Mus. Bot., Berlin, if extant). non

E. villosula Pax, Bot. Jahrb. 19: 118. 1894.

Urban's comment on the species compares it with E. turpinii, but the name seems to have been used for plants which resemble C. adenoptera, perhaps because the description mentions that the glands are not all the same size. Since no authentic material has been seen the position of this species cannot be decided with confidence.

PHYLOGENY

The relationships within Euphorbia sensu lato are far from clear. No study of the genus at the specific level has been completed since that of Boissier in 1862, and the treatments of the tribe Euphorbieae by Pax (1890) and Pax and Hoffman (1931) in Die Natürlichen Pflanzenfamilien, and of the family by Scholz (1964) in the Syllabus, are limited by the format laid down by Engler and Prantl when they originated these works.

The study by Haber (1925) of the anatomy of the cyathium did not provide much basis for speculation on the relationship of the divisions proposed by various authors, although she suggests that there are considerable differences between species in the degree of specialization shown. A similar pattern of demonstrating the possible utility of characters without drawing phylogenetic conclusions exists in the chromosome studies by Perry (1943) and the work on electrophoresis of latex by Moyer (1934). It was disappointing to find that Punt (1962) could give so little indication of possible phylogenetic paths within the genus Euphorbia in view of some of the remarkable results obtained from pollen studies in the rest of the family and many other parts of the plant kingdom.

Wheeler (1941) has correlated the type of branching described by Croizat (1936b, 1937) for the genus Chamaesyce with the suggestions for the origin of the group first made by Roeper in 1824. He feels that the development of branches from the crown of the stem after the abortion of

the main axis in Chamaesyce is parallel with the formation of a pleiochasium in Euphorbia subgenus Esula Pers. after the main axis has produced a terminal cyathium. The stems of Chamaesyce would, then, be homologous to the rays of subgenus Esula which are usually dichotomously branched. This explanation is in accord with Croizat's description of the growth of the stems in Chamaesyce by successive production of nodes terminating in a bud or cyathium, and with extension beyond this by the development of laterals.

A pleiochasial development similar to that in subgenus Esula is shown by some members of Euphorbia subgenus Agaloma. Both groups have alternate leaves on the main axis but opposite leaves on the rays, and it is suggested that Chamaesyce has developed from one or the other by the reduction of this main axis to one or two nodes. This is illustrated in Figures 1 and 2 of the series of diagrams (adapted in part from Wheeler) in Plate 55.

This origin for Chamaesyce seems entirely reasonable, and implies that dichotomous branching is a primitive characteristic within the genus. Dichotomous branching for the full length of the stems (secondary axes) is rare in the species under consideration, but many show a tendency toward dichotomy at the tips of the branches and apparently lateral branching in the lower parts of the stem. This transition is illustrated in Figure 3. The lateral branching comes about by the unequal development of the lateral buds at each node, and in most cases the partial suppression of one lateral alternates up the stem. This type of branching is found in most of the upright, large-leaved species such as C. hyssopifolia and C. hypericifolia.

The production of cyathia is usually confined to the upper parts of the stem, and the solitary cyathium is terminal at each node, although a lateral may extend the axis so that it appears to be lateral. In some species such as C. *hyssopifolia*, production is concentrated on the partially suppressed member of the pair of laterals, which develops into a compound dichasium bearing many cyathia. Condensation of the internodes of the dichasium, and reduction or loss of leaves gives rise to the glomerulate grouping of cyathia in C. *hypericifolia* and to the tight glomerules of C. *hirta* and similar species (Figures 4 and 5).

In many of the prostrate species, such as C. *maculata*, there is very little tendency to dichotomy in any part of the stem, and there is apparently a normal alternate lateral branching system. This represents an extreme suppression of one or other lateral, which then shows the same suppression in its own branching. Reduction of internodes in these laterals gives rise to the congested production of cyathia which is often seen at the upper nodes of these species (Figure 6).

Two paths can thus be traced in the evolution of branching pattern in the group of species under consideration. Dichotomous branching appears to be the primitive condition, and, in almost all cases, has given way to unequal development of the two branches of the dichotomy. In one series the partially suppressed branch has retained its dichotomous tendency, and the cyathia are carried in compound dichasia, which, by uniform reduction of internodes, have given rise to tight glomerules. The second series involves a continuation of the suppression of one of the branches of the dichotomy into the branching of these sideshoots themselves. Reduction of the internodes of these shoots has given the congested branchlets on which

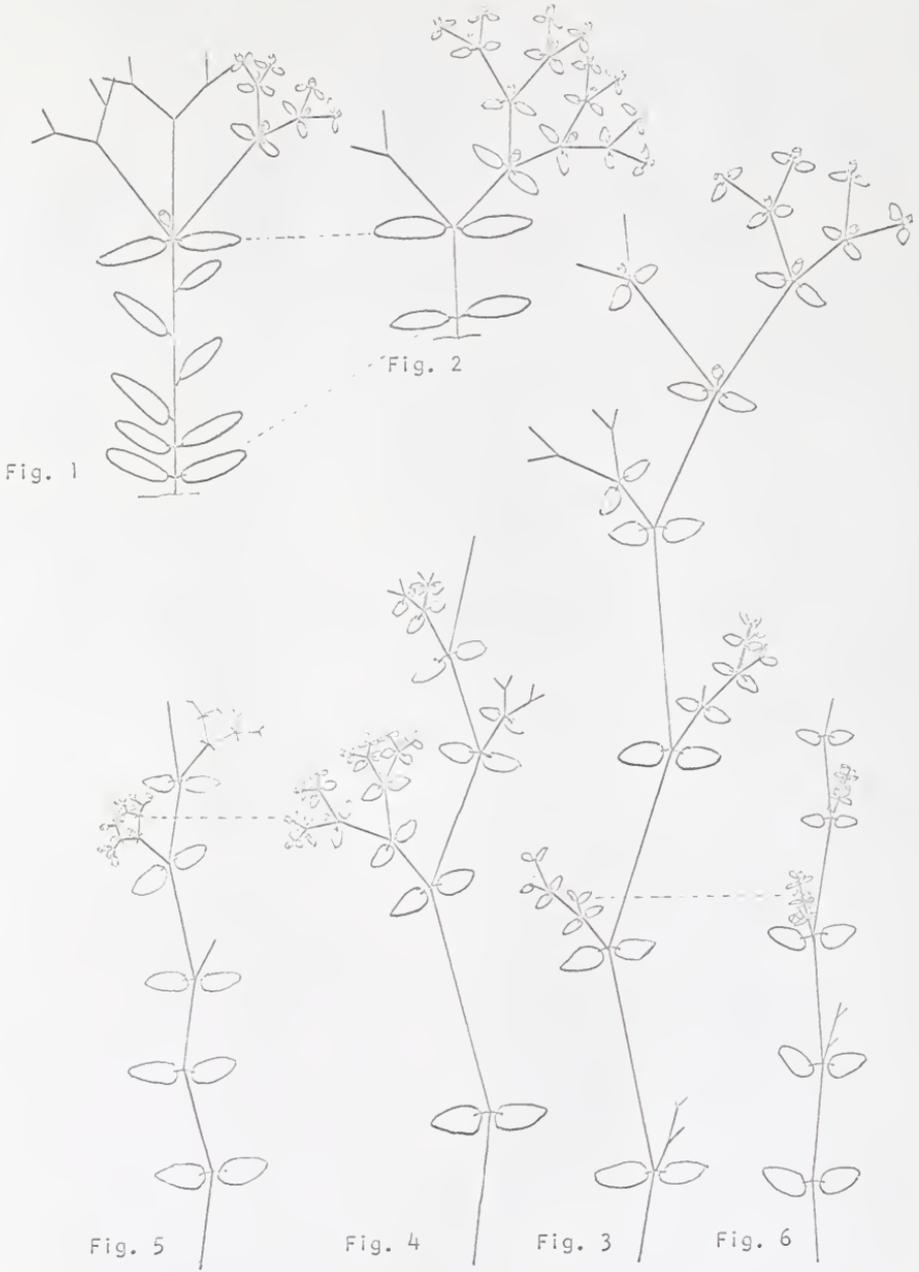


Plate 55. EVOLUTION OF BRANCHING PATTERN IN CHAMAESYCE

most of the cyathia are developed in many species. These are usually leafy, but further reduction in C. leonardii has resulted in the production of small groups of cyathia on a leafless axis.

There is no evidence to suggest that reduction in either of these series has proceeded to the point at which there has been much loss in the number of cyathia, and in particular it seems safe to assume that the production of a single terminal cyathium at a node is a primitive rather than a derived condition.

No other characters in the genus show transitions which are as easily recognizable as are those in the branching and the position of cyathia production.

Croizat pointed out, while describing the abortion of the primary axis which characterizes the genus, that the ability to produce buds at this aborted apex, or for them to be held back by factors of the environment, makes the plant very efficient under adverse conditions. Many species grow very slowly under drought or an unfavorable temperature regime, but produce heavy growth and abundant seed when conditions improve for even a short period. This must have represented a selective advantage over plants which had to produce a large basic branch system before forming cyathia, such as those of Euphorbia subgenus Esula.

An aborted primary axis from which grow many fruiting branches, homologous to the rays of subgenus Esula, is taken to be the primitive state in Chamaesyce. Once this character was established, evolution was probably from a small to a much enlarged root in the unfavorable habitats in which the appropriate selection pressure was present, and this type of root, and the associated long life-span, are probably derived characters.

The situation is not clear-cut, however, since in less stringent environments it is unlikely that the same pattern of development would have occurred. The maximum seed production under uniformly favorable conditions would come from steady growth and fruiting, and in this case a single- or few-stemmed plant might be derived from the basic type in which many stems grow from the crown of the root. The shrub habit is probably also derived, and represents another response to environment, perhaps in species in which the ability to produce multiple stems from ground level had already been lost.

Pubescence is widespread in the family Euphorbiaceae, often with complex stellate or branched hairs. It is not common in the groups close to Chamaesyce, but presumably represents a primitive condition. All pubescence in the genus is of simple hairs, although most are multicelled, and in some cases are large and heavily pigmented.

Most characters of the inflorescence are rather stable in the genus. The perianth of the female flower is reduced to a vestigial calyx represented by a pad of tissue and in only one species, C. serpens, do the three lobes develop to about 0.3 mm. long, and recurve. It would be necessary to examine the vascular traces to decide if this is more than a casual elaboration of tissue.

The number of male flowers varies greatly from species to species, and Haber (1925) traced a series through Euphorbia sensu lato in which the numbers in each fascicle in the cyathium were reduced, from the primitive state with many present, by loss of terminal and lateral flowers in various combinations. The examples that she gives from Chamaesyce fall throughout the series.

The same is true of the elaboration or reduction of the bracts which subtend the male flowers in their inflorescences inside the cyathium. These bracteoles are fused, large and much divided in most species of Chamaesyce and this is probably derived from the simple, unjoined type that Haber suggests as the basic form for the genus Euphorbia.

The fifth gland and the sinus in which it lies seem variable within species but are broadly similar through the genus Chamaesyce. The fifth gland occasionally develops in the full glandular form in C. vacinulata, indicating perhaps, that the primitive condition with five equal glands is not completely lost from the group.

The glandular appendages are petalloid through most of the group, and their loss is a derived condition which is found consistently in only a few species. It is more common for pairs of appendages to develop to a different extent. This is of very frequent occurrence, and in one set of species the condition has developed to such a marked degree that the cyathium is covered at maturity by the greatly elongated pair which flank the sinus.

These characters, and others in which changes are even less marked, give little insight into possible phylogenetic paths in the genus. With the large number of species to consider it is surprising that no grouping can be made, at the taxonomic level of series for example, within the genus. The only groups which suggest themselves are those such as the species with expanded appendages, or those in which all cyathia are carried on congested laterals, which have no features to give a constant separation from the remainder of the genus. It is interesting to note that Wheeler (1941), in his study of approximately the same number of species from the

area north of the Caribbean, was equally unwilling to lay down lines, and Boissier (1862) divided his section Anisophyllum on patently artificial grounds, and as a matter of convenience rather than phylogeny.

The impression gained from this work with the genus in the Caribbean is that speciation is proceeding at a relatively rapid pace. The treatment here has been conservative in that many taxa recognized as species by earlier authors have been reduced to a lower taxonomic rank. This is due in some cases to the availability of a wider range of material than other workers used, which has shown their species to be merely the extremes of a continuous series, but more often to a different assessment of the degree of interchange of genetic material still taking place. The potential for complete separation in many of these cases appears to be high.

Neither the pollen nor the seed is adapted for wide distribution, and this may account for the high degree of endemism shown by the group. All parts of the area studied had endemic species, in some cases restricted to a single island. In many cases it was possible to recognize similar species from the area, but others must relate more closely to taxa from other parts of the world, and emphasize the difficulties of phylogenetic speculation based on even as apparently contained an area as the Caribbean.

BIBLIOGRAPHY

- ALAIN, Hermano. 1953. Flora de Cuba, 3. Contr. Ocas. 13, Mus. Hist. Nat. "Col. de la Salle", Habana.
- BOISSIER, E. 1862. Euphorbieae, in de Candolle, Prodrromus systematis naturalis regni vegetabilis, 15(2): 3-188. Paris.
- BRITTON, N. L. and MILLSAUGH, C. F. 1920. The Bahama Flora. Published by the authors, New York.
- BRITTON, N. L. and WILSON, P. 1924. Scientific Survey of Porto Rico and the Virgin Islands, 5: Botany of Porto Rico and the Virgin Islands. New York Academy of Sciences, New York.
- BROWN, N. E. 1911. Euphorbia, in Thistledon-Dyer, Flora of Tropical Africa, 6(1): 470-603. Reeve & Co., London.
- BROWN, R. 1818. Observations on the natural family of plants called Compositae. Trans. Linn. Soc. 12: 76-142.
- BURCH, D. G. 1965. The application of the Linnaean names to some New World species of Euphorbia subgenus Chamaesyce. Rhodora, in press.
- BURMAN, J. 1737. Thesaurus Zeylanicus. Amsterdam.
- CROIZAT, L. 1936a. On the classification of Euphorbia. I. How important is the cyathium? Bull. Torr. Bot. Club 63: 525-531.
- _____. 1936b. Chamaesyce, in Degener, Fl. Hawaii, family 190, Chamaesyce 1 & 4. Published by the author, Honolulu.
- _____. 1937. Chamaesyce, in Degener, Fl. Hawaii, family 190, Chamaesyce 2 & 3. Published by the author, Honolulu.
- DAVIS, P. H. and HEYWOOD, V. H. 1963. Principles of Angiosperm Taxonomy. Van Nostrand Co., New York.
- D'ISNARD, A. T. D. 1720. Mem. Acad. Roy. Sci., Paris.
- ERDTMAN, G. 1952. Pollen Morphology and Plant Taxonomy. Chronica Botanica Co., Waltham, Mass.
- FARWELL, O. A. 1936. Euphorbia pilulifera in Michigan. Rhodora 38: 331-332.

- FAWCETT, W. and RENDLE, A. B. 1920. Flora of Jamaica, 4. British Museum, London.
- GRAY, S. F. 1821. A Natural Arrangement of British Plants, 2. Baldwin, London.
- GUNTHER, R. T. 1959. The Greek Herbal of Dioscorides. Oxford University Press, Oxford.
- HABER, J. M. 1925. The anatomy and morphology of the flower of Euphorbia. Ann. Bot. 39: 657-707.
- HAWORTH, A. H. 1812. Synopsis Plantarum Succulentarum. Taylor, London.
- _____. 1827. Descriptions of new succulent plants. Philos. Mag. & Ann. Philos. n.s. 1: 271-277.
- JACQUIN, N. J. 1763. Select. Stirp. Amer. Hist. Vienna.
- KLOTZSCH, J. and GARCKE, H. 1859. Linne's Natürliche Pflanzenklasse Tricoccae. Abh. Akad. Berlin 1859 (Phys.): 1-108.
- LANJOUW, J. and STAFLEU, F. A. 1964. Index Herbariorum: 1. The Herbaria of the World, edition 5. International Bureau for Plant Taxonomy and Nomenclature, Utrecht.
- LINNAEUS, C. 1753. Species Plantarum, ed. 1. Stockholm.
- _____. 1754. Genera Plantarum, ed. 5. Stockholm.
- MERRILL, E. D. 1948. Unlisted binomials in Chapman's Flora of the Southern United States. Castanea 13: 61-83.
- MICHAUX, F. A. 1803. Flora Boreali-Americana. Paris.
- MILLER, P. 1754. The Gardener's Dictionary, abridged ed. 4. London.
- _____. 1768. The Gardener's Dictionary, ed. 8. London.
- MILLSPAUGH, C. F. 1909. Praenunciae Bahamensis II. Field Mus. Bot. 2: 289-322.
- MOYER, L. S. 1934. Species relationships in Euphorbia as shown by the electrophoresis of latex. Am. J. Bot. 21: 293-313.
- PAX, F. 1890. Euphorbiaceae, in Engler & Prantl, Die Natürlichen Pflanzenfamilien, 3(5): 1-119. Leipzig.
- _____. 1924. Die phylogenie der Euphorbiaceae. Bot. Jahrb. 59: 129-176.

- PAX, F. and HOFFMANN, K. 1931. Euphorbiaceae, in Engler & Prantl, Die Natürlichen Pflanzenfamilien, 2 Aufl., 19c: 11-233. Leipzig.
- PERRY, B. A. 1943. Chromosome number and phylogenetic relationships in the Euphorbiaceae. Am. J. Bot. 30: 527-541.
- PERSOON, C. H. 1806. Synopsis Plantarum. Paris.
- PUNT, J. 1962. Pollen morphology in the Euphorbiaceae with special reference to taxonomy. Wentia 7: 1-116.
- RAFINESQUE, C. S. 1817. Second decade of undescribed American plants. Amer. Monthly Mag. 2: 119-120.
- _____. 1838. Flora Telluriana, 4. Philadelphia.
- REICHENBACH, H. G. L. 1841. Repertorium Herbarii sive Nomenclator Genera Plantarum. Dresden.
- RODGERS, A. D. 1944. American Botany 1873-1892. Princeton University Press, Princeton.
- ROEPER, J. 1824. Enumeratio Euphorbiarum. Gottingen.
- _____. 1828. Euphorbia, in de Candolle, Botanicon Gallicum, 1: 412-417.
- SCHOLZ, H. 1964. Euphorbiaceae, in Engler, Syllabus der Pflanzenfamilien, 11. Dicotyledoneae, 255-261. Gebrüder Borntraeger, Berlin.
- SMALL, J. K. 1933. Manual of the Southeastern Flora. Published by the author, New York.
- TORREY, J. 1843. A Flora of the State of New York. Albany, New York.
- TOURNEFORT, J. P. de. 1700. Institutiones Rei Herbariae. Paris.
- URBAN, I. 1898-1928. Symbolae Antillanae seu Fundamenta Florae Indiae Occidentalis. Nine volumes. Berlin.
- URBAN, I. and EKMAN, E. L. 1929. Ark. f. Bot., Stockh. 22A: parts 8-16.
- WHEELER, L. C. 1939. A miscellany of the New World Euphorbiaceae. Contr. Gray Herb. 127: 48-78.
- _____. 1941. Euphorbia subgenus Chamaesyce in Canada and the United States exclusive of southern Florida. Rhodora 43: 97-154, 168-205, 223-286. Reprinted as Contr. Gray Herb. 136.

WHEELER, L. C. 1943. The genera of living Euphorbieae. Am. Mid. Nat.
30: 456-503.

_____. 1960. Typification of Euphorbia maculata. Rhodora 62:
134-141.

WIMAN, J. 1752. Euphorbia ejusque Historia Naturalis. Uppsala. Re-
printed in Amoen. Acad. 3: 100-131.

APPENDIX

The following new names and combinations are used in this work, and will be validated by publication at a later date.

New species

Chamaesyce leonardii

Chamaesyce tumistyla

New combinations

Chamaesyce lecheoides (Millsp.) Millsp. var. wilsonii (Millsp.)

Chamaesyce lecheoides (Millsp.) Millsp. var. exumensis (Millsp.)

Chamaesyce porteriana Small var. keyensis (Small)

Chamaesyce porteriana Small var. scoparia (Small)

Chamaesyce parciflora (Urb.)

Chamaesyce hepatica (Urb. & Ekm.)

Chamaesyce helwigii (Urb. & Ekm.)

Chamaesyce ophthalmica (Pers.)

Chamaesyce adenoptera (Bertol.) Small ssp. pergamena (Small)

Chamaesyce adenoptera (Bertol.) Small ssp. gundlachii (Urb.)

Chamaesyce minutula (Boiss.)

Chamaesyce deltoidea Small ssp. serpyllum (Small)

Chamaesyce deltoidea Small ssp. deltoidea var. adhaerens (Small)

BIOGRAPHICAL SKETCH

Derek George Burch was born on June 26th, 1933, in Caerphilly, Glamorgan, Great Britain. He attended school in London, and college at University College of Wales, Aberystwyth, where he received a B.Sc. (Hons.) in Agricultural Botany in 1954. He carried out graduate work at that institution and at the University of Nottingham leading to an M.Sc. in 1957.

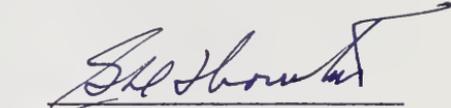
After working for a sugar company in the Dominican Republic, and in various areas of horticulture in Miami and Montreal, Mr. Burch was admitted to the Graduate School of the University of Florida in September, 1961. He has been employed as a teaching and research assistant and as an Instructor in the Department of Botany, and as herbarium correspondent for the Agricultural Extension Service while pursuing his work toward the degree of Doctor of Philosophy.

Mr. Burch is a member of the Association of Applied Biologists, the Society for Experimental Biology, the Classification Society, and the Royal Geographical Society.

Mr. Burch is married to the former Nancy Hudgins of Lake Wales, Florida, and they have no children.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Agriculture and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

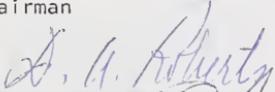
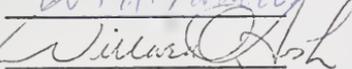
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