

Studies in the Genus *Boerhavia* L.
(Nyctaginaceae), 1-5

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ABSTRACT

Fosberg, F. Raymond. Studies in the Genus *Boerhavia* L. (Nyctaginaceae), 1-5. *Smithsonian Contributions to Botany*, number 39, 20 pages, 1978.—The genus *Boerhavia* is discussed, its infrageneric classification is reviewed, and four subgenera are recognized. Distinctions of two Linnaean species, *B. diffusa* and *B. repens* are clarified. *Boerhavia mutabilis* R. Brown and *B. pubescens* R. Brown are typified. The *Boerhavia repens* group is discussed and delimited, as is *B. rubicunda* and several similar species. *Boerhavia repens* var. *maris-indici*, *B. albiflora*, *B. crispifolia*, and *B. herbstii* are described as new. A curious abnormal form of *B. crispifolia* is also described and discussed.

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Studies in the Genus *Boerhavia* L. (Nyctaginaceae), 1-5

F. Raymond Fosberg

1. Introduction to the Genus *Boerhavia* L.

Almost 200 binomials have been proposed in *Boerhavia* L. (often spelled "*Boerhaavia*"), according to the *Index Kewensis*. Of these, some are nomenclatural synonyms and homonyms, many are taxonomic synonyms, and others have been transferred to other genera. Some species are polymorphic, others very uniform. They are tropical or subtropical, and some have wide geographic ranges.

Two major sources of taxonomic difficulty with *Boerhavia* are immediately apparent to one who attempts to identify plants belonging to it or to look at the genus as a whole. One is the level at which supra-specific categories are to be classified. The other is the apparent plasticity or polymorphism within the species.

The first problem, as in several other groups in the family (e.g., *Pisonia* L., *Mirabilis* L., *Abronia* L.), is the level at which to recognize genera. Considered in a broad sense *Boerhavia* has a distinctive and recognizable habit or facies. No one at all familiar with the family is likely to confuse *Boerhavia* with any other genus. Technically it is not easy to circumscribe. Herbaceous or rarely slightly woody, usually elongate stems with prominent nodes and in some species with a band of sticky mucilaginous material around the middle of the internodes, slender forking cymose or rarely racemose or even spicate inflorescences with small,

scale-like free bracts, small flowers with campanulate, cylindric, or funnel-shaped perianth limb separated by a constriction from the sulcate, enlarged lower portion of the perigone, which develops into a clavate or oblong, often glandular, anthocarp or fruit; these form a good combination of recognition characters.

Within this circumscription four groups of species are easily recognized: (1) Plants with 10 well-defined sulci on a symmetrical fruiting perigone have been segregated by some as the genus *Anulocaulis* Standley. They have the sticky band around the internodes prominently developed. Four or five species are included here, occurring from the Death Valley region of California and Nevada to Coahuila, Mexico. (2) Another group has rather large, sometimes slightly asymmetric fruits, faintly 10-sulcate, provided with a few prominent sticky glands. The flowers are larger and more funnelliform and zygomorphic than is usual in the genus *Boerhavia*, sensu lato. The species with these characteristics have been given the generic name *Commicarpus* Standley. Two or more of the species are very widely distributed. (3) Still another group, with only one or two Mexican species, producing similarly large flowers in racemes and very asymmetric, rather gibbous, fruits, has been called *Cyphomeris* Standley. (4) The remaining species, *Boerhavia* L. sensu stricto, have small, almost regular flowers, and 3-5-sulcate, glabrous or viscid-glandular symmetrical fruits, the glands small and sessile or shortly

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stalked. The species of this group are well distributed in open habitats in the warm parts of the world.

No answer satisfactory to all taxonomists is possible to the question of whether these four groups should be recognized as separate genera or rather as sections or subgenera of one broad genus, *Boerhavia* L. For those who are interested in relationships, who better comprehend larger complex groups, or who are not specialists in the family Nyctaginaceae, the broad single genus will be preferable. Those who find smaller, more coherent, simpler groups easier to remember and understand, to whom relationships are not as important as differences, or who are Nyctaginaceae specialists may prefer to maintain the four genera. My own inclination is to the first of these viewpoints. Also, since the generic name and specific epithet are what form the specific name, it seems to me that a wide knowledge of plants is made easier by maintaining the members of these two ranks, genus and species, in as broad a sense as is consistent with phylogenetic probability and morphological continuity. In this study, *Boerhavia* will be used in the broader sense indicated above and in its synonymy.

The other source of confusion is the apparent extraordinary plasticity or polymorphism of some of the species, especially the strand and coastal ones. These latter have, at least the Old World ones, frequently been treated as belonging to one enormous wide-ranging and complex species to which the name *Boerhavia diffusa* L. has usually been applied—mistakenly in my opinion. If *B. diffusa* is removed (pp. 4-5) much of the remaining complexity, again at least in the Old World, might be included in *B. repens* L.

It would be possible to treat *B. repens* as a prostrate species to include all prostrate axillary-flowered, thick-rooted boerhaviae, as has been done in the past, under the misapplied name "*Boerhavia diffusa*." This course has not been satisfactory to many field observers who have had much experience with the boerhaviae of the Pacific islands or those of the Caribbean. Without having any illusions that all the problems presented by these plants are solved, it seems that a partial resolution of some of the difficulties might be made by recognizing some of the clearer components of the complex as separate species. In this study a beginning will be made toward doing this and toward clarification

of the application of several of the older names that have been applied to members of the group.

ACKNOWLEDGMENTS—I wish to thank the authorities of the numerous herbaria where I have, during many years, been able to study plants of this genus, some of whom have sent specimens as loans or gifts. Thanks are also due to Miss Dulcie A. Powell, who has made numerous dissections and notes on floral details. Her work and some of the field work and herbarium visits have been supported by grants from the Smithsonian Research Awards Program, administered by the Smithsonian Research Foundation. Logistic support for field work in the Phoenix Islands was provided by the U. S. Air Force.

Boerhavia L.

- Boerhavia* L., Gen. Pl. ed. 5, 4, 1754 [1753]; Sp. Pl. 3, 1753.—Choisy, in de Candolle, Prodr. 13(2):449-450, 1849.—A. Gray, Am. Jour. Sci. II. 15:321-324, 1853.—Heimerl, Beitr. Syst. Nyctag. 24-29, 1897; in Engler and Prantl, Nat. Pflanzenf. III, 1(b):26, 1889.—Standley, Contr. U. S. Nat. Herb. 12:375, 1909; North Amer. Fl. 21(3):204, 1918.—Heimerl, in Engler and Prantl, Nat. Pflanzenf., ed. 2, 16(c):117-119, 1934.
- Boerhaavia* auct. plur. [orthographic variant].
- Lindenia* Martens & Galeotti, Bull. Acad. Bruxelles 10(1):357, 1843 [not Bentham, Pl. Hartw. 84, 351, 1842].
- Tinantia* Martens & Galeotti, Bull. Acad. Bruxelles 11(1):240, 1844 [not Scheidweiler, in Otto and Dietrich, Allg. Gartenz. 7:365, 1839].
- Senkenbergia* Schauer, Linnaea 19:711, 1847 [not *Senkenbergia* Gaertner f., Meyer and Scherbius, Oekon. Fl. Wetterau 2:413, 1800] [orthographic variants].
- Commicarpus* Standley, Contr. U. S. Nat. Herb. 12:373, 1909; 13:428, 1911; 18:101, 1916; North Amer. Fl. 21(3):215, 1918.
- Anulocaulis* Standley, Contr. U. S. Nat. Herb. 12:374, 1909; 13:430, 1911; North Amer. Fl. 21(3):216, 1918.
- Cyphomeris* Standley, Contr. U. S. Nat. Herb. 13:428, 1911; North Amer. Fl. 21(3): 214, 1918.

TYPE SPECIES.—*Boerhavia diffusa* L. (lectotype).

DESCRIPTION.—Herbs, rarely vine-like, creeping, or scrambling, rarely somewhat woody at base; leaves opposite, simple, entire to sinuate or repand lobed, estipulate, usually petiolate; flowers borne in variously formed cymose, umbelloid, racemose or rarely spicate inflorescences, these bracteate, the involucre bracts subtending ultimate partial inflorescences not connate; perianth of a single completely united series of parts termed a perigone, this separated into two parts by a strong transverse constriction, distal portion, corolloid, campanulate,

tubular or funnellform, caducous, proximal portion longitudinally sulcate, persistent, at maturity closely investing the fruit, termed an anthocarp; stamens basally attached, filaments free, anthers with 2 orbicular cells, usually exerted; pistil 1, ovary unilocular, ovule 1, basally attached, style filiform, stigma capitate, usually somewhat exerted; anthocarp 3, 4, 5, or 10 sulcate, indehiscent, containing one erect seed.

INFRAGENERIC CLASSIFICATION.—The principal essays toward an infrageneric classification of *Boerhavia* have been written by Anton Heimerl in the two editions of Engler and Prantl, *Die natürlichen Pflanzenfamilien*, in 1889 and 1934. The 1889 classification was used in modified form in Heimerl's studies of the Nyctaginaceae in 1897. In the 1889 classification, Heimerl recognized five sections: *Senckenbergia* A. Gray, *Micranthae*, *Pterocarpon*, *Solenanthae*, and *Adenophorae*, the last four all erected by Heimerl in this treatment. In 1897 he used this same arrangement except that he here merged sect. *Pterocarpon* into sect. *Micranthae*.

Standley, in 1909 and 1911, elevated three of Heimerl's sections to generic rank, giving them new generic names. Sect. *Solenanthae* became *Anulocaulis*, sect. *Adenophorae* became *Commicarpus*, and *Senckenbergia* became *Cyphomeris*. For the last of these, three earlier generic names exist, all later homonyms, as shown by the synonymy. Since *Senckenbergia* Gaertner f., Meyer & Scherbius and *Senckenbergia* Schauer are both named in honor of Johan Christian Senckenberg (Heimerl, 1934:115), they are orthographic variants and, therefore, must

be regarded as homonyms for nomenclatural purposes (ICBN, Art. 64 note and Art. 75).

Heimerl in 1934 accepted these genera, proposed by Standley, and treated *Boerhavia* L., sensu stricto, as including only what he had previously, in 1897, called sect. *Micranthae*. This genus he divided into four sections, *Spicatae*, *Singuliflorae*, *Pyramidatae*, and *Clavatae*.

The four major subdivisions are without doubt natural groups, whatever rank they are assigned. Heimerl's (1934) four sections of *Boerhavia* sensu stricto are somewhat less convincing, but no better scheme has been proposed. For the purposes of this series of studies they will be adopted until the genus is well enough known that improvements or refinements become possible. The names of these sections must be brought into accord with the *International Code of Botanical Nomenclature*.

Since a broad generic concept is adopted here the segregate genera are regarded as subgenera. These seem to be clearly distinguishable by the characters used in the key to subgenera below.

In subgenus *Boerhavia* (*Boerhavia* L., sensu stricto, *Boerhavia*, sensu Heimerl, 1934) Heimerl distinguishes the four sections indicated above. These are recognizable here, but are very close together and it is by no means certain that this is the most natural arrangement possible, or even that they should be distinguished as sections (see Standley, 1909: 377).

Within these sections are recognizable species groups, not yet well enough defined to be given formal recognition as series. They will be referred

Key to the Subgenera of *Boerhavia*

(modified from Standley, 1911:382)

1. Anthocarp very asymmetric, inflorescences racemose, upper part of perigone funnellform *Cyphomeris*
1. Anthocarp symmetric to slightly asymmetric, inflorescences cymose or cymose paniculate, rarely with spicate or racemose ultimate branches, upper part of perigone campanulate, cylindrical or funnellform 2
 2. Anthocarp distinctly 3-5-ribbed or carinate (or even alate), upper part of perigone campanulate or cylindrical *Boerhavia*
 2. Anthocarp 10-ribbed, sometimes only faintly so, upper part of perigone funnellform to salverform 3
 3. Anthocarp tending to be cylindrical and somewhat asymmetric with large gummy glands *Commicarpus*
 3. Anthocarp without glands, strongly 10-ribbed, internodes with sticky bands *Anulocaulis*

to as the *Boerhavia repens* group, the *B. diffusa* group, etc., without formal definition.

Subgenus *Boerhavia*

Boerhavia auct. plur. orth. mut.

Boerhavia sect. *Micranthae* Heimerl, in Engler and Prantl, Nat. Pflanzenf. III, 1(b):26, 1889; Beitr. Syst. Nyctag. 24, 1897.

TYPE-SPECIES.—*Boerhavia diffusa* L. (lectotype).

DESCRIPTION.—Herbs frequently with enlarged roots, inflorescence variously cymose or cymose paniculate, smaller branches ending in capitate, glomerate, or umbellate or irregular clusters of small flowers, anthocarps 3–5 sulcate, often glandular, apices rounded or conic, mature or almost mature fruits articulate to and readily detached from pedicels or common receptacle.

DISTRIBUTION—Pantropical and subtropical.

Section *Boerhavia*

Boerhavia sect. *Micranthae* Heimerl, Beitr. Syst. Nyct. 84, 1897 [pro parte]; in Engler and Prantl, Nat. Pflanzenf. III, 1(b): 26, 1889 [pro parte].

Boerhavia sect. *Clavatae* Heimerl, in Engler and Prantl, Nat. Pflanzenf. ed. 2, 16(c):118, 1934.

Pantropical and subtropical.

Includes the common widespread lowland and strand species with usually sticky fruits with rounded or conical apices.

Section *Spicatae*

Boerhavia sect. *Spicatae* Heimerl, in Engler and Prantl, Nat. Pflanzenf. 16(c):118, 1934.

Southwestern U. S. to Peru.

A few annual species with flowers rather spicately to rarely capitately arranged on the inflorescence branches, anthocarps glabrous, 4–5-ribbed.

Section *Singuliflorae*

Boerhavia sect. *Singuliflorae* Heimerl, in Engler and Prantl, Nat. Pflanzenf., 16(c):118, 1934.

New Mexico and Texas to Mexico (and Asia and Africa?).

A few species with flowers on ultimate branches of inflorescence mostly reduced to one, anthocarps glabrous or hairy, not sticky glandular.

Section *Pterocarpon*

Boerhavia sect. *Pterocarpon* Heimerl, in Engler and Prantl, Nat. Pflanzenf., ed. 1, 3(1b):26, 1889.

Boerhavia sect. *Pyramidatae* Heimerl, in Engler and Prantl, Nat. Pflanzenf. 16(c):118, 1934.

Southern U. S. to Brazil and Ecuador, one species widely introduced in the Old World tropics and one or two probably indigenous African ones. A few species of annual plants with usually obpyramidal anthocarps with 3–5 keels or wings.

2. Clarification of *Boerhavia diffusa* L. and *Boerhavia repens* L.

The two Linnaean names, *Boerhavia diffusa* and *Boerhavia repens*, have generally been applied to a great diversity of Old World strand and lowland plants characterized principally by small flowers and narrowly clavate 5-ribbed, mostly viscus-glandular anthocarps. The extreme view on this complex was that of Heimerl, who, in his later years, placed almost all Indo-Pacific *Boerhavia* in *B. diffusa*, recognizing a multitude of varieties and forms. *Boerhavia repens* has occasionally been applied to prostrate forms, but until recently, not consistently to any one.

In 1956 in Colombo, Ceylon (Sri Lanka) Prof. B. A. Abeywickrama pointed out to me as *Boerhavia diffusa* L. a plant of decumbent habit with

fine ascending, diffusely paniculate inflorescences, noting that this was the type-locality of this species. To me, this was definitely not conspecific with the plants commonly thought to be *B. diffusa* in the Pacific Islands and so determined by Anton Heimerl in 1936, when he identified the Mangarevan Expedition collections (1937).

Later study by me of the material in the Linnaean Herbarium suggests that, though very fragmentary, the specimen 9.3 of *B. diffusa* could, indeed, belong to the Colombo species. This is here designated lectotype. The Linnaean specimen 9.8 of *B. repens*, also rather fragmentary, belongs also in the complex of prostrate plants generally called, up to then, *B. diffusa*, but characterized by axillary

inflorescences. Linnaean specimen 9.2, marked *B. diffusa* has axillary inflorescences and belongs nearer to *B. repens*, though not identical with it.

Study of a wide range of specimens apparently of this relationship suggests that a reasonable division can be made on the basis of strictly terminal paniculate inflorescences (*B. diffusa* group) versus axillary pendunculate cymes or umbels (*B. repens* group). Both of these are complex groups, in which several reasonably distinct species can be recognized. Alternatively, they may be regarded as two very broad collective species. The principal possibility of confusing the two is in populations of *B. repens* where repeated branching takes place distally, giving a paniculate appearance. Here the presence of axillary peduncles with umbelloid or glomerate inflorescences on the median parts of the plants seems

a good distinguishing mark for *B. repens* and its close relatives.

Boerhavia diffusa L. in a narrow sense is a decumbent plant with rather elongate prostrate main branches radiating from a root-crown, with ample, diffuse, finely branching, ascending panicles of small purple or pinkish flowers and narrowly clavate-fusiform sticky anthocarps. It is common in disturbed weedy places in Ceylon, with related forms widespread in South Asia, Malesia, and to Australia. How *B. paniculata* Richard, *B. coccinea* Miller, *B. caribaea* Jacquin, *B. viscosa* Lagasca et Rodriguez, and *B. hirsuta* Willdenow, all of the New World, differ has not yet been worked out to my satisfaction, but several species probably exist in this complex.

3. Typification of *Boerhavia mutabilis* R. Brown and *Boerhavia pubescens* R. Brown

The original publication of *B. mutabilis* R. Brown (Prodr. 422, 1810) follows:

1. *B. mutabilis*, procumbens glabra v. tenuissime pubescens, caule tereti, foliis repandis subovatis obtusis: paginis discoloribus, floribus 3-2-andris (T.M!) v.v.

Obs. *B. tetrandra* Forst. forsan hujus varietas.

1. *B. mutabilis*, procumbent glabrous or very thinly pubescent, stem terete, leaves repand subovate obtuse: surfaces not of the same color, flowers with two or three stamens (T.M.) seen alive.

Observation. *B. tetrandra* Forst. perhaps a variety of this. [Translation by Fosberg.]

This name, *Boerhavia mutabilis*, has been a source of confusion in a genus that is, even without it, about as confusing as a genus can be. The epithet *mutabilis* suggests that Brown himself encountered problems with it. An examination of his material and his field notes in the British Museum leaves one more than sympathetic with Brown, especially as he lived at a time when special creation and fixity of species were normal doctrine.

There are 8 sheets of specimens in the herbarium collected by Brown, possibly 9 collections—it is not certain if on one sheet there are two separate gatherings. Another plant is mentioned in the field notes, but could not be located. Of course, the best set of his material was lost at sea, and another set

was separated out as the "Public Collection" (W. T. Stearn, BM(NH), pers. comm.).

Thus Brown may have had in hand as many as 10 plants of his own gathering, as well as one collected in "Nova Cambria: Bustard Bay, 1770" by Banks and Solander (as the label is in Solander's hand according to Drs. Marshall and Groves of the British Museum botany staff). In Brown's field notes, these specimens were initially indicated as separate species and varieties of *B. mutabilis*. By the time of publication of the *Prodromus* they had been reduced to two species, *B. mutabilis* for most of them and *B. pubescens* for one with notably pubescent stem and leaves. The latter is a plant of the *Boerhavia repens* L. relationship, soft-pubescent with multicellular hairs and "flores subtriandri." No flowers remain on this Brown specimen from Carpentaria, which must be regarded as the holotype of *B. pubescens* R. Brown. Although the label of this specimen bears only the locality "Carpentaria," in Brown's field notes is the statement, "In apricis arenosis prope littora insularum lalons occidentalis Sinu Carpentariae." The specimen has axillary cymes, with insertion appearing pushed out of the axil proper by the development of a branch. It represents a pubescent form of *Boerhavia repens* L. that occurs rather widely distributed in the Pa-

cific Islands. The type is soft-pilose, hairs multicellular, with ovate, obtuse, mucronulate leaves that are smaller distally as the stems elongate; cymes one at an axil, with an axillary branch pushing the peduncle out of the axil as it develops. The branch bears another cyme, peduncle about 3 cm long, bearing a tiny not quite umbellate cluster at the top with 5–8 pedicels 2–3 mm long, no flowers left, but the field notes say “flores subtriandri.” In the *B. repens* complex the number of stamens per flower is somewhat variable, usually between 2 and 4, and cannot be relied on as a distinguishing character. However, considerable field observation suggests that forms otherwise morphologically and habitally distinct, are each likely to have preponderately a particular number of stamens.

I do not at present regard this pubescent form as specifically distinct from *B. repens* L., but as it is, nevertheless, identifiable over a substantial geographic range, it may be given the rank of “varietas.” If further field study shows that local populations in different regions are distinguishable, its rank might have to be elevated to subspecies within which varieties could then be described. For the present, the following disposition will serve: *Boerhavia repens* var. *pubescens* (R. Brown) Fosberg, new combination and new status (*Boerhavia pubescens* R. Brown, Prodr. 422, 1810).

The following eight (or nine) specimens in BM (plus one mentioned in Brown’s field notes but not located in BM) form the basis of *B. mutabilis* R. Brown and from among them a lectotype must be designated, to firmly pin down this name, which has been variously applied by different writers and collectors. They are a diverse lot and come from widely scattered localities around the Australian coast. Brief descriptions of these sheets and designation of one sheet as lectotype of *B. mutabilis*, with reasons, follow. The Brown specimens have been arbitrarily given numbers 1 to 8 to facilitate discussion, even though two of them also bear numbers given by Brown.

1. This specimen from Bay XII, 10 March 1802, is from the South Coast of Australia according to Brown’s system of indications in his field notes. It lacks fully developed leaves and has only one umbel with two remaining fruits on an elongate, probably originally paniculate branch. It is borne on a strong root crown. The leaves are described as oblong-lanceolate, 5–6 lines long, which suggests that he

was describing the reduced distal leaves that still remain on the specimen. The flowers are described as purple, with 2 stamens, the style curved above. The specimen is so incomplete that I cannot at this time assign it to a species.

2. A specimen (*Brown 10*) indicated in the field notes as from “island a Nov. 24, 1802,” but labeled “islands a, b, e, f, g, h, l, main opp. Groote Island,” is typical *B. diffusa* L., with ample leaves, a coarse subglabrous stem, and a paniculate inflorescence about 30 cm long; stamens 2. On the label and in the notes this is indicated as “ β undulata.” Since this epithet was not published by Brown, it has no status in the nomenclature of *B. mutabilis*.

Another plant is described in the notes as from “Island a,” collected on the same day, differing in having less undulate leaves with less prominent veins, and 3 stamens. This specimen was not located.

3. Mounted on the same sheet as No. 1 is a plant labeled “A desc.” and “*Boerhavia diandra?* Capentaria Island e Decbr. 6.” (It is not my intention here to publish a new binomial but merely to quote Brown’s label.) This is a much-branched subglabrous plant with small oblong-elliptic leaves, a somewhat paniculate rather stout inflorescence with flowers ultimately in few-flowered glomerules rather than umbels, fruit not very glandular (though the description in the notes contradicts this), and the stamens are described as “3 interdum 2.” Though rather too coarse, the paniculate inflorescence places this plant close to *B. diffusa* L., but the leaves are more like those of *B. tetrandra* Forster.

The sheet bearing this and No. 1 is marked “type specimen” but with no indication by whom or that such a lectotypification has ever been published or to which of the two plants it applies. Hence it is here disregarded.

4. A specimen labeled “*Boerhavia mutabilis* & *parvifolia*/Boerhavia pumilio/B spec. [or B. desc.]/Carpentaria Island e Dec. 6, 1802,” which seems certainly to be two branches of a witches-broom caused by *Albugo* infection (a common phenomenon in Pacific strand *Boerhavia*). It is rather condensed in habit, but not as much as some others; leaves small 6 × 4 mm; but flowers abnormally large, 5–10 mm long, possibly because the perianth limb persistent on the perigone, continued to grow.

5. On the same sheet with No. 4 are 2 sterile branches, designated “ γ axillaris,” of a large-leaved

plant, that look like sterile branches of *B. diffusa* L. No locality is given unless the same as that of var. e [4, above], "Carpentaria Island e," which is on a label that could apply to both specimens. On the γ *axillaris* label is "Ramuli petioli" and "venis . . . folia pulvero-pubescentes" and in the field notes "axillaris Foliis planiusculis majoribus umbellis rubra ramis solitariis caulo angulato? An distincta species? an *B. diffusa* Lin.?" "Ora orientalis" [= East Coast?].

6. A specimen (*Brown 44*) from Keppel Bay, 10–14 September 1802, is a plant with subglabrous stems branched at base from a heavy root-crown, with ovate-oblong obtuse leaves and axillary, filiform, almost hair-like cymes with a few umbellate flowers at their tips. In some leaf axils, in addition to the cymes, there are axillary branchlets bearing more cymes. The stamens are described in the notes as "2." The capillary cymes of this specimen bring to mind plants of the high islands of the Pacific, such as Hawaii and the Marianas, which have frequently been called *B. mutabilis* R. Brown, but which have conspicuously acute leaves, rather than obtuse as in this specimen. A Robert Brown specimen without data in Leningrad corresponds to this one.

7 and 8. On a sheet labeled "*Boerhavia mutabilis* ∂ *glandulosa*" "Northumberland Islands Sept. 30, 1802" are two series of fragments. A diagnosis in the field notes says "foliis undulatis glanduloso." Number 7 (the upper row) labeled as above, is of 6 pieces, very stunted, witches-broom-like, congested, with leaves ovate, about 1 cm long, short pubescent. Number 8 (the lower row) is of 5 larger fragments, not so congested, and are merely labeled "Carpentaria." The leaves are larger, more broadly ovate, conspicuously undulate, notably short-pubescent, acute to obtuse, mucronate, with axillary cymes shorter than the leaves.

The "glands," abundant on both series, but more so on the upper pieces (No. 7), are sessile black dots that seem to be fruiting pustules of a fungus. The description in the field notes (1 October 1802) is rather full, but does not mention the "glands." It describes the flowers as on subaxillary peduncles, "1–2 floris," limb campanulate, stamens 2, style filiform, equaling the stamens.

This plant does not exactly resemble anything I know, but I am sure it is strongly affected by a fungus.

Through the kindness of Dr. J. B. Marshall of the British Museum Herbarium, material from these two series was submitted to the Mycological Institute at Kew. Their report (3 August 1973) is as follows:

Dr. Sutton confirms that fungal mycelium is present in the leaf tissues of the two collections of *Boerhavia mutabilis* var. *glandulosa* (IMI 177418 and 177419). However, it does not appear to be consistently associated with the occluded cells and it appears unlikely that the latter condition is the direct result of fungal infection. It is not possible to identify the mycelium without other vegetative structures or reproductive organs.

The mention of "occluded cells" does not refer to anything observed by me, nor is it clear why the black dots or pustules were not mentioned.

In addition to the specimens collected by himself, Brown apparently had available a sheet presumably collected by Banks and Solander at "Nova Cambria: Bustard Bay, 1770" (Solander's hand, according to J. B. Marshall and Groves). This seems to be a very wilted and crumpled specimen of *B. diffusa* L., with a paniculate inflorescence. In addition to filling out, somewhat, Brown's concept of his *B. mutabilis*, this sheet indicates that the weedy *B. diffusa* had reached Australia in pre-European times.

This account of the protologue of *Boerhavia mutabilis* shows that Brown's concept of his species was most inclusive, as well as indicating how appropriate was the epithet "*mutabilis*." To clarify the application of the name, according to modern standards, a lectotype must be chosen from among the diversity of specimens.

Brown gave no indication of what he thought was his species, *sensu stricto*, unless the "A desc." on sheet no. 3 is an indication, along with his indications of "B. desc." on sheet no. 4 and γ and ∂ on sheets 5 and 7–8. Whoever noted sheet no. 1–3 as type presumably thought so. Brown's brief description in the *Prodromus* (1810:422) is of little help.

Most of these specimens are either too fragmentary or too abnormal (because of fungal attack) to be easily associated with known taxa. Sheet no. 2, *Brown 10*, is clearly *B. diffusa* L., with a diffuse panicle and large undulate leaves.

Since the application of the name is not at all clear from Brown's published description and since his specimen, *Brown 10*, is the one most clearly referable to a known species, it seems entirely

proper to dispose of this troublesome name, *Boerhavia mutabilis* R. Brown, by choosing *Brown 10* as its lectotype, which is hereby done. It is not yet possible to dispose of all the remaining specimens in Brown's protologue except as indicated in the discussion of these specimens above. *Boerhavia mutabilis* R. Brown (1810) now becomes a taxo-

nomic synonym of *Boerhavia diffusa* L. (1753), and need no longer be used.

The only tenable alternative would be to choose sheet no. 6, *Brown 44*. This seems less advisable as its leaf characters are fairly different from those of the plants that at times have been referred to *B. mutabilis*.

4. *Boerhavia repens* Group

Perhaps the most taxonomically refractory group in the genus *Boerhavia* is composed of an indeterminate number of taxa of seacoast and arid-land plants with basically axillary inflorescences, and 5-ribbed clavate fruits. They are mostly prostrate, with elongate stems, often forming loose or dense mats. In some forms the leaves become gradually reduced in the most distal parts and the branching appears paniculate, lateral branches developing on alternate sides, and what appears to be a main axis is strongly zig-zag. The peduncles, however, are still axillary.

This is, as presently understood, an Old World group, extending from Africa to throughout Polynesia. It may be closest to the New World *B. coccinea* and its relatives, as these usually bear some axillary peduncles and have clavate, usually glandular anthocarps.

The taxonomy of the *B. repens* group is not yet understood. Several taxa seem reasonably clear. *Boerhavia repens*, sensu strictissimo, is African, originally from Nubia, but I have seen too little African material to define it to my satisfaction. Two Pacific species, *B. tetrandra* and *B. albiflora*, new species, seem fairly clear, but probably hybridize locally with related forms. They are treated below, along with a preliminary discussion of *B. repens* and two of its varieties. One additional variety (*B. repens* var. *pubescens*) is assigned above in the discussion of *B. mutabilis* Brown. More species and subordinate taxa remain to be clarified.

The members of this group have usually been treated as *B. diffusa* L., which however, is a plant with a terminal paniculate inflorescence (pp. 4-5). Dr. L. E. W. Codd of the Botanical Survey of South Africa, (1966:114, 121), working on African material, restricted *B. repens* to plants with axillary inflorescences.

Field studies in the Central Pacific, Micronesia, and on the Great Barrier Reef islands have turned up a widespread rather distinctive white-flowered plant of the *Boerhavia repens* L. relationship. In some islands where it occurs, it seems to be the only *Boerhavia* encountered. In other islands others occur, but little intergradation has been noticed. It is described below as *B. albiflora* Fosberg, new species.

Boerhavia repens L.

Boerhavia repens L., Sp. Pl. 3, 1753.

Herbaceous plant with thickened root and several prostrate stems radiating from the root crown, sparingly to much branched; leaves mostly ovate to oblong, obtuse to acute at apex, rounded to truncate to subcordate at base, shortly petiolate, blade usually pale or even white beneath, green above; flowers borne in axillary pedunculate cymes or pseudo-umbels, usually from alternate axils, the peduncles appearing to be crowded aside from the axil proper by the growth of an axillary branch, which very soon bears axillary cymes, leaves often reduced distally, creating a paniculate appearance, but with a clear central axis; peduncle branched only near tip, branches umbellately or subumbellately branched, each branch ending in a glomerule of flowers, or the branch system reduced to a single umbellate to glomerate cluster of flowers, or the peduncle bearing one pair of leaves and a glomerate cluster of flowers; perigone strongly constricted below the middle, lower part glandular, 5-costate, upper part corolloid, campanulate, shortly 5-lobed; stamens 2-4, subequal with perigone; style also subequal; anthocarp clavate to ellipsoid, rounded at apex, 5-ribbed, very glandular.

A widespread Indo-Pacific and African species,

type from "Nubia inter Mocho & Tangos." This is a protean species most of whose varieties have not been clearly distinguished.

***Boerhavia repens* var. *maris-indici* Fosberg,
new variety**

Herba prostrata internodiis 1–2 (–5) cm longis, radice gracile fusiformis striatis, foliis parvis 2 × 1.5 cm basibus truncatis vel subcordatis, apicibus obtusis pedunculis axillaribus subumbellatis gracilibus, floribus glomeratis, anthocarpiis ellipsoidiis vel clavatis.

Root narrowly fusiform, stems prostrate, puberulent, internodes mostly 1–2 cm long except toward base where they may be up to 5 cm, striate; leaves small, mostly about 1–1.5 × 0.7–1.0, rarely up to 2 × 1.5 cm, becoming smaller distally, base truncate to subcordate, apex obtuse or acutish, margin often somewhat crispate, upper surface green, minutely glandular puberulent, lower pale, with about 3(–4) veins on a side, intricately and deeply rugose when dry, petiole slender, up to 1 cm long; peduncles very slender, 2–3, rarely up to 4 cm long, subumbeloid to rather irregularly branched above, puberulent, flowers glomerate to sub-openly arranged; bracts lanceolate; perigone with ribs smooth or somewhat glandular, intervals glandular, limb puberulent without, 1.5–2 times as long as lower part, whitish to purple, campanulate; stamens 4(–5), subexserted, anthers with cells orbicular; style subexserted, stigma discoid, peltate; anthocarp ellipsoid to somewhat clavate, 2.5–3 mm, shortly pedicellate to subsessile, more or less glandular with shortly stalked glands.

This variety is similar in habit to *Boerhavia repens* var. *minor* Delile, (1824:119–120, pl. 3), described from Egypt, but which differs in that each axillary peduncle seems to be composed of 2 internodes, with a pair of leaflike bracts at the node between them.

A number of the cited specimens, e.g. *Renvoize 1315*, *Gwynne & Wood 1258*, *1185*, *1211*, and *Veevers-Carter 21*, have all or most of the peduncles on small lateral branches rather than on the main trailing stems. In this they suggest var. *minor* Delile. Also a number of collections, *Fosberg 52146* from the Seychelles, *Gwynne & Wood 1330* from Assumption, *Stoddart & Poore 1240* and *Fosberg 49806* from Cosmoledo, *Stoddart & Poore 1300*, *Fosberg 49732*,

Fosberg 49677 from Astove, and *Fosberg 49551* from Aldabra have the leaf margins crisped somewhat as in *B. crispifolia*. This could indicate some gene exchange between the two.

The anthocarps are rather variable both in shape and degree of glandularity, occasionally approaching those of *B. crispifolia*. The glands are mostly stipitate, however.

SPECIMENS EXAMINED

ALDABRA.—s.l. *Abbott* in 1892 (US). Mentor I.: *Frazier 4* (US, K); *Renvoize 1315* (US); small islet in lagoon W of mouth of Gionnet Channel, *Fosberg 49551* (US).

ASSUMPTION.—*Stoddart 1081* (K); *Gwynne & Wood 1330* (EA), close to *B. elegans* in leaf form; near settlement, *Stoddart 1062* (K) (atypical but specimen scrappy); center of island, *Frazier 759* (US).

COSMOLEDO ATOLL.—Menai Island: S of settlement, *Stoddart & Poore 1240* (K, US); *Gwynne & Wood 1258* (EA). Wizard I.: *Thomasset* in 1902 (K); central part of Wizard I., *Fosberg 49806* (US, K), *49792* (US, K); *Renvoize 1226* (US, K).

ASTOVE I.—*Ridgway 21* (US); *Veevers-Carter 21* (EA); *Fryer 9* (K); *Gwynne & Wood 1314* (K, EA); N of settlement, *Stoddart & Poore 1294* (K, US); *Renvoize 1187* (US, K); Grand Anse, *Fosberg 49677*, *49732*, *49702* (US, K).

SEYCHELLES.—Cousin Island: NE corner, *Fosberg 52145* (US), *52146* (US); Roche Canon, *Fosberg 52077* (US).

FARQUHAR ATOLL.—North I.: *Gwynne & Wood 1185* (EA) (as *B. coccinea*). Farquhar (South) I.: *Gwynne & Wood 1211* (EA).

AMIRANTES.—Remire I.: *Gwynne & Wood 877* (EA), *886* (EA) (very young). Iles Africains: Southern Is., *Stoddart & Poore 1431* (US, K). Des Noeufs I. *Vesey-Fitzgerald 5807* (K, 2 sheets) ("tuberous roots fed to pigs").

Heimerl, in Schinz (1897), refers Voeltzkow 34 (not seen) to a *Boerhavia diffusa* var. *eudiffusa* Heimerl f. *psammophila* Heimerl, possibly proposed in the place cited. I have not seen this specimen and hesitate to refer it definitely here, but from the brief remarks about it, that it has a leafy prostrate stem and axillary inflorescences, it likely belongs here. The uncertainty leads me to give my plants a new epithet rather than changing the rank of Heimerl's epithet.

***Boerhavia repens* var. *minor* Delile**

Boerhavia repens var. *minor* Delile, Descr. Egypte, vol. 19 (Histoire naturelle): 119–120, Atlas pl. 30 (by Redoute), 1824.

Two or 3 glandular clavate-ellipsoid anthocarps on a bibracteate axillary peduncle. The 2 opposite

bracts are like reduced leaves about half-way up on the peduncle. One cyme at a node, alternating sides, rarely the peduncle branched, with 2 cymelets. Opposite axil has a semi-abortive inflorescence or branchlet. Leaves unequal at a node. (Description drawn from Redoute plate, cited above.)

Codd (1966:121) regards this as synonymous with var. *repens*. The bracteate peduncles seem to justify maintaining var. *minor* for the time being, until more ample African material can be studied.

***Boerhavia repens* var. *pubescens*
(R. Brown) Fosberg**

Boerhavia pubescens R. Brown, Prodr. 422, 1810.

For transfer and discussion see pages 5 and 6.

***Boerhavia tetrandra* Forster f.**

Boerhavia tetrandra Forster f., Prodr. 2, 1786; Pl. Esc. ins. Oc. Austr. 41, 1786.—Vahl, Enum. 284, 1894.—de Candolle, Prodr. 13(2):456, 1849.—Guillemin, Ann. Sci. Nat. Bot. series 2, 7:190–191, 1837.—Heimerl, Ann. Cons. Bot. Genève 5:188, 1901.—Setchell, Carn. Inst. Wash. Pub. 341:249–250, pl. 33B, 34A, B, 1924.—Taylor, Plants of Bikini, 176–177, 1950.

Boerhavia diffusa var. *tetrandra* (Forster f.) Heimerl, Beitr. Syst. Nyct., 27, 1897.

Forster's plant was from the Society Islands and his short description from the *Prodromus* (1786:2) follows: "5 *B. tetrandra*, caule repente, floribus tetrandris. F. Ibidem."

I understand this to be a common, widespread, fairly characteristic plant recognizable by its rather long slightly arcuate internodes, firm, usually oblong or elliptic leaves not much tending to reduction distally, and axillary strong erect peduncles usually umbellate or (in bud) glomerate, at summit, the rays either ending in single pedicellate flowers or more usually in secondary umbels with raylets ending in single or more rarely 2 or 3 flowers, not ordinarily glomerate, and with limb of perigone clear pink, campanulate, margin spreading, scarcely lobed, almost like a diminutive morning-glory flower in appearance.

The Forster specimen at the British Museum, a photo of which was kindly sent by the then Director, Sir George Taylor, fits this concept quite well, as do the manuscript description by Forster quoted by Guillemin (1837:190–191), and the descriptions

by Setchell (1924:249–250) and by Taylor (1950:176).

Herbaceous prostrate plant with several to many elongate stems from a thickened root or cluster of such roots, stems branching, tending to form very loose mats, internodes up to 8 (–10) cm long, tending to be slightly arcuate; stems and leaves glabrous or minutely appressed puberulent or even rarely densely short-pilosulose, especially the young growth, tending also to be reddish; leaves rather thick and firm, oblong or elliptic, to almost orbicular, more rarely somewhat ovate or obovate, entire, base rounded to subcordate, apex rounded to emarginate, lower surface very pale, veins 4 or 5 on a side tending to be rather obscure, petiole 5–7 mm, rarely 10–11 mm long; peduncles strong, erect, up to 10 cm tall, either umbelloid or a single small cluster of flowers at summit, branches with one or several flowers, these in open clusters rather than close glomerules, flower about 4 mm long; perigone pubescent, with stalked glands especially on ridges of lower part, limb campanulate with margin spreading, only shallowly lobed, pink; stamens (2–) 4 or 5, filaments straight to somewhat curved, anthers with 2 orbicular cells apparently opening while still in bud; style straight to somewhat curved, stigma peltately capitate; anthocarps clavate to oblong, 5-ribbed, glands especially on ribs, apex rounded to subtruncate.

This species is known to me principally from low coral islands—atolls and barrier reef islands around high islands. I have seen it from the Marshalls, Gilberts, Phoenix Islands (Hull Atoll only), Line Islands, Rose Atoll, Swain's Isand, Flint Island, Society Islands, Austral Islands, and the Tuamotus. Some Hawaiian specimens may belong here, but their final disposition must await study of the Hawaiian boerhavia as a whole.

SPECIMENS EXAMINED

LINE ISLANDS.—Washington I.: N side, *Long 1845* (US); SW road about 1.5 mi [2.4 km] E of village, *Long 2824* (HAW, US); S road, 1 mi [1.6 km] E of village, *Long 2826* (US).

Palmyra Atoll: s.l., *Long 1814* (US), *1788* (US); *Rock 10273* (NY, US); *Judd & Mitchell 12* (NY); islet directly N of W channel, *Long 2832* (US); S side of runway $\frac{3}{4}$ mi [1.2 km] from the W end of runway, *Long 2864* (US).

Christmas Island: *Bergman 9* (NY), *11* (US).

CENTRAL PACIFIC ISLANDS.—Howland I.: *Bryan 1307* (NY) (unusually small, broadly ovate, obtuse to acutish leaves firm); *Judd and Mitchell 155* (BISH) (some glands in furrows as well as on ridges),

Jarvis I.: *Bergman 56* (NY) (flowers purple, 2(-3) stamen).
Tongareva Atoll: *Cocos* grove, *Long 3125* (US), *Long 3127* (US), *Long 3138* US; island N of the NW passage, *Sibley (Long's) 3173* (US).

Vostok Island: *Long 3191* (US), *3202* (US), *3208* (US).

PHOENIX ISLANDS.—Hull Atoll: S leg of E Islet near W end, *Fosberg & Stoddart 54820* (US).

Gardner Atoll: S side of Main Channel, *Fosberg & Smith 55777* (US).

SOCIETY ISLANDS.—s.l. *Forster* (BM, type). Tahiti: Tautira District: beach, *Nadeaud 322* (G). Scilly Islands: Motu Roa, *Quayle 232* (US). Tetiaroa Atoll: Motu-Aie, *Fosberg & Sachet 54624* (US, NY).

COOK ISLANDS.—Aitutaki: Akitua, *Stoddart 2222* (US); Motukitui, *Stoddart 2342* (US); Tavaema, Motu, *Stoddart 2345* (US).

AUSTRAL ISLANDS.—Raivavae, *Whitney Expedition 298* (US).

Tubuai I.: Tapapatauai I., 1 m, *St. John 16404* (NY, 2 sheets).

Maria Atoll: Middle I., *Fosberg 12121* (NY); S.E. Islet, *Fosberg 12071* (US).

TUAMOTU ARCHIPELAGO.—Tatakoto Atoll: *Chapin 809* (NY) (unusually short and bushy); *808* (NY) (normally elongate).

Hao Atoll: *Chapin 819* (NY); *Barclay 3260* (US) (as Bow I.).

Rangiroa I.: *Moore 196* (US).

Raroia Atoll: *Doty & Newhouse 11111* (US, NSW), *11172* (US), *11007* (US).

Oeno Island: *St. John & Fosberg 15191* (US).

MARSHALL ISLANDS.—Eniwetok Atoll: Rujoru I., *St. John 23806* (US); Rigili I., *St. John 23747* US; *Rainey* s.n. (US); Bogon I., *St. John 23761* (US); Igurin I., *Fosberg 24306* (US, BISH, NY); Bogombago I., *Taylor 46-1307* (US, G).

Bikini Atoll: Eniirikku I., *Taylor 46-1030* (NY), *46-1034* (US, BM); Airukiraru I., *Taylor 46-1152* (NY, BM, G); Ailinginae, Sifo I., *Fosberg 36685* (US, BISH, Fo).

Rongelap Atoll: Rongelap I., *Fosberg 36653* (US, BISH, Fo); Kabelle I., *Fosberg 36668* (US, BISH, Fo); Gegen I., *Fosberg 36729* (US, BISH, Fo); Rigonman I., *Taylor 46-1376* (US, NY).

Utirik I.: *Fosberg 33644* (US, BISH, NY) (somewhat paniculate).

Taka Atoll: s.l., *Amermon (Long's) 2921, 2938, 2941* (all HAW); Taka I., *Fosberg 33746* (US, NY); Watwerok I., *Fosberg 33761* (US, BISH, NY).

Jemo Island: *Fosberg 33881* (US, NY).

Likiep Atoll: Aikini I., *Fosberg 27058* (US, BISH, NY) (fls. pink); *Fosberg 27057* (US, BISH, NY) (fls. white); *Fosberg 27006* (US, BISH, NY) (fls. pink).

Lae Atoll: Bikenaj I., *Fosberg 34074* (US, BISH, NY); *Fosberg 34076* (US, BISH).

Ujelang Atoll: Bokan I., *Fosberg 34163* (US, BISH, NY).

Wotho Atoll: Wotho I., *Fosberg 34277* (US, BISH).

Ujae Atoll: Bock I., *Fosberg 34320* (US, BISH, NY).

Kwajalein Atoll: Enewetok I., *Fosberg 34136* (US, BISH, NY).

Arno Atoll: Arno I., *Stone 1103* (US); *Hatheway 802* (US, BISH, Fo); Enirik I., *Anderson 3742* (US, NY), *3731* (US, NY).

Namorik Island: *Betche* in 1881 (NSW).

Jaluit Atoll: *Schnee* in 1902 (NSW); Mejatoo I., *Fosberg 41418* (NY, US).

GILBERT ISLANDS.—s.l., *Woodford* in 1884 (BM); *Jensen* in 1878 (BM).

Onotoa Atoll: *Moul 8202* (US) North I., *Moul 8151* (NY, US); Tabuarorae I., *Moul 8223* (NY, US).

Butaritari Atoll: Butaritari I., W end of island near Uki-angang Village, *Herbst & Allerton 2747* (US).

Tarawa: Bikenibeau, *Catala 27* (P); near Teachers Training College, *Sachet 1443* (US); Ranapa, between Bairiki and Bikenibeu, *Sachet 1424* (US).

Marakei Atoll, *Adair 189* (US).

SWAIN'S ISLAND.—*Whistler W3382* (US).

SAMOA.—Rose Atoll: center of island few yards north of monument, *Harris 303* (BISH), *304* (NY) (leaves small broad, slightly emarginate, cymes axillary, unusually short, slender); *Swerdloff & Needham* in 1970 (US); *Schultz 24* (US).

Boerhavia albiflora Fosberg, new species

Planta herbacea, caulibus pluribus prostratis pallide- viridibus, foliis formis variis infra pallidis, pedunculis axillaribus apice umbelliformis, floribus albis glomeratis limbo perigonio campanulato, staminibus plerumque 2, filamentis styloque valde curvatis, antheris stigmatique leviter exsertis, anthocarpio ellipsoidale vel plus minusve clavato 5-sulcato sulcis valde glandulo-pubescentibus.

Herbs with several to many long, pale green, creeping stems radiating out from a very thick (up to 8 cm) root-stock; leaves broadly oval, obtuse, dull green above, white beneath, tending to become smaller distally and more ovate, 4 or 5 pairs of veins, each leaf tending to produce a leafy branchlet in its axil, the branchlets at successive nodes on alternate sides developing, with a very reduced vestige on the other side; on the same side as the branchlet but off to one side a long stout peduncle, or a scar of one; peduncle to 12 cm, with an umbeloid summit, branches usually 5, of different lengths, each branch subtended by a subulate bract, and with several much reduced branches in a tiny umbel at its summit, each of these with a small glomerule of 4-10 or more sessile flowers or fruits; perigone with lower segment 5-sulcate with glandular pubescence principally in the furrows, ridges tending to be mucilaginous, upper segment white, campanulate, with 5 emarginate lobes, externally puberulent especially in tiny tufts of hairs at summits of lobes; stamens 1-3, mostly 2, with strongly curved filaments and orbicular anther cells, anthers slightly exserted; style curved, making the flower appear

somewhat zygomorphic, stigma slightly exerted; anthocarp ellipsoidal to slightly obovoid, narrowed toward apex, then rounded-subtruncate, pentagonal in cross-section, with 5 costae, strongly glandular pubescent, especially in furrows, sticky.

This is the principal species found in the Phoenix Islands and is very abundant there. It extends northward and westward in the Marshall Islands and to Wake Island, southward and eastward through the central Pacific islands, and also occurs on the southern islands of the Great Barrier Reef. In all this range, except for the degree of reduction of the leaves distally and the strength of the tendency toward paniculate inflorescences distally, there is surprisingly little variation. One specimen, *Long 2612* (US) from Phoenix Island, with flowers pink, leaves scarcely exceeding 12 mm in length and stems rather densely short puberulent, probably belongs here, as it has flowers with tufts of puberulence at top of upper perianth, 2 stamens, and glands mainly in grooves of anthocarp. The plants from Wake Island and the northern Marshalls have a characteristic leaf shape and may be treated as a geographical variety. It is newly described below as var. *powelliae*. The collections, cited below, from Malden and Starbuck islands tend to have 3 or even 4 stamens and in this respect are intermediate with *B. tetrandra*. The glands tend to be on the sides of the furrows in the Malden plants.

Boerhavia albiflora* Fosberg var. *albiflora

Described above.

HOLOTYPE.—*Fosberg & Stoddart 54748* (US), Enderbury Island.

SPECIMENS EXAMINED

GILBERT ISLANDS.—Onotoa Atoll: South Island, *Moul 8198* (GH); North Island, *Moul 8340* (GH), N end North Island, *Moul 8084* (US).

PHOENIX ISLANDS.—Canton I.: s.l., *Shultz 21* (US); s.l., *De-gener & Hatheway 21313* (US); *Browne* in 1939 (BISH); around Air Base, *Fosberg & Walker 30207* (US); around Pan-American Hotel settlement, *Fosberg 30883* (US); area back of docks, *Fosberg & Stoddart 54892* (US).

McKean I.: on E rocky slopes, *Long 2030* (US); on the NW beach, *Long 2046* (US); on the SW end on the inner slope, *Long 2041* (US); on the W side of the lagoon, *Long 2034* (US); NW side, *Long 2428* (US); near SW end, *Long 2439* (US); on the inner NE side of lagoon, *Long 2443* (US); S side of island, *Fosberg 55795* (US); W side of island, *Fosberg 55788* (US).

Birnie I.: s.l., *Fosberg & Stoddart 54724* (US).

Phoenix I.: SW side, *Long 2622* (US); N side, *Long 2077* (HAW); E side, *Long 2081* (US); midwest rim above lagoon, *Long 2083* (US); S end, *Long 2087* (US); W of N end of lagoon, *Fosberg & Stoddart 54762* (US); SW shore of island, *Fosberg & Stoddart 54767a* (US), *Fosberg & Stoddart 54768* (US); S margin of lagoon, *Fosberg & Stoddart 54770* (US).

Enderbury I.: inside U. S. Air Force Station enclosure, *Fosberg & Stoddart 54747* (US); in center of flats near N end of island, *Fosberg & Stoddart 54759* (US); nearby U. S. Air Force Station enclosure, *Fosberg & Stoddart 54748* (US, holotype, BISH, A, K, BM, L, G, NY, UC, TI, BO, BRI, P, B, F, S, isotypes).

Gardner Atoll: 'Gardner Isld.' U. S. Expl. Exped. (GH). (Leaves small, ovate or oblongish, cymes rather slender, axillary, ending in a single glomerule. No color given); SE end of lagoon, *Fosberg 55761* (US); W coast somewhat inland, *Fosberg 55772* (US).

Hull Atoll: s.l., *E. H. Bryan Jr. 53* (US); small islets on N reef, *Fosberg & Stoddart 54832* (US); near middle of S leg of East I., *Fosberg & Stoddart 54823* (US).

Sydney Atoll: S side of atoll, lagoon shore, *Fosberg & Stoddart 54864* (US); back of abandoned Gilbertese village site on W side of island, *Fosberg & Stoddart 54859* (US); in abandoned Gilbertese village, W side of island, *Fosberg & Stoddart 54854* (US); SE shore of lagoon, *Long 2588* (US); SW side of island, *Long 2580* (US).

Vostok Island: *Long 3204* (US), *3203* (US); *Anderson* in 1935 (US).

Malden Island: SW side, *Long 3382* (US); S side, *Long 3385* (US).

Jarvis Island: 6 m, *Bergman 52* (US); *Bryan 1388* (BISH).

Starbuck Island: s.l., *Long 3302* (US); N peninsula, *Long 3319* (US), *3300* (US); E end, *Long 3307* (US); W beach, *Long 3351* (US).

AUSTRALIA.—Queensland: Capricorn Is., Heron Island, *Fosberg 55063* (US).

***Boerhavia albiflora* var. *powelliae* Fosberg,
new variety**

Foliis anguste ovatis vel lance-ovatis valde acutis vel acuminatis.

Leaves narrowly ovate to lance-ovate, apices very acute to acuminate.

Named for Miss Dulcie Powell, who has made a great many dissections of these difficult flowers.

SPECIMENS EXAMINED

WAKE ISLAND.—U. S. Expl. Exped. (GH); Wake Islet, *Fosberg 34947* (US), *34454* (US).

MARSHALL ISLANDS.—Bikini Atoll: Bikini Is., *Taylor 46-1052* (US, A); *Taylor 46-1097* (US, A); Namu I., *Taylor 46-1117* (US); Rongerik Atoll: Enyvertok I., *Taylor 46-1432* (US, A);

Eniwetok Atoll: Araanbiru I., *Taylor 46-1337* (US); Japtan I., *Taylor 46-1295* (US); Eniwetok I., *Fosberg 36700* (US); Rongelap Atoll: Kabelle I., *Fosberg 36670* (US); Gegen I., *Fosberg 36728* (US, holotype).

Boerhavia aff. *albiflora*

A group of specimens from the Hawaiian Islands—Laysan Island, *Long 2360* (US), *2390* (US), *2388*

(HAW), *Young 147* (US), and Oahu, *Fosberg 27127* (US)—approach this species in their white or whitish flowers and few stamens, also in having the glands mostly in the furrows of the lower part of the perigone. In habit they are rather diverse and are, for the present, excluded until the Hawaiian *Boerhavia* population can be studied as a whole.

5. *Boerhavia rubicunda* Steudel and Somewhat Similar Species

One of the most distinctive species of *Boerhavia* subgenus *Boerhavia* is an Asian-African species that has usually been called *Boerhavia elegans* Choisy, indeed an appropriate, even if incorrect, name for it. It does not seem particularly related to any of the other species known to me, though one species, described here as *Boerhavia crispifolia* Fosberg has been confused with it. The fruits of the two show considerable similarity, also with those of *Boerhavia herbstii* Fosberg, also described below. These are not similar enough to be called a "group" in the sense used above for the *Boerhavia repens* group, as their similarity principally lies in the form and indument of their anthocarps. It is convenient to treat them here together for comparative purposes. Technically, *B. rubicunda* Steudel (*B. elegans* Choisy) falls into *Boerhavia* sect. *Singuliflorae* Heimerl, although I am by no means certain that it is closely related to the American members of that section.

The nomenclature of *Boerhavia rubicunda* illustrates the difficulty of writing a code of rules that is universally satisfactory. The name *Boerhavia elegans* Choisy is accompanied by a reasonably well-prepared and adequate description. However, Choisy (1849:453) cited the somewhat earlier name *Boerhavia rubicunda* Steudel (1840:213) as a synonym. Examination of the original publication of this latter name shows that the only descriptive information accompanying it is the symbol \mathcal{L} , explained by him as meaning "perennial." A specimen "Arab. fel. *Boerhavia* nr. 744 Herb. arab. un it." is cited that is certainly the same Schimper collection cited by Choisy for *B. elegans*. This is borne out by two sheets of this collection, one in P, the other in US with "Herbarium Steudel" written on the upper margin of the label and named *Boerhavia rubicunda* Steudel.

This symbol is certainly not an adequate description. However, the International Code of Botanical Nomenclature, Art. 32, dealing with conditions for valid publication requires only a "description," not necessarily an adequate one. I see no way to avoid regarding *B. rubicunda* as validly published, and no way to avoid using it as the correct name for the species under discussion, since its type is known and identifiable. There is also no way to avoid considering *B. elegans* Choisy as superfluous and illegitimate as Choisy did not take up the earliest available epithet.

Boerhavia rubicunda Steudel

Boerhavia rubicunda Steudel, *Nom.*, ed. 2, 1:213, 1840.—Heimerl, *Beitr. Syst. Nyctag.*, 28, 1897 [type: Arabia Felix, Montis Sedder, *Schimper 744* (P)].

Boerhavia elegans Choisy, in A. de Candolle, *Prodr.* 13(2):453, 1849 [nom. superfl. illegit.].

Erect herb, or suffrutescent below, to at least 90 cm tall, branching at base from a woody root crown, stems appearing more or less glaucous, this appearance reinforced by short incurved puberulence, especially in lower parts, basal part of stem gnarled with stubs of branches; leaves mostly basal and at several nodes, cauline somewhat smaller, sometimes with small ones singly or fascicled in axils, blades ovate to oblong, subfleshy or subcoriaceous, 1–1.5 cm × 0.6–1.0 cm, apex acutish to obtuse and apiculate, base obtuse to subcordate, both surfaces more or less gray-scurfy and puberulent, nerves obscure, about 3–5 on a side; petiole short, slender; upper ½ or ¾ of plant paniculate, leafless, branches gracefully spreading, curving-divergent, repeatedly, up to 8 or even 12 times, dichotomous but tending in each fork to have a long capillary pedicel bearing a flower, outer

branches of a dichotomy tending to become more divergent than inner; pedicels about 1 cm long, perigone 2–3 mm long, constricted about $\frac{1}{3}$ the way up, appearing less strongly constricted than usual in the genus, but actually strongly but extremely abruptly constricted, limb narrowly campanulate, pink or striped with red especially on lower part, more or less pubescent especially at or above tips of stripes, rarely (one sheet of *Schimper 744*) glabrous, lower segment of perigone obovoid, with 5 glabrous ridges, grooves between them slightly to densely puberulent, not glandular or with sessile glands only; stamens 3, sometimes 4, rarely 5, filaments straight to somewhat curved, anthers exerted, suborbicular, when dehisced appearing didymous; style with a strong curve in the middle or rarely straight, longer than stamens, stigma capitate, exerted; anthocarp about 4 mm long, clavate to ellipsoid, round at apex, with 5 heavy, rounded, glabrous ridges, grooves puberulent or glandular with subsessile glands, in age glabrate, many conspicuous white raphide bundles in grooves.

The superficial resemblance of this species to a number of species of the western American genus *Eriogonum* (Polygonaceae) is remarkable.

Ranges from India and Pakistan to Iran, Arabia and eastern Africa. The plants are rather poorly separable into two varieties, var. *rubicunda* from mostly rather low elevations mostly near the coast, from Iran to Africa, and var. *stenophylla*, almost entirely at higher elevations from India to Iran, and very rarely from Arabia. Many of the labels give localities that are hard to locate, and some may be variant spellings.

Boerhavia rubicunda* Steudel var. *rubicunda

This is as described above. Its leaves are ovate to oblong or even obovate, gray, margins tending to be somewhat wavy, pedicels tending to be about 1 cm long.

SPECIMENS EXAMINED

IRAN.—M. Gazy Manzal [Gazeh Manzil or Minzil] on Rud-e-Kaju, branch of Silop [or Selup] River, about 55 km N of Chahbakar, *Gadde 64* (LE, 2 sheets); Baluchistan, Zahedan Province, 18.5 mi [30 km] NE of Geh (=Nikahaht), road to Qasrqad, c. 1600 ft [490 m], *Gray-Wilson & Hewer 302* (K).

ARABIA.—Arabia Felix: "In rupibus montis Sedder, *W. Schimper 744* (type collection of both *B. rubicunda* and *B. elegans*, P, holotype, 3 isotypes, US, 2 sheets, L, 4 sheets, LE,

GH, NY, BM, all isotypes); Shugra, *Schweinfurth 112* (US, in part). Oman: s.l., *Jayakar s. n.* (BM); Muscat (Maskat), Mutrak in Wadi, 50–100 ft [15–30 m], *Waring* in 1958 (K); Muscat, *Bent 14* (K); from Hameira (near Shinas) to Ajib, *Fernandez 838* (K), *2314* (K), *2320* (K). Aden: s.l. *Baudouin* in 1867 (P); *Balfour* in 1880 (K); *Perry* in 1878 (K); *Hooker 92* (K); *Thomson* in 1837 (K); *Yerbury 34* (BM); *Germain 2* (G); *de Marchesetti s.n.* (K); Khusaf Valley, 50–100 ft [15–30 m], *Waring* in 1958 (K); Goldmore Valley, *Schweinfurth 61* (BM, G, P 2 sheets); Steamboat Point, *Lunt* in 1893–4 (BM); Hadramaut, Jut, *Kerfoot 3058* (K); Hadramaut Wadi, north of Saiyun, 2000 ft [610 m], *Popov, Tillin & Gilliland 4158* (K). Hejaz: Jidda (Jedda, Djeddah) *Kruijt 199* (L, 2 sheets); 25 miles [40 km] NNE, *Trott 1259* (K). Not located on map: Djair et Khara, *Ehrenberg 137* (LE); Djara et Viara *Ehrenburg* in 1820–1826 (K) (perhaps same as foregoing); km 32 Mudhailif Bani Sharfa, *Mosnier 2938* (P); Ad regionem inferiorum Kefr et Sidi, *Fischer 159* (LE, 3 sheets, L, 2 sheets).

AFRICA.—Somaliland: 5 mi [8 km] west of Berbera, *Hemming 2337* (K); Guban, Berbera, *Courbon 388* (P); Busteh, 10 mi [16 km] inland from Berbera, *Bally* in 1957 (K), *11856* (G); Mt. Busteh, near Berbera, *Bally 7218* (G); Wagga Mountain, *Phillips* in 1897 (BM); Diddin Tug Valley, *Glover & Gilliland 721* (BM, K); Boundary road at Hormo (or Homo?), *Glover & Gilliland 936* (BM, K); "Chessala", *Courbon* in 1859–1860 (P), "Abyssinie: Golfe d'Adoullis" [=Eritrea: Dulla], *Courbon* in 1859–60 (P). Côte Française des Somalis: Aoussa (bord des lacs), *Chédeville 667* (P). "Junction of tugs, 44° 18' × 9° 57'," *Gillet 4346* (K) (leaves narrowly oblong, 2.5 × 0.6 cm, distributed on young sprouts, slightly smaller ones fascicled in axils; much like var. *stenophylla* but leaves somewhat broader and mostly rounded at apex, petioles to 5 mm, slender).

EGYPT (?)—Wady Rabdeit, Jebel Elba, *Shabstei F. 1728* (K) (very young plant, inflorescences not much developed, mostly in bud, 1–12 stems from branching woody caudex).

NIGER.—"Air-Greboun" "2005 N 0838 E," 3700+ ft [1130 m], *Davies 71* (BM) (sterile, a strong woody caudex much branched at top but plant grazed down to a few cm, stubs of branches covered with leaves that could be of this species, but this would be hard to prove).

If the latter two specimens are correctly identified, it suggests that *B. rubicunda* may extend much beyond its established range and that further collecting should be done in northern East Africa.

***Boerhavia rubicunda* var. *stenophylla* (Boissier) Fosberg, new combination**

Boerhavia elegans var. *stenophylla* Boissier, *Flora Orientalis* 4:1046, 1879.

Boerhavia elegans sensu Stewart, *Annot. Cat. Vasc. Pl. W. Pakistan* 233, 1972 [not Choisy in A. de Candolle, *Prodr.* 13(2):453, 1849].

Erect, leaves elliptic to lanceolate, prominent on cauline nodes, with fascicles of smaller ones in

axils; inflorescence very ample, to 30 cm high, 20 cm wide, open, branches with tendency to curve outward, up to 10 times ramified; pedicels 1–2 cm; anthocarp ellipsoid, ribs smooth, grooves whitish papillate, raphide bundles not noted.

Rajasthan to eastern Iran, and rarely eastern Arabia, tending to occur inland and at higher elevations than is usual for var. *rubicunda*.

"Folia anguste lineari-lanceolata" "Hab. in siccis Arabiae Mascatensis (Auch. 5250!) [corrected in pencil in British Museum copy to 5251]. *Beluschiae inferioris* (Stocks!)" (Boissier, 1879:1046).

SPECIMENS EXAMINED

INDIA.—Rajasthan: Jais al Mer Distr.: Mohanjar, *Wadhwa* 5060 (LE, L).

PAKISTAN.—Scind [=Sind]: *Stocks s. n.* (G, H, L, E). "Bel. Inferra" *E. Stocks* [in], 1851 (G–BOISS, syntype, lectotype; Baluchistan: Kargoshk Kah, coast, *Pierce* in 1880 (K); Kalat, Jhal Jhao to Awaran "mountain areas," *Lamont* 338 (RAW, G). Northwest Frontier Province: Bannu, Salt Range, *Rakman* 25871 (RAW). Hyderabad: Tandojam District: 1.5 mi [2.4 km] from Telephone Saebony, Rotai, *Jalis* in 1959 (RAW). Province not indicated on labels: Paniala Forest, Dera Ismail Khan [Northwest Province] *Monsi* 9 (RAW); 6 mi [9.7 km] from T. B. Khan on way to Hyderabad, *Qaisir et al.* 583 (KAR); 12 mi [19.3 km] from T. B. Khan, Northern Hills, *Qaisir et al.* 640 (KAR); 3 mi [4.8 km] Teejahban on way to Turbat, *Abedin & Hussain* 6052 (KAR), 6053 (KAR); 10 mi [16.1 km] before Mund, Turbat-Mund Rd., *Abedin & Hussain* 6241 (KAR); 2 mi [3.2 km] from Pasni on way to Turbat, *Abedin & Hussain* 6474 (KAR), 6488 (KAR); 10 mi [16.1 km] from Turbat on way to Awaran, *Ali et al.* 1540 (KAR, 2 sheets); 30 mi [48.3 km] from Turbat on way to Hoshab, *Abedin & Hussain* 6550 (KAR); 34 mi [54.7 km] from Awaran on way to Hoshab, *Qaisir* 797 (KAR); 1.5 mi [2.4 km] from Teejaban on way to Hoshab, *Abedin & Hussain* 6049 (KAR); 46 mi [74 km] from Thaljhush on way to Bela, *Abedin & Qaisir* 7493 (KAR), 7494 (KAR); Lau Pass, 8 mi [12.9 km] from Bela on way to Awaran, *Ghafoor & Qaisir* 1 (KAR); 17 mi [27.4 km] from Bela on way to Awaran, *Qaisir et al.* 747 (KAR); 30 mi [48.3 km] from Bela on way to Awaran, *Abadin & Qaisir* 7465 (KAR); 11 mi [17.7 km] before Awaran, Bela, Awaran Hills, *Ali et al.* 1450 (KAR); 8 mi [12.9 km] from Bela on way to Awaran, *Abedin* 2133 (KAR); 10 mi [16.1 km] from Sehwan on way to Jamshoro, *Farooqi & Qaisir* 2192 (KAR); 10 mi [16.1 km] from Hoshab on way to Panjgur, *Qaisir et al.* 1066 (KAR) 10 mi [16.1 km] from Nasurabad on way to Tump, Turbat-Mund Road, *Abedin & Hussain* 6176 (KAR), 6177 (KAR); 50 mi [80.5 km] from Mund on way to Suntsar, *Ghafoor & Qaisir* 243 (KAR); 21 mi [33.8 km] from D. G. Khan on way to Fort Munro, *Abedin & Hussain* 9643 (KAR), 9636 (KAR); 28 mi [45.1 km] from D. G. Kahn on way to Fort Munro, *Abedin & Hussain* 9661 (KAR); 16 km W of Bela, E side of Gan Pass, *Lamond* 294 (G); Bikaner, *Popov* G.P. 63/412 (BM).

IRAN.—Prov. Balucistan: inter Khash (Vasht, Kwash) et Iranshahr (Bampur), Montes Kawandar, 1500–1600 m, *Rechinger et al.* 3986 (G, BM, K).

ARABIA.—Arain, "Haidwan", *Philby* 23 (BM); Mascate, *Aucher-Eloy* 5251 (G–BOISS, syntype, US, BM, K, isosyntypes).

The following specimens have leaves somewhat broader than is typical for the variety *stenophylla*, but narrower than usual for var. *rubicunda*, otherwise as in var. *stenophylla*.

PAKISTAN.—S. of Prohdab, Mile 76, Nushki Road, 4000 ft [1220 m], *Crookshank* 141 (K); 3 mi [4.8 km] from Teejahban on way to Turbat, *Abedin & Hussain* 6054 (KAR), 6055 (KAR); 15 mi [24.1 km] from Teejahban on way to Turbat, *Abedin & Hussain* 6057 (KAR); 25 mi [40.2 km] from Teejahban to Turbat, *Abedin & Hussain* 6081 (KAR); 5.5 mi [8.8 km] from Mund on way to Turbat, *Ali et al.* 920 (KAR), 1068 (KAR); 33 mi [53.1 km] from Mund on way to Teeran Fezath, *Ali et al.* 1776 (KAR); 4 mi [6.4 km] before Hushab, Awaran-Hushab Road, *Ali et al.* 1461 (KAR), 1465 (KAR); 12 mi [19.3 km] from Hushab on way to Awaran, *Ghafoor & Qaisir* 74 (KAR); 34 mi [54.7 km] from Awaran on way to Hushab, *Qaisir et al.* 797 (KAR); 11 mi [17.7 km] before Awaran, Bela-Awaran Road, *Ali et al.* 1449 (NY, KAR), 1450 (KAR); 6 mi [9.7 km] from Thaljao on way to Awaran, *Abedin & Qaisir* 7474 (KAR).

Boerhavia crispifolia Fosberg, new species

Boerhavia elegans auct. Aldabrae [not Choisy, in A. de Candolle, Prodr. 13(2):453, 1849].

Herba gracilis puberula, radicem crassiuscula, caulibus pluribus, ascendentibus infra ramosis, distaliter sensim tenuiter paniculatis, foliis parvis tenuiter petiolatis margine crispatis, cymis axillariibus desunt, floribus parvis 3–6 glomeratis bracteolatis perigonio campanulato lobis emarginatis, staminibus 2–3(–4), curvatis, anthocarpio anguste elliptico 5-costato costis glabris apice rotundato intervalis glandulosis vel glabris albo-lineolatis.

Tap-root to 8 (–12) mm thick, branched to, rarely, nearly simple; several stems from slightly thickened root crown, prostrate to somewhat ascending, branched, especially near base, puberulent, grayish to white below, purplish distally, internodes from very short to rarely as much as 6 cm long in leafy portions, longer in lower part of inflorescence, stem leafy in proximal 5–30 cm, changing gradually or somewhat abruptly from leafy stems to rather bare panicle; leaves ovate to oblong, obtuse to acute, mostly under 10 × 5 mm, rarely to 20 × 10 mm, upper surface usually purplish, to brownish green, beneath pale, margins usually strongly crispate,

blades containing abundant cystoliths or crystals and a few raphide bundles, petiole 2–6 mm long, rarely longer; axillary cymes none, panicle slender, capillary or almost so distally, 10–30 cm long, puberulent, main axis with branches on alternate sides at alternate nodes in lower part, 2 leaf-like bracts at each lower node, distal nodes tending more and more to develop 2 branches, with axis tending to be reduced, bracts on distal nodes reduced to ovate ciliate scales; flowers sessile in glomerules of 3–6, subtended by ovate-lanceolate, glandular-ciliate, scale-like bractlets, central flower opening first; entire flower about 2.5 mm long, very strongly constricted, part above constriction campanulate to cylindrical, caducous, 1.5 mm long, puberulent, especially in distal half, which has longitudinally arranged raphide bundles, slightly lobed, tending to be erose or ciliolate at tips in bud, sinuses between the (4 or) 5 lobes glandular ciliolate, lobes emarginate; stamens 2–3(–4), slightly exerted, or included, filaments strongly curved, anthers broader than high, each half almost orbicular, both ends emarginate; style subequal with stamens, curved in upper part, stigma strongly depressed globose, (peltate); anthocarp or fruiting perigone narrowly ellipsoidal to subclavate, about 2 mm long, ends rounded to subtruncate, 5-ribbed, ribs broad, smooth, intervals glandular to almost or quite glabrous. Most parts of the plant are marked by white short-linear or elliptic raphide bundles, especially conspicuous in the flowering perianth and in the intervals between the ribs of the anthocarp.

This species is notably variable in habit, especially in the degree to which the inflorescence is developed, and in leaf size and shape. In flower and fruit morphology it is rather uniform, varying only in distribution and amount of puberulence on the flowering perigone, slightly in fruit shape, and considerably, from glabrous to densely but shortly glandular puberulent in the intervals between the ribs of the anthocarp. The crispate character of the leaf-margins is much more evident in living than in pressed and dried specimens.

SPECIMENS EXAMINED

ALDABRA.—West I.: near settlement, *Stoddart 965* (US); *Fosberg 49471* (US, K); inland from settlement near edge of mangrove, *Fosberg 48713* (US, K); Bassin Cabri, *Hnatiuk 731744, 731745, 731746, 731747, 731748, 731750, 731751, 731752, 731753, 731754* (all US).

Middle I.: Camp at Passe Gionnet, *Renvoize 1161* (US, K); East Channel, *Renvoize 1282* (US, K).

South I.: 0.7 km WNW Cinq Cases Camp, *Fosberg 49223* (US, K); near Cinq Cases Camp, *Fosberg 48873* (US, holotype, isotypes, K, MO, L); *Fosberg 48892* (US); *Fosberg 49188* (US), *Fosberg 48976* (US, K); *Renvoize 781* (US, K); *Hnatiuk 731936* (US); *Fosberg 49152* (US, K); 1–2 km south of Cinq Cases Dune, *Fosberg 49170* (US, K); *Fosberg 49171* (stems and leaves green, flowers white) (US, K); Takamaka, *Hnatiuk 731931, 731940, 731941, 731942, 731943, 731944* (all US); *Renvoize 868* (K, US); south of Takamaka, *Renvoize 1123* (K, US); Hadoul Point, *Renvoize 891* (K, US).

Common fairly generally on pitted limestone and coral gravel near the coast on South Island; on plain inland on West Island but rare.

ABNORMAL FORM

One plant of a strange *Boerhavia* (*Fosberg 48929*) was found that I do not understand. It seems almost like a caricature of a *Boerhavia*. In appearance it resembles a small prostrate *Euphorbia* of subgenus *Chamaesyce*, with fine, intricately branched stems, internodes 1 cm long or less, the entire plant about 20 cm across, more densely puberulent than *B. crispifolia*, purplish, the leaves like those of *B. crispifolia* in size and shape, but thinner and flat-margined, not noticeably crispate, to about 5 × 3 mm, bracteal ones reduced but still foliaceous, to about 3 × 1.5 mm; inflorescences not strongly distinct from vegetative part of plant, to at most 3–4 cm long, showing some tendency for one branch at a node to be suppressed, cymes 2–4 times branched; flowers in glomerules of 2–3(–4), perigone about 2–3 mm long, strongly puberulent, especially distally on buds and perigone lobes, noticeably marked with raphide bundles, perigone only weakly constricted, the lower part only obscurely 5-ribbed, distal part funnel-form-campanulate, or urceolate above, lobes ovate, not at all corolloid, lobes ovate, short, densely puberulent, ovary lanceoloid, about 1/3 the length of the flower, stamens 2, subequal with ovary, anthers not well developed; no tendency toward development of anthocarps, but perhaps the plant was too young.

This plant is so different from *B. crispifolia* that it is only its association with populations of that species, the occurrence (so far as is known) of only a single individual, and the rudimentary nature of the stamens that makes me associate this plant with *B. crispifolia*.

The change in habit of *B. repens* with attack by

the fungus *Albugo platensis* is well known, but although the present specimen was examined at the time of collection and later, no *Albugo* pustules were found.

After the above plant had been studied and described, a shipment of *Boerhavia* from Aldabra arrived from S. A. Renvoize (Royal Botanic Gardens, Kew), including a number of *B. crispifolia*, several *B. repens* var. *maris-indici*, and three specimens resembling to some extent the plant described above. Two of these, *Renvoize 769* and *981*, were from the same general area, Cinq Cases, as *Fosberg 48929*, and the other, *869*, was from "Takamaka turn off." No. *869* is much more condensed than *48929*, but has the same sort of scarcely constricted, vase-shaped flowers. No. *769* is of several unattached branches, all much more elongate than *48929*. The main stems of these have the nodes 3–6 cm long, but all but one piece have most of the branches condensed and the flowers abnormal in the same way as in *48929*. One branch has an almost normal appearance, but some of the flowers are normal, some abnormal.

No. *981* is of several pieces, all extremely slender, the smaller branches filiform with the general appearance of *48929* but more loose and elongate, the leaves ovate, obtuse, not at all crispate, not more than 5 mm long. The distal parts are rather irregularly paniculate, bracteate, puberulent, flowers in clusters of 3 or 4, pedicellate, buds notably clavate, perigones clavate, with no constriction whatever, 2.5–3.5(–4) mm long, tube slender below, gradually dilated upward, lobes short, incurving, notably pubescent, the tube tending to absciss from receptacle but to persist around the ovary.

The presence, on no. *769*, of both abnormal and normal flowers shows that these plants are indeed *Boerhavia crispifolia*, but I have no suggestion as to a possible cause for these abnormalities. Comparable, but not similar, abnormalities have been found in Aldabra populations of at least two other, unrelated, genera, *Nesogenes* and *Euphorbia*.

Boerhavia herbstii Fosberg, new species

Herba prostrata decumbens foliis triangulo-ovatis infra pallidis, pedunculis gracilibus foliis valde superantibus, partibus plantae laxè paniculatis ad sexies ramosis, floribus perigoniis parte proximo obovato glabro parte distale ventricosò staminibus

styloque perigonio excedens, anthocarpio 5-costato subglabro ellipsoideo.

Prostrate herb, stems apparently decumbent, pink, to 60 cm long or more, finely and thinly puberulent, internodes 4–15 cm long, very sparsely branched except in inflorescence, nodes with a transverse ridge bearing a line of pubescence; leaves triangular-ovate, to 4 × 2 cm, light green above, very pale beneath, subglabrous, margin slightly scabrous, apex bluntly acute, base obtuse to subtruncate, petiole 0.4–1 cm long, puberulent; nodes bearing long slender peduncles 6–7.5 cm long, just at side of leaf axil on alternate sides, umbellately branched at summit, branches bearing glomerules of flowers; distal half or more of plant leafless, glabrous or nearly so, very openly paniculate, the panicle branches ascending, two inflorescence branches at each node of main axis and of secondary axis, one branch always much larger than other, larger ones on alternate sides, ramified up to 6 times, penultimate ramification tending to be umbelloid, each ray bearing a glomerule of 2–4 flowers, glomerules rarely proliferous, or tending to be racemulose, each branch of inflorescence subtended by a bract, these successively smaller, and more narrowly lanceolate, penultimate ones lance-subulate, those subtending glomerules and flowers ovate, subulate-acuminate, straw-colored-hyaline with dark purple acumen, glandular-ciliolate; perigone 2–2.5 mm long, constricted about at middle, lower half green, obovoid, shallowly 5-ribbed, glabrous or with slight puberulence in grooves, limb very broadly cylindrical-campanulate, ventricose at base, glabrous except for slight puberulence distally, pink but drying yellowish pink; stamens 3, anthers exerted, opened cells orbicular; style curved, stigma well exerted; anthocarp 3–3.5 mm long, ellipsoid, somewhat constricted at base, apex rounded-subtruncate, 5 ribs heavy, glabrous, intervals exceedingly minutely glandular, appearing glabrous, with a few very narrow raphide bundles longitudinally placed.

HAWAIIAN ISLANDS.—Lanai: Hulope Beach, on rock ledge above ocean, common in this area, 31 March 1976, *D. Herbst 5798* (US, holotype).

This species does not much resemble any of the known Hawaiian forms, all relegated to varieties of *B. diffusa* L. by St. John (1973:154) following Heimerl (1937), unless it be *B. diffusa* var. *gymnocarpa* Heimerl. The photo of the type (Heimerl,

1937, pl. 3) somewhat resembles it, but the description does not fit very well and is not sufficiently detailed to justify either its status as a variety of *B. diffusa* L. or inclusion in it of the present plant. *Boerhavia herbstii* in all likelihood is not really related to either *B. rubicunda* Steudel or *B. crispifolia* Fosberg, but it does have an ample leafless

panicle as do these two, and the fruits of all three are closely similar.

The axillary peduncles of *B. herbstii*, below the panicle, suggest a place in the *Boerhavia repens* group, where it fits also geographically. When that group has been adequately studied this species may find a place there.

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