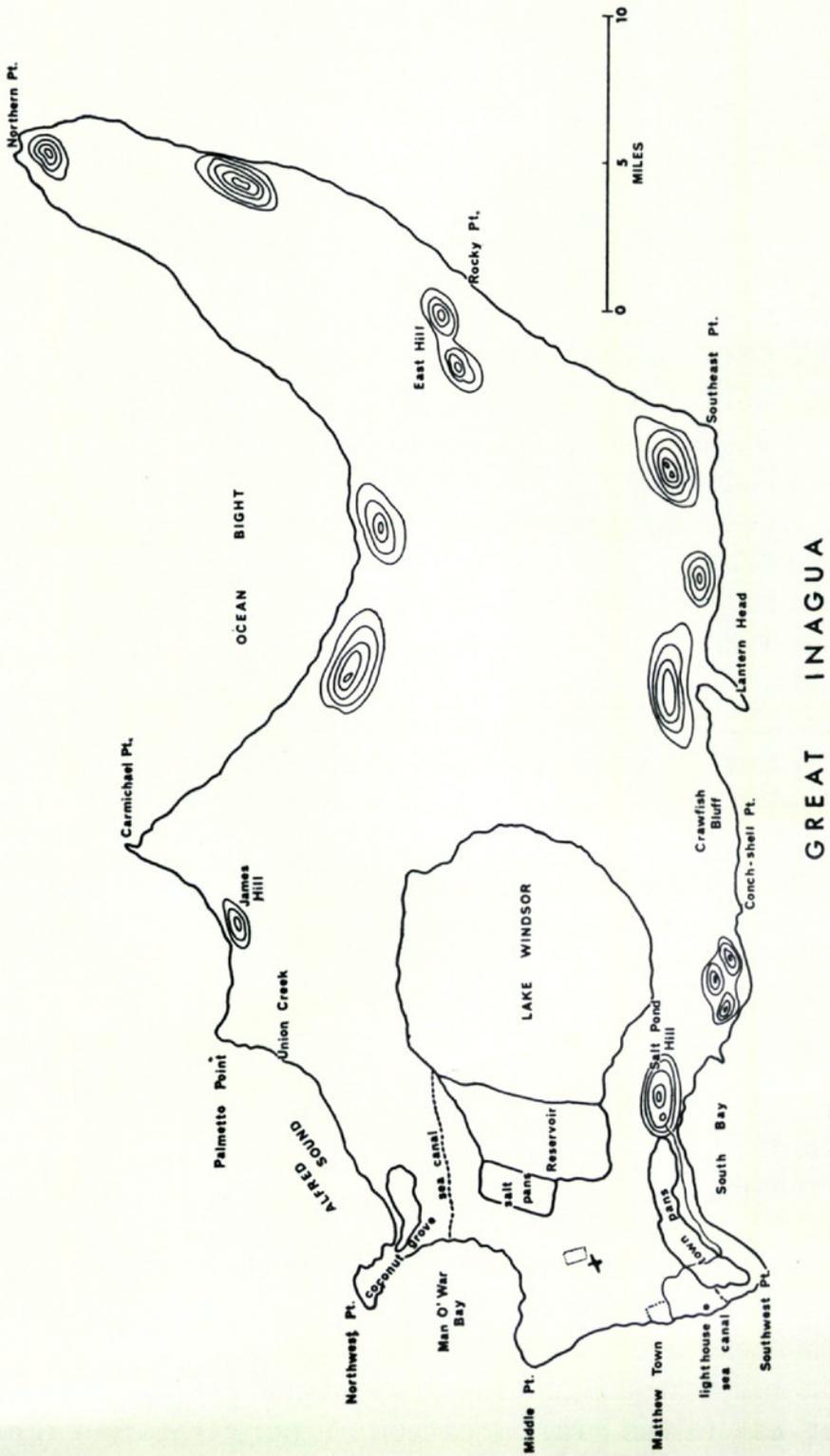


ADDITIONS TO THE FLORA OF INAGUA, THE BAHAMAS

RICHARD A. HOWARD AND HENRY F. DUNBAR

In 1904 George V. Nash, accompanied by Norman Taylor, visited Inagua in the southern part of the Bahamas to collect specimens in support of the work of N. L. Britton. Nash reported (Jour. N. Y. Bot. Gard. 6: 1-19. 1905) the islands as "botanically unexplored previous to our visits" and supplied a good description of the vegetation and a map with local place names. Nash's transportation was limited to horse and carriage, and short jaunts on foot from points reached by small coastal boats. He stated "the flora here is not a large one, and the same species will be found repeating themselves time and again in different parts of the island, but in almost all the places at which we touched some few plants were found which we had not detected elsewhere, so that it would require a pretty thorough exploration of all parts to secure a complete representation . . ." Nash collected "over 1,000 specimens" which Britton and Millspaugh (Bahama Flora 653. 1920) indicated as 482 collectors numbers (874-1138, 1258-1474) from Inagua and 96 numbers (1162-1257) on Little Inagua.

Britton reported on the collections of Nash and Taylor, among others, in a series entitled "Contributions to the Flora of the Bahama Islands" (Bull. N. Y. Bot. Gard. 3: 441-453. 1905. 4: 115-128, 137-143. 1906). In these he described *Pithecolobium flavovirens* N & T 1143, *Cassia inaguensis* N & T 910, *Sarcomphalus taylori* N & T 961, *Opuntia nashii* N & T 1063, *Plumiera inaguensis* N & T 960, *Lycium spathulifolium* N & T 1321, *Coccolobis bahamensis* N & T 1352, *Caesalpinia reticulata* N & T 1012, *Heliotropium inaguense* N & T 1293 and *Anastraphia cuneifolia* Greenman in Britton N & T 1295 and *Marsilea nashii* Underwood in Britton N & T 1411 all based on collections from Inagua. From collections made on Little Inagua Britton described in the same series *Bursera inaguensis* N & T 1190, *Heliotropium diffusum* N & T 1221 and *Lantana*



balsaminifera N & T 1211. Subsequently other species, including one new genus, were described based on these collections and these included *Agave inaguensis* Trelease N & T 21833, *Agave nashii* Trelease N & T 21855, *Euphorbia lecheoides* Millsp. N & T 1305, *Heliotropium nashii* Millsp. N & T 1011, *Iresine inaguensis* Millsp. N & T 1139, *Nashia inaguensis* Millsp. N & T 1006, *Portulaca gagatosperma* Millsp. N & T 1064, *Varronia lucayana* Millsp. N & T 1175 and *Dichromena inaguensis* Britton N & T 1254. It is of interest to record that of these 24 species, 20 are recognized by recent monographers. Millspaugh (Field Mus. Pub. Bot. 2: 141. 1906; 291. 1909) and Britton and Millspaugh (Bahama Flora 650. 1920) noted that Prof. J. T. Rothrock and Prof. Albert S. Hitchcock travelling together but collecting independently both had visited the island of Inagua for one day in the winter of 1890-1, and that Percy Wilson stopped at the west end of Little Inagua for one day in 1907. We have been unable to find any herbarium specimens representing collections made on Inagua since 1907. However, in the winter of 1961, one of us (HFD) had the opportunity to visit Inagua and to become interested in the vegetation. In the two succeeding winter seasons collections were made totalling 300 numbers. The present status of the island differs little from that described by Nash.

The Island of Inagua consists of an aeolian limestone in places consolidated into either hard or soft rock and in other places fragmented into sand and gravel. Much of the shore line is rocky, consisting of a very hard, chemically metamorphosed coral rock. Some ocean bluffs rise to heights of 30 feet. In other places there are long stretches of beautiful sandy beaches. Inland in flat areas some soil has accumulated among the rocks. On other islands such arable areas are called "black lands" but that term is not common in local usage on Inagua. Agricultural areas known locally as "farms" rarely exceed an acre in extent and are prepared by cutting off the shrubs and trees about a foot above their bases and then burning the area. This milpa

agriculture is referred to as "cut and burn" on Inagua. Crops usually consist of corn, several kinds of beans and peas, ochra, papaya, sweet potatoes, yams, squash, cabbage, tomatoes, lettuce and beets. The presence of both sisal and cotton plants suggests a former commercial type of agriculture. Some ruins of buildings are referred to as the "sisal plant." At present, however, the meagre subsistence crops probably provide but a fraction of the food consumed by any one family. At Northwest Point there is a large planted coconut grove, but most of the crop is consumed locally.

Scattered throughout the island are depressed areas up to 100 feet in diameter and 4-6 feet deep. These sinkholes presumably fill with water during rains but only a very few contain permanent water. *Nymphaea*, *Potamogeton*, *Chara* and *Neptunia* have been found in such ponds. *Acrostichum aureum* was found at the margins of one sinkhole between Matthewtown and Northwest Point. The sinkholes with an evanescent supply of water may have sandy bottoms devoid of vegetation with the margins occupied by various Cyperaceae, *Lippia*, *Marsilia*, *Echinodorus* and *Chara*.

Rainfall on Inagua is surprisingly uniform as indicated by monthly rainfall records maintained by the salt company. There is no regular wet or dry season although somewhat more rain is recorded in September, October and November. The average annual rainfall is between 25 and 35 inches. Rain storms are more frequent at Northwest Point than in the central area or that occupied by the salt ponds. The heaviest single storm recorded on Inagua occurred in June of 1960 when 18 inches of rain were recorded in one fall, setting back salt production by many months.

In the early 1940's the West Indies Chemical Company established a sea water evaporation industry north and east of Matthewtown, supplanting an old hand labor industry which had existed there for generations. In recent years an annual average of 250,000 tons of salt has been produced from 15,000 acres of evaporation area. Nearly the entire population of the island of 1400 persons is employed by the

salt company and lives in or near Matthewtown. The other settlements indicated by Nash have been abandoned. The salt company maintains a store and operates a boat service for its product between Inagua and southeastern U. S. ports. The Bahama airways supplies biweekly plane service from Nassau, and a small vessel operates between the Bahama islands on an irregular schedule.

Transportation around Inagua is limited. A dirt road extends approximately 30 miles along the south coast and a similar road runs a shorter distance along the north shore. A car with four-wheel drive is essential in many areas due to drifting sand.

The National Audubon Society maintains a warden on the island to observe and protect a large colony of flamingos present at Lake Windsor. The Bahama National Trust is engaged in building dams at the mouth of Union Creek in an attempt to raise turtles. This conservation project is jointly sponsored with the National Audubon Society.

Dunbar's collections do not include any new species. They do include many taxa which are not recorded previously from Inagua in Britton and Millspaugh's Bahama Flora. A few taxa are reported as new to the Bahamas or to the West Indies. Dunbar made an attempt to locate and recollect the endemic species described by previous authors. A study of these collections has permitted us to comment on Britton and Millspaugh's descriptions and keys, and to correct the nomenclature. The species cited without comment in the following list appear to be new records for the flora of Inagua. Voucher specimens are deposited in the herbarium of the Arnold Arboretum and some duplicates will be distributed.

MARSILEACEAE

Marsilea nashii Underwood. This taxon is based on collection, *Nash & Taylor 1411*, from Smith's Thatch Pond on Inagua. Underwood reported it to be "very abundant in sandy loam alternately dry and covered with a few inches of water. The species is remarkable for the compact habit of growth and for the extremely narrow leaflets which recall those of *M. tenuifolia* from Texas." Dunbar made an attempt to determine the variation in leaflet width and his numerous collections *94, 144, 157, 192, 235* show that leaflets vary from 2 to 5

mm. in width. Dunbar found this species in a score of places, thriving in surprisingly dry sandy soil; common near the upper edges of sink-holes and missing in places which are submerged for many months. In one area beyond Crawfish Bluff, plants of *Marsilea nashii* form a mat covering several acres.

TYPHACEAE

Typha domingensis Pers. Dunbar 48A. Recorded by Britton & Millspaugh as *T. angustifolia* L. but not from Inagua.

ALISMATACEAE

Echinodorus berteroi (Spreng.) Fassett. Fassett's revision (Rhodora 57: 133-156. 1955) recognizes two varieties, and Dunbar's collections 41, 244 represent the typical one. Britton and Millspaugh referred the Bahama plants to *Echinodorus cordifolius*, a species Fassett restricted to the United States. The collection Dunbar 41 was made at the edge of a pond and had leaves narrowly lanceolate and acute at both ends averaging 6 cm. long, and a mature infructescence 13 cm. long. Collection Dunbar 244 made in black muck and usually submerged, had leaves averaging 18 cm. in length with blades broadly ovate, rounded at the apex and truncate-cordate at the base. Fassett did not record this degree of variation in the plants he studied.

GRAMINEAE

Aristida ternipes Cav. Dunbar 7

Andropogon pertusus (L.) Willd. Dunbar 3

Cenchrus incertus Curtis Dunbar 33

Chloris polydactyla (L.) Sw. Dunbar 37

Paspalum laxum Poir. Dunbar 6, 139, 186, 169, 202

Paspalum molle Poir. Dunbar 149

Paspalum poiiretii R. & S. Dunbar 142

Tripsacum dactyloides L. Dunbar 196. This species was "observed" on Inagua by Nash who thought its presence was "especially noteworthy." Apparently no specimen was collected or is preserved at the New York Botanical Garden. Dunbar's collection indicates the species persists on Inagua although it has not been found elsewhere in the Bahamas.

CYPERACEAE

Cyperus odoratus L. Dunbar 114

Dichromena colorata (L.) Hitchc. Dunbar 18, 147. Britton described *Dichromena inaguensis* based on Nash and Taylor 1254 from Little Inagua. An examination of the type collection of this species and a comparison with the Dunbar collection suggests that the morphological characteristics used to distinguish the endemic species are neither significant nor reliable and it should be considered synonymous with *D. colorata*.

Eleocharis geniculata (L.) R. & S. Dunbar 31

AMARYLLIDACEAE

Agave inaguensis Trel. *Dunbar 50*. Formerly regarded as endemic to Little Inagua and South Caicos, this distinct species is now found on Inagua along with *Agave nashii* Trel. *Dunbar 185, 299*.

IRIDACEAE

Sisyrinchium exile Bicknell *Dunbar 145*. This is the first record from the Bahamas of the small yellow flowered species usually called *S. micranthum* Cav. Shinnars, in his privately published journal *Sida* (1: 32-42. 1962), has pointed out that *S. micranthum* Cav. is a taller leafy stemmed species from Peru. *Sisyrinchium exile* is based on a specimen from Texas which was probably a ballast plant and its area of origin may be southern Brazil or northern Argentina. The occurrence of *S. exile* is as a waif in Inagua. Plants called *S. micranthum* collected at high altitudes in Hispaniola suggest further study of this "species" is needed.

URTICACEAE

Pilea microphylla (L.) Liebm. *Dunbar 209*. This ubiquitous plant has not been recorded previously from Inagua. The collection at hand represents the smallest leaf size of a species with a disturbing range of variability.

OLACACEAE

Schoepfia obovata C. Wr. *Dunbar 49*

AMARANTHACEAE

Amaranthus dubius Mart. *Dunbar 258*

Amaranthus viridis L. *Dunbar 201*. These two species are extremely rare in the Bahamas although they are weeds elsewhere in the West Indies. Dunbar's collections made in a vacant lot in Matthewtown represent the first records for Inagua.

Iresine inaguensis Millsp. *Dunbar 29, 199*. This unusual species with linear and sub-fascicled leaves is often thought to be of dubious rank. Dunbar's collections of many duplicates show little variation. The type collection *Nash & Taylor 1139* was made on Sheep Cay in Alfred Sound and a subsequent collection was made on Salt Pond Hill. Dunbar found the species at Northwest Point where plants were abundant on sandy soil and in the coconut groves.

LEGUMINOSAE

Caesalpinia ovalifolia Urb. *Dunbar 162*

Abrus precatorius L. *Dunbar 40*

Desmodium glabrum (Mill.) DC. *Dunbar 56, 159*. This species is listed by Britton and Millspaugh as *Meibomia mollis* but was not known from Inagua.

Parkinsonia aculeata L. *Dunbar 273*. An ornamental species commonly cultivated and escaped in the West Indies but extremely rare in the Bahamas and not previously recorded from Inagua.

RUTACEAE

Zanthoxylum fagara (L.) Sarg. *Dunbar* 267

POLYGALACEAE

Polygala wightiana Blake *Dunbar* 176

EUPHORBIACEAE

Croton eluteria (L.) Sw. *Dunbar* 92

Jatropha gossypifolia L. *Dunbar* 256

SAPINDACEAE

Cardiospermum microcarpum H.B.K. *Dunbar* 64

Meliococcus bijugatus Jacq. *Dunbar* 282. Dr. George Brizicky has pointed out to us that the original form of this name was altered to *Meliococca bijuga* by Linnaeus and so used by Britton and Millspaugh. Dunbar's collection is the first record from Inagua.

MALVACEAE

Cienfuegosia heterophylla (Vent.) Garcke *Dunbar* 146. This species has been recorded from the West Indies only from Cuba and Puerto Rico where it is regarded as weedy. This is the first record for the Bahama flora.

Thespesia populnea (L.) Soland. *Dunbar* 275

OLEACEAE

Jasminum fluminense Vell. *Dunbar* 67. Not recorded in Britton and Millspaugh from the Bahamas.

LOGANIACEAE

Polypremum procumbens L. *Dunbar* 86. This species was recorded by Britton and Millspaugh from Matthewtown on Inagua as the only location in the Bahamas and it still persists.

GENTIANACEAE

Centaurium brittonii Millsp. & Greenm. *Dunbar* 20, 42, 214

APOCYNACEAE

Plumeria obtusa L. var. *sericifolia* (C.Wr.) Woods. *Dunbar* 286. Reported by Britton and Millspaugh as *Plumeria sericifolia* and known only from Cuba and Inagua.

Rhabdadenia biflora (Jacq.) Muell. Arg. *Dunbar* 203. Recorded by Britton and Millspaugh as *R. paludosa* (Vahl) Miers but not from Inagua.

ASCLEPIADACEAE

Cynanchum inaguense (Vail) comb. nov.

Metastelma inaguense Vail, Bull. N. Y. Bot. Gard. 4: 142. 1906. Woodson and others have transferred many West Indian species of *Metastelma* to the genus *Cynanchum*. *Dunbar* 98 and 207 are referred to this species which seems distinct. However, the genus is badly in need of revision.

HYDROPHYLLACEAE

Nama jamaicense L. *Dunbar* 260. Recorded by Britton and Millspaugh as *Marilaunidium jamaicense* (L.) O. Ktze. but not from Inagua.

BORAGINACEAE

Heliotropium diffusum Britton *Dunbar 106, 249*. The type of this species was collected on Little Inagua and the Dunbar collections are the first records for Inagua. Plants are abundant on Conchshell Point. *Heliotropium inaguense* Britton *Dunbar 277*. The distinctness of this species has been questioned but I. M. Johnston has indicated in unpublished notes in the herbarium that he regarded it as a good taxon. *Heliotropium nashii* Millsp. *Dunbar 191, 210*. This species was originally described as endemic to the vicinity of Matthewtown. Dunbar's collections indicate its distribution is greater than originally supposed on Inagua and that the plants persist as perennials, becoming dense cushion-forms.

VERBENACEAE

Nashia inaguensis Millsp. *Dunbar 82, 187*. Urban did not recognize this genus and transferred the species to *Lippia*. Both Moldenke and Alain, however, do distinguish the genus from *Lippia* and *Phyla* on the basis of the capitellate sessile or sub-sessile inflorescence and the cohering fruits. Dunbar's field notes indicate the plants appear to be restricted to an area within a mile or two of Matthewtown. He noted that the branches were commonly long and straggling with few if any lateral branches but that plants were found with the branches crowded with the twigs in four rows. In fresh material the fruits are smooth, shiny, spherical, of a translucent pale yellow color and shallowly longitudinally grooved.

SCROPHULARIACEAE

Scoparia dulcis L. *Dunbar 95*. This ubiquitous weed of the West Indies is of infrequent occurrence in the Bahamas and the present collection is the first record for Inagua.

MYOPORACEAE

Bontia daphnoides L. *Dunbar 272*

PLANTAGINACEAE

Plantago virginica L. *Dunbar 252*. The published local floras of the West Indies do not record this species although herbarium vouchers in the New York Botanical Garden indicate that plants have been collected in Bermuda and at Cinchona in Jamaica. Dunbar found *P. virginica* in abundance in flat land beyond Conch-shell Point with the plants growing mostly in the shade of bushes.

RUBIACEAE

Borreria savannarum Britton *Dunbar 177, 231*. Of the eight species of *Borreria* recognized from the Bahamas by Britton and Millspaugh, six are local endemics. An examination of the type specimens of the endemic species supports the distinctions used by Britton and Millspaugh. A study of Dunbar's collections of this and the following species clearly indicates a greater range of variation in pubescence

and suggests a re-evaluation will be necessary after further field study.

Borreria thymifolia Griseb. *Dunbar* 105, 121, 170, 251, 278

Erithallis odorifera Jacq. *Dunbar* 179, 294. Most recent manuals of tropical American floras have listed this species in the synonymy of *E. fruticosa* L. Britton did so in the Bahama Flora although he had recognized two species in his earlier papers. Recent studies on the other West Indian islands suggest two species are present and that *E. odorifera* comprises plants larger in size and leaf dimensions and possessing flowers with a strong odor. A number of morphological intermediates are available suggesting inbreeding populations which clearly deserve further field study.

Ernodea nashii Britton *Dunbar* 217. Britton and Millspaugh recognize six species of *Ernodea* in the Bahamas, five of them endemic to one or a few islands. The present species is a new record for Inagua but it is clear a field study is required to understand the specific limits in this genus.

CAMPANULACEAE

Lobelia lucayana Britton & Millsp. *Dunbar* 150. This species does not appear to have been collected a second time. Dunbar's collection is the first record from Inagua.

COMPOSITAE

Flaveria bidentis (L.) O. Ktze. *Dunbar* 135. Dr. Otto Solbrig kindly supplied the identification for this herbaceous widely branching plant of inland roadsides. The species is widely distributed in South America and this is the first record of its occurrence in the West Indies.

***Gochnatia bahamensis* (Urb.) comb. nov.**

Anastraphia bahamensis Urb. *Symb. Ant.* 3:415. 1903. Mr. Roy Jervis studied the genus *Anastraphia* and annotated many sheets to indicate it is synonymous with *Gochnatia*. Various authors have supplied many of the new combinations but the present one is needed. *Dunbar* 280 is comparable to the type of *Anastraphia cuneifolia* Greenman from Inagua which Britton and Millspaugh have regarded as synonymous with *A. bahamensis*.

Salmea petrobioides Griseb. *Dunbar* 109, 242

Sonchus oleraceus L. *Dunbar* 65

Wedelia trilobata (L.) Hitchc. *Dunbar* 190

Tridax procumbens L. *Dunbar* 261

In addition to the flowering plants cited above Dunbar collected a moss *Barbula agraria* Hedw. *Dunbar* 15 and two fungi *Pycnoporus sanguineus* (Linn. ex Fr.) Murr. *Dunbar* 16 and *Xylospheera dichotoma* (Mont.) Dennis *Dunbar* 17 which have not been reported previously from Inagua. We are grateful to colleagues at the Royal Botanic Garden, Edinburgh, for these determinations.

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