VASCULAR PLANTS OF JOHNSTON AND WAKE ISLANDS

By

ERLING CHRISTOPHERSEN

BERNICE P. BISHOP MUSEUM

OCCASIONAL PAPERS

VOLUME IX, NUMBER 13

TANAGER EXPEDITION

PUBLICATION NO. 6

HONOLULU, HAWAII
PUBLISHED BY THE MUSEUM
MAY, 1931

VASCULAR PLANTS OF JOHNSTON AND WAKE ISLANDS

By Erling Christophersen

The present paper deals with the vascular plants of Johnston and Wake islands, being a report on the collections made by the Tanager Expedition of July and August, 1923.[1] (See fig. 1.) The plants

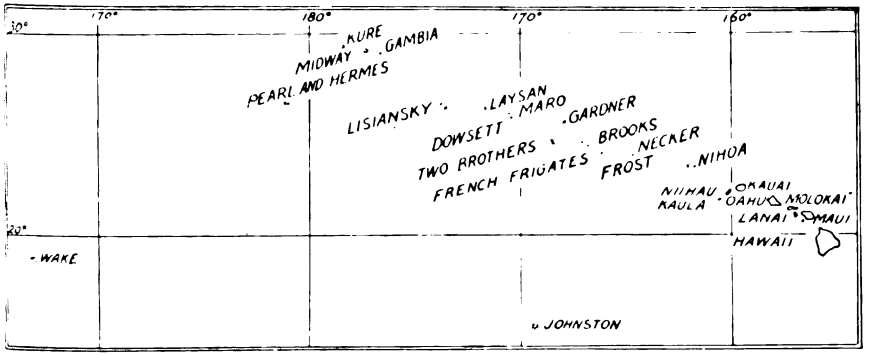


Figure 1.—Map showing position of islands surveyed by the Tanager Expedition.

were collected by Dr. J. B. Pollock, Professor of Botany, University of Michigan, assisted by Mr. E. H. Bryan, Jr., Entomologist with the expedition, and Mr. Orme E. Cheatham, both of the staff of Bernice P. Bishop Museum.

Dr. F. B. H. Brown has passed his opinion on all the plants represented, for which I am greatly indebted to him. I am also indebted to Dr. E. D. Merrill for his determination of *Calonyction grandiflorum*, which has involved the revision of a very complicated synonymy.

Mr. E. H. Bryan, Jr., has prepared notes on the vegetation of Johnston and Wake islands, compiled from his field notes and records. I am also indebted to him for preparing sketch maps of the islands. He writes:

Johnston Island is a low sand and coral island, 717 miles WSW. from Honolulu. It is 800 yards long, about 200 yards wide, and reaches a height of 48 feet at Summit Peak. A mile and a half to the NE. lies a small sand islet

[1] Gregory, H. E., Report of the Director for 1923: B. P. Bishop Mus., Bull. 10, p. 22, 1924.

(Sand [Agnes] Island) 200 yards in diameter. Both islets are enclosed by a semicircular reef, nearly continuous on the north, but open to the south. (See fig. 2.)

Both islets are entirely covered by vegetation behind the sand or raised coral beaches. Only three species of plants are present. These are: *Lepturus repens*, growing in low, dry, brown bunches, forming a fairly dense, dominant stand (Pl. I, *A*); scattered patches of *Tribulus cistoides*, and a few numbers of plants of *Boerhaavia diffusa*. On the larger island *Tribulus cistoides* ranks second in abundance, being scattered generally among the bunches of *Lepturus repens* (Pl. I, *B*). *Boerhaavia diffusa* is most abundant at the east end of the island, on the seaward slopes of the highest hill; being sparingly found elsewhere. On Sand (Agnes) Island *Boerhaavia diffusa* is more abundant than *Tribulus cistoides*, but neither begins to compare with the bunch grass in extent. A single kukui nut (*Aleurites moluccana*) and a *Mucuna* seed were picked up on the south beach.

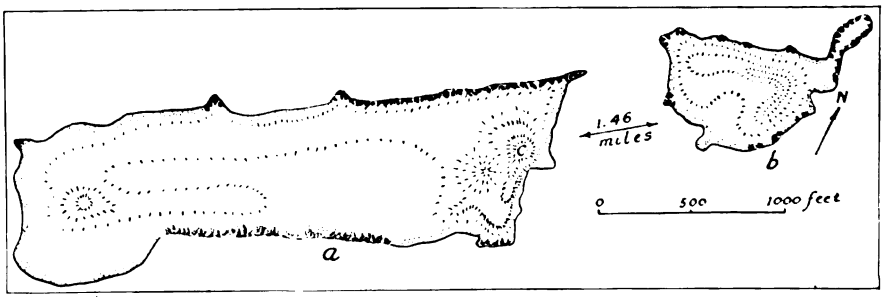


FIGURE 2.—Map of Johnston Island: *a*, main island; *b*, Sand (Agnes) Island; *c*, Summit Peak. (Based on a survey by James B. Mann, H. S. Palmer, and E. H. Bryan, Jr., 1923.)

Wake Island is a coral atoll, consisting of three islets (fig. 3): the largest, which is wedge-shaped—the two arms being three miles long by less than half a mile wide—carries the name of the group; the two smaller islets, each about a mile and a half long by a quarter to a half mile wide, are named for Wilkes and Peale of the United States Exploring Expedition that visited the island in 1841. Wilkes[2] writes:

> There is no fresh water on the island, and neither pandanus nor cocoanut trees. It has upon it the shrubs which are usually found on the low islands of the Pacific, the most abundant of which was the *Tournefortia*.

The two ends of the smaller islets are connected by a broad, flat reef, portions of which are visible at low tide. The lagoon thus en-

[2] Wilkes, C., U. S. Exploring Expedition, Narrative, vol. 5, p. 285, 1844.

closed is shallow, in few places exceeding one or two fathoms in depth; and the entire east end of it is a sand flat, dry at low tide.

The flora here is much richer than that on Johnston Island. A total of 16 (possibly 17) species were collected: *Gramineae* indet.,

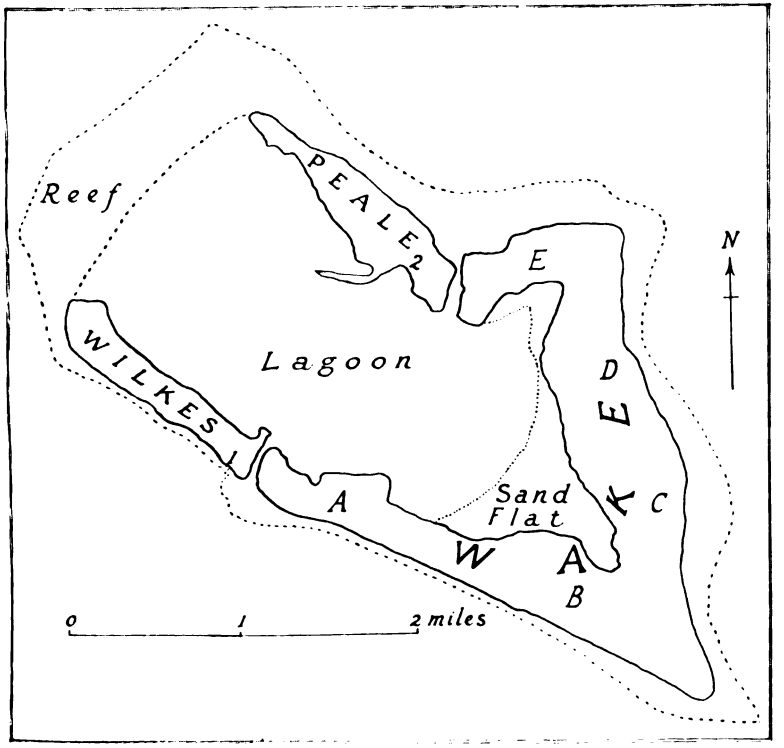


FIGURE 3.—Map of Wake Island: *A-E*, areas in which records of vegetation were made; 1, camp of the Tanager Expedition; 2, remains of a Japanese camp. (Surveyed by James B. Mann and H. S. Palmer, 1923.)

Boerhaavia diffusa, *Ceodes* sp., *Sesuvium portulacastrum*, *Portulaca lutea* (?), *Portulaca oleracea*, *Lepidium owaihiense*, *Sida fallax*, *Gossypium hirsutum* var. *religiosa*, *Pemphis acidula*, *Calonyction grandiflorum*, *Ipomoea pes-caprae*, *Cordia subcordata*, *Heliotropium anomalum*, *Tournefortia argentea*, *Nicotiana tabacum*, and *Scaevola frutescens*.

Of these several species are trees or shrubs and give the vegeta-

tion an aspect quite different from that of Johnston Island. Bryan[3] writes: "Behind a broad beach of sand and broken coral, with numerous coral boulders, rises a dense stand of low trees and shrubs."

The following notes on the vegetation of the island are furnished by Bryan:

Wilkes Island. The dominant plants at the east end are *Tournefortia* and *Pemphis* (Pl. II, *A*), with an undergrowth of *Portulaca*, red-stemmed *Boerhaavia*, fine-leaved grass (much dried up), *Lepidium*, *Sida*, and beach heliotrope.

As one goes west the *Tournefortia* becomes more dominant, with *Pemphis* only in clumps along the lagoon beach. At one place a "finger" of *Pemphis* runs almost across the island, but this is young growth, around a few older plants, which seems to be crowding in upon the *Tournefortia*. About three-eighths of a mile from the west end of the island the *Tournefortia* trees are more stunted and scattered, and *Pemphis* entirely disappears. The herbs here are more abundant. Just before reaching the west end there is a thicket of larger *Tournefortia*, about which is an area covered with large rocks and a quantity of dead limbs and trunks, some up to two feet in diameter. Finally there is a narrow beach, with beach heliotropes, broken coral, and then the broad reef, which runs in a sweeping curve northwest to the west point of Peale Island.

Near the east end are the remains of a small Japanese shack and grave.

Wake Island. The vegetation covering the southwest arm of Wake Island (fig. 3, *A*) is made up largely of a forest of *Pemphis* and *Tournefortia* with here and there thickets of *Cordia* and *Scaevola*. *Portulaca* grows on the ground between the trees, and the climbing vine (*Calonyction*) covers large rocks, brush, fallen limbs, and climbs into the trees. There are numerous open spaces, in which grow both the red, and the green-stemmed *Boerhaavia* creepers. The *Cordia*, for the most part, forms small, stunted thickets, with much dead wood, although there are some fine, luxuriant trees, with leaves 9 inches long by 5 inches wide.

Along the lagoon side there is an almost continuous stand of *Pemphis*, with dried-up tufts of a fine-leaved grass, and open flats covered with *Sesuvium*. The *Calonyction* vine climbs over both dead and live *Pemphis*, as well as *Tournefortia* and *Cordia*. In these nest frigate birds and boobies.

Along the ocean side (fig. 3, *B*) is a growth of *Tournefortia* trees, 15 to 20 feet high, with open spaces which contain piles of dead branches and brush, with avenue-like lanes connecting them. Here and there are thickets of *Cordia* and *Scaevola*. Underneath, the ground is covered with sand and broken coral, upon which there is a sparse growth of *Boerhaavia*, *Portulaca*, and stunted *Sida*. The climbing *Calonyction* vine grows over rocks and up into the trees. The flightless rail is most abundant in this region. The ocean beach is rocky, with areas of raised reef; single trees of *Tournefortia* and patches of the beach heliotrope are present (Pl. II, *B*).

Toward the lagoon side there are patches of *Pemphis*, separated by clearings carpeted with *Sesuvium*, in the sand, beneath which are many shearwater (*Cuneatus*) burrows.

[3] Bryan, E. H., Jr., Insects of Hawaii, Johnston Island, and Wake Island: B. P. Bishop Mus., Bull. 31, p. 8, 1926.

The area on the east side of the main island (fig. 3, *C*) is somewhat different. Starting from the lagoon side, there is a sand flat, partly covered with *Sesuvium*, and partly bare, with areas where the sand has solidified into a crust. Through this are channels, showing either the work of heavy rainfall, or storms which have broken over from the ocean side. This gives way to short (waist-high) *Pemphis* and tangles of *Calonyction* vine. The patches of these are interspersed with patches of *Sida* (vigorously growing and in blossom), broad-leaved bunch grass, and tussocks of a finer grass. Toward the ocean side the ground becomes rocky, with an open stand of *Tournefortia* and *Cordia*. The beach here is pebbly and quite narrow, but with a broad reef. An occasional *buka* tree (*Ceodes* sp.) is seen, although these are more abundant toward the north side. *Scaevola*, which forms clumps on the south side, further west, is rare here.

In the eastern part is another area (fig. 3, *D*), which is similar to the area just described (fig. 3, *C*), except that the coral rocks of the sea beach are found almost across the rim of the island, and the *Tournefortia*, which is thicker, with more *Sida*, *Boerhaavia*, and *Portulaca*, grows most of the way across, the fringe of *Pemphis* and *Sesuvium* being confined to the edge of the sand flat on the lagoon side. (See Pl. III, *B*.) There is also a little more beach heliotrope in evidence.

Between "*D*" and "*E*", at the northeast angle of the lagoon (fig. 3, *D* and *E*), are a few extensive patches of *Cordia*, some in fruit and flower, and a small tangle of a sprawling shrub (*Gossypium*) with long slender, blackberry-like branches.

The area along the northwest arm of Wake Island (fig. 3, *E*) has the largest growth on the three islands. Facing the north sea beach and about 200 yards from the water line, is an almost impenetrable wall of vegetation. This is made up of *Tournefortia*, *Cordia*, and great, gnarled *buka* trees (*Ceodes*). The latter (Pl. IV), despite their squat, stunted appearance, reach a height of 20 to 25 feet, with trunks 3, 4, and even 5 feet in diameter at the ground, the lateral roots spreading out along the surface of a rocky coral soil. Between this long line of trees and the shore is a stretch of high, rocky coral beach, in places over twenty feet above high water, constituting the highest land on the island. It is bare except for small patches of broad-leaved bunch-grass and stunted *Cordia* and *Tournefortia*.

On the lagoon side is an area covered with a tangle of vines and dead stumps, suggesting that it might have been burned over. Even the rocks have a crumbly, burned appearance. In the continuous thicket only one break was found, a narrow bare path, about 40 feet wide, which looked as if it might have been the track of a small tornado or such like, which had left only rotting stumps, over which had grown a tangle of vines. Here *Pemphis* occurs sparingly only on the edge of the lagoon.

Peale Island. The vegetation on Peale Island appeared at the time to be more luxuriant than elsewhere, *Sida* and *Boerhaavia* being abundant and in flower, beneath the vigorously growing *Tournefortia*. A patch of broad-leaved bunch grass borders the north entrance to the lagoon, and *Pemphis* is seen only at the extreme east end, where it appears to be a recent arrival from the southern and eastern islets.

Along the ocean beach there are alternate stretches of sand, coral ledge, and broken coral shingle, in front of which is a broad, flat reef, exposed at low tide. On the sandy beaches one finds a considerable amount of drift: timbers,

boards, railway ties, cork, fish net floats, and refuse from ships, such as walnut shells, tooth powder cans and empty bottles. One log was seen, which was 50 or 60 feet long.

On the south side is a long, narrow arm, ending in a coral reef which runs well out into the lagoon. On this arm nest a considerable colony of terns, both in the open, among the *Sida*, *Boerhaavia*, and beneath the scattered *Tournefortia* trees.

The vegetation toward the west end consists of an open stand of *Tournefortia*, in some places very open. The sand between, with its scattered coral rocks, is bare or with clumps of beach heliotrope. Toward the middle of the island the *Tournefortia* trees are a little lower, with *Portulaca*, the climbing *Calonyction*, *Lepidium*, and both forms of *Boerhaavia*, the one having reddish stems, green leaves with red veins, and lavender flowers, and the other yellowish-green stems, light green leaves, and white flowers. Toward the east end of the island the former seems to merge by slow degrees into the latter. A broad-leaved bunchgrass begins about a third of the distance east.

Near the east end of Peale Island are the remains of a Japanese camp. Part of an inscription on one of the walls was translated to mean a date (November 13, 1908). Here is a large patch of *Ipomoea pes-caprae*, the only one seen on the three islands.

LIST OF VASCULAR PLANTS

(In the citation of specimens it is stated, preceding the date, whether flowers or fruits are present; the abbreviations used are: *fl*, flower; *fr*, fruit; *b*, bud; *y*, young.)

GRAMINEAE

Lepturus repens (Forster) R. Brown: Prodr. Fl. Nov. Holl., p. 207, 1810.

Johnston: Main island, on the dunes, *fl*, July 13, 1923, Pollock No. 3; Sand Island, *fl*, July 15, 1923, Pollock No. 6. Grows all over the island.

A sterile specimen of grass from Peale Island, Pollock and Bryan No. 23, with broad leaves, apparently does not belong to *Lepturus repens* (Forster) R. Brown. Two other collections of sterile grasses were made on the Wake Island group, but the specimens have not been seen.

NYCTAGINACEAE

Boerhaavia diffusa Linnaeus: Sp. pl., p. 3, 1753.

Johnston: Main island, in sandy soil on the upper beach, *fl*, *fr*, July 11, 1923, Pollock No. 2; Sand Island, *fl*, *fr*, July 15, 1923, Pollock No. 5. Wake: Main island, in sand on the upper beach, *fl*, *fr*, July 30, 1923, Pollock No. 11; Peale Island, in sand, *fl*, *fr*, July 31, 1923, Pollock and Bryan No. 30.

The plants from Wake Island differ from those of Johnston Island in their lanceolate, relatively narrower and sharply acute leaves, their more slender peduncles, and the less dense pubescence with absence of glandular hairs. The leaves of the Johnston Island plants are rounded or broadly acute, ovate or suborbicular, the peduncles stout and stems and petioles are densely pubescent with presence of glandular hairs.

The Wake Island specimens may well be referred to *Boerhaavia diffusa* Linnaeus, but the Johnston Island specimens belong to a fairly distinct group of Polynesian *Boerhaavia* found especially on the coral islands, characterized by relatively broad, often suborbicular leaves, number of stamens two to five, generally a rather stout habit and varying from glabrate to densely hirsute or viscose. In the glabrate

end of the series we find plants corresponding closely with the type of *B. tetrandra* Forster[4] from Huahine, Society Islands, and in the viscose and hirsute end we find approximations to the West Indian *B. caribaea* Jacquin (*B. viscosa* Lagasca et Rodriguez). Dr. P. C. Standley has kindly examined two specimens of this latter type (Bergman No. 10 *A*, Christmas Island, published in B. P. Bishop Mus., Bull. 44, p. 23, 1927, as *B. hirsuta* Linnaeus, and Caum No. 47, Pearl and Hermes Reef), and, referring them to *B. diffusa* Linnaeus, he states that "there is no need nor justification for using the name *B. caribaea* for the Pacific plants" [personal communication].

Plants of this group have generally been referred to *B. tetrandra* Forster. Those from Johnston Island, however, do not agree with Forster's type in British Museum, and the best thing at present, until the various Polynesian forms are better understood and the status of this species, if it is a distinct species, is made clear, is probably to refer these plants to *B. diffusa* Linnaeus sens. lat. as outlined, at least for the old world, by Heimerl (Engler and Prantl, Nat. Pfl.-fam., III, 1*b*, p. 26, 1889). Standley (North American Flora, 21, pt. 3, 1918) does not include *B. diffusa* Linnaeus.

Ceodes sp. (Pl. V).

Wake: Main island, July 28, 1923, Pollock and Wetmore No. 9; July 29, 1923, Pollock and Andersen No. 14; male *fl, fr,* August 3, 1923, Pollock, Bryan and Cheatham No. 39.

The Pacific species of *Pisonia* have been segregated into a distinct genus by Heimerl (Oesterr. Bot. Zeitschr., vol. 63, pp. 19-21, 279-290, 1913), who gave it the name *Calpidia* Du Petit-Thouars. This segregation has been followed by Wilson and Rehder (Jour. Arnold Arb., vol. 1, p. 117, 1919) and by Skottsberg (Meddel. Göteb. Bot. Trädg., vol. 2, p. 231, 1926). The latter author, however, has restored the older name *Ceodes* Forster, arguing that Forster's *Ceodes umbellifera* is congeneric with the species of *Calpidia* cited by Heimerl.

The *Ceodes* plants from Wake Island are probably referable to a species of wide distribution on the coral islands of the Pacific. They come very close to specimens from the Equatorial islands (Fanning, Palmyra, Christmas) and Rose atoll, Samoa. They differ from these in their relatively broader and shorter leaves, and wider calyx of the

[4] Examined at the British Museum by Mr. G. Taylor. A photograph of the type is published by Setchell (American Samoa, Pl. 34, *A*, Washington, 1924).

staminate flowers, but in other characters, however, there is good agreement, the fruiting perigone agreeing closely with Cooper No. 10275, from Palmyra Island, the only fruiting specimen available for examination. These specimens have been referred to *Pisonia grandis* R. Brown, by Rock (Palmyra Island, p. 50, Honolulu, 1916), Setchell (American Samoa, p. 247, Washington, 1924), and Christophersen (B. P. Bishop Mus., Bull. 44, pp. 24, 42, 55, 1927). Merrill (Interpret. Herb. Amb., p. 216, 1917) accredits this species with a wide distribution on the small uninhabited islands of Malaya and Polynesia. This identification may be correct, but a complete revision of the Pacific species is much needed and probably necessary to settle this point. The species is not included in the treatment by Heimerl (Oesterr. Bot. Zeitschr., vol. 63, pp. 279-290, 1913).

AIZOACEAE

Sesuvium portulacastrum[5] Linnaeus: Syst. Nat., ed. 10, p. 1058, 1759.

Wake: Main island, in dense mats on the coral beach just above high water, *fl,* July 29, 1923, Pollock No. 12; U. S. Expl. Exped. in 1841, acc. to A. Gray (U. S. Expl. Exped., Botany, pt. 1, p. 142, 1854).

PORTULACACEAE

Portulaca lutea Solander: in Forster, De. pl. esc., p. 72, 1786.

Wake: Wilkes Island, *fr,* July 29-30, 1923, Pollock No. 18. Peale Island, *fl, fr,* July 31, 1923, Pollock and Bryan No. 27.

Portulaca lutea Solander is no doubt a good species, in fresh material very distinct from *P. oleracea* Linnaeus in its almost suffrutescent habit with scaly bark in the lower part of the stems, and its much larger flowers. In the herbarium, however, the distinction between the two species is not so apparent due to the fact that the delicate petals wither away soon after they are gathered, and that the difficulty in drying the fleshy plants usually results in poor herbarium specimens. Setchell (American Samoa, pp. 250-51, Washington, 1924) discusses at length the differences between *P. lutea* Solander and *P. oleracea* Linnaeus, but probably not all the characters mentioned by him serve to distinguish the two species. An

[5] At the request of the author, attention is called to the fact that in the capitalization of specific names Bishop Museum follows the procedure of the United States Government Printing Office.

examination of fresh material of *P. lutea* from Kaena Point on Oahu, agreeing in details with Solander's description and a tracing of Parkinson's drawing at British Museum[6] as compared with fresh material of *P. oleracea* from the same locality, as well as from Honolulu, reveals the following differences:

P. lutea	P. oleracea
Lower part of stems almost suffrutescent with scaly bark.	Lower part of stems herbaceous, no scaly bark.
Flowers large, sepals in anthesis 7-10 mm. high [dry: 5-7 (8) mm.], petals 10-12 mm. high (dry: 9-10 mm.), number of stamens 24-46.	Flowers small, sepals in anthesis 3-5 mm. high (dry: 3-4 mm.), petals 2-4 mm. high (shrinking but little when dried), number of stamens 12 or less.
Seeds stellately rugulose but not prominently warty, 1-1.1 mm. long.	Seeds stellately rugulose (less distinctly stellate) prominently warty on the edge, 0.7 mm. long.

Both species may have a prostrate or erect habit, the leaves of both are distinctly petiolate with short hairs in the axils, not always dark in fresh material, and the bracts enclosing the calyx seem to offer no distinguishing characters.

The most convenient herbarium character is the appearance of the seeds. The height of the sepals is also useful, but only when they are fully grown.

Portulaca oleracea Linnaeus: Sp. pl., p. 445, 1753.

Wake: Main island, in sand, *fl, fr*, August 4, 1923, Pollock (and Cheatham) No. 40.

It is with doubt that this specimen is referred to *P. oleracea*. There are no ripe seeds attached, but seeds in a separate envelope show essentially the characters of *P. lutea*. The stamens number 19 in one flower, the sepals are 3.5 mm. high, and the stem is rather suffrutescent at the base. On the field label is written: "Flower small, yellow, different from the large flowered upright."

Pollock (B. P. Bishop Mus., Bull. 28, pp. 16-17, 1926) states that both *P. oleracea* and *P. lutea* are present on Wake Island. But he cites A. Gray erroneously when he states that Gray only gave *P. oleracea* from Wake Island in the report of the United States Exploring Expedition. Gray (U. S. Expl. Exped., Botany, pt. 1, p. 139, 1854) writes as follows: "This is enumerated in Dr. Pickering's list

[6] This drawing, I suppose, is to be considered the type since no specimens are to be found as stated by Seemann (Fl. Vitiensis, p. 9, 1865), a fact that I could only confirm at the British Museum. A photograph of the drawing is reproduced by Setchell (American Samoa, pl. 34, C, Washington, 1924), and Solander's manuscript description is given in full by Seemann.

under the name of *Portulaca lutea* of Forster, which it undoubtedly is, as distinguished from the *P. oleracea;* but the specimens do not furnish any tangible distinctive characters."

CRUCIFERAE

Lepidium owaihiense Chamisso et Schlechtendal: Linnaea, vol. 1, p. 32, 1826.

Wake: Main island, *fl, fr,* July 30, 1923, Pollock and Bryan No. 10; Wilkes Island, *fl, fr,* July 30, 1923, Pollock No. 16; Peale Island, *fl, fr,* July 31, 1923, Pollock No. 28.

These specimens show the broad emarginate short-style fruits characteristic of *L. owaihiense,* but differ somewhat from Hawaiian specimens in the leaves, being more densely serrate in nos. 10 and 16.

ZYGOPHYLLACEAE

Tribulus cistoides Linnaeus: Sp. pl., p. 387, 1753.

Johnston: Main island, in sandy soil, *fl, fr,* July 11, 1923, Pollock No. 1; Sand Island, *fl, fr,* July 15, 1923, Pollock No. 4.

MALVACEAE

Sida fallax Walpers, Nov. act. acad. Caes. Leop.-Carol. Nat. Cur., vol. 19, suppl. 1, p. 306, 1843.

Wake: Wilkes Island, July 29-30, 1923, Pollock and Bryan No. 17; Peale Island, *fl,* July 31, 1923, Pollock and Bryan No. 25; U. S. Expl. Exped. in 1841 acc. to A. Gray (U. S. Expl. Exped., Botany, pt. 1, p. 161, 1854).

Gossypium hirsutum Linnaeus var. **religiosa** Watt: Wild cultiv. cotton, p. 201, London, 1907.

Wake: Main island, August 1, 1923, Pollock and Bryan No. 33.

In the northeastern part of the main island a patch of this cotton was found. It is characterized by its long slender branches which do not grow erect, its tomentose, cordate, and long-petioled leaves with 3 triangular acute or obtuse and mucronate lobes, its free, moderately laciniate bracteoles, its four-celled fruits with seeds covered by a dense rust-colored short fuzz and a firmly adherent longer floss which may be rust-colored or white.

LYTHRACEAE

Pemphis acidula Forster: Charact. gen. pl., p. 68, t. 34, 1776.

Wake: Wilkes Island, *fl, y fr*, August 1, 1923, Pollock and Cheatham No. 31. Grows all over the island.

CONVOLVULACEAE

Calonyction grandiflorum (Jacquin) Choisy: Mem. Soc. Phys. Genéve, vol. 6, p. 442, 1833.

Wake: Main island, on coral sand, *y fl*, August 3, 1923, Pollock No. 37; "Peale, Wilkes, and Wake," climbing on *Tournefortia* trees, Pollock and Bryan No. 21.

A specimen of Pollock's collection No. 37 was sent to Dr. E. D. Merrill who has kindly given the above determination. According to Dr. Merrill this widely distributed species was misinterpreted by House (Bull. Torr. Bot. Club, vol. 31, p. 591, 1904) as being identical to *Ipomoea alba* Linnaeus, which, however, is the species with tailed sepals. The oldest valid specific name for the species with blunt sepals is contained in *Convolvulus grandiflorus* Jacquin (Hort. Vind., 3, 39, t. 69, 1776).

Ipomoea pes-caprae (Linnaeus) Roth: Nov. pl. sp., p. 109, 1821.

Wake: Peale Island, on the beach, passée *fl, b*, July 31, 1923, Pollock and Bryan No. 22.

BORAGINACEAE

Cordia subcordata Lamarck: Illustr. gen., vol. 1, p. 421, 1791-97.

Wake: Main island, in coral sand, July 29, 1923, Pollock No. 13, Pollock and Wetmore No. 19; *fl, fr*, August 1, 1923, Pollock and Bryan No. 34; Peale Island, in coral sand back of the beach ridge, *fl*, July 31, 1923, Pollock No. 26.

Heliotropium anomalum Hooker et Arnott: Bot. Beech., p. 66, 1830-32.

Wake: Main island, on the coral beach, *fl*, August 1-3, 1923, Pollock No. 36.

Tournefortia argentea Linnaeus fil.: Suppl. syst. veg., p. 133, 1781.

Wake: Wilkes Island, in sand and on coral rocks, *fl, fr,* August 1, 1923, Pollock and Cheatham No. 32.

Stated to grow on all the three islets of Wake Island.

SOLANACEAE

Nicotiana tabacum Linnaeus: Sp. pl., p. 180, 1753.

Wake: Peale Island, *y fr,* July 31, 1923, Pollock No. 29.

Found only in the vicinity of an abandoned shack. Introduced.

GOODENIACEAE

Scaevola frutescens (Miller) Krause: Engl. Pflanzenreich, IV, 277, p. 125, 1912.

Wake: Wilkes Island, *fl,* July 29, 1923, Pollock and Bryan No. 20.

A

B

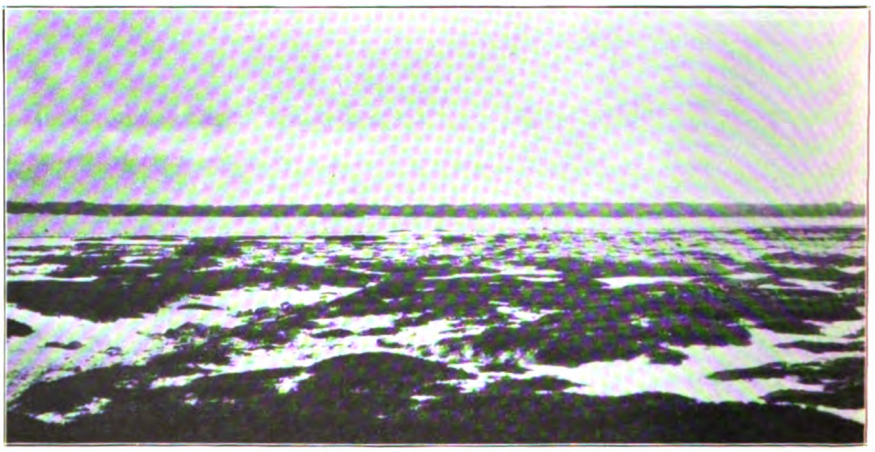
PLATE I.—Johnston Island: *A*, view looking west from Summit Peak, vegetation of *Lepturus repens*; *B*, boobies nesting in *Tribulus cistoides*, grass is *Lepturus repens* (photographs by E. H. Bryan, 1923).

A

B

PLATE II.—Wake Island: *A*, forest of *Pemphis acidula* and *Tournefortia argentea* on Wilkes Island (photograph by H. S. Palmer, 1923); *B*, single trees of *Tournefortia argentea* and abundant growth of *Heliotropium anomalum* on south shore (photograph by E. H. Bryan, 1923).

A



B

PLATE III.—Wake Island: *A*, *Tournefortia argentea* on the beach (photograph by H. S. Palmer, 1923); *B*, mats of *Sesuvium portulacastrum* in the northeastern part of the central lagoon (photograph by E. H. Bryan, 1923).

PLATE IV.—Trunk of *Ceodes* at northwest end of Wake Island (photograph by E. H. Bryan, 1923).

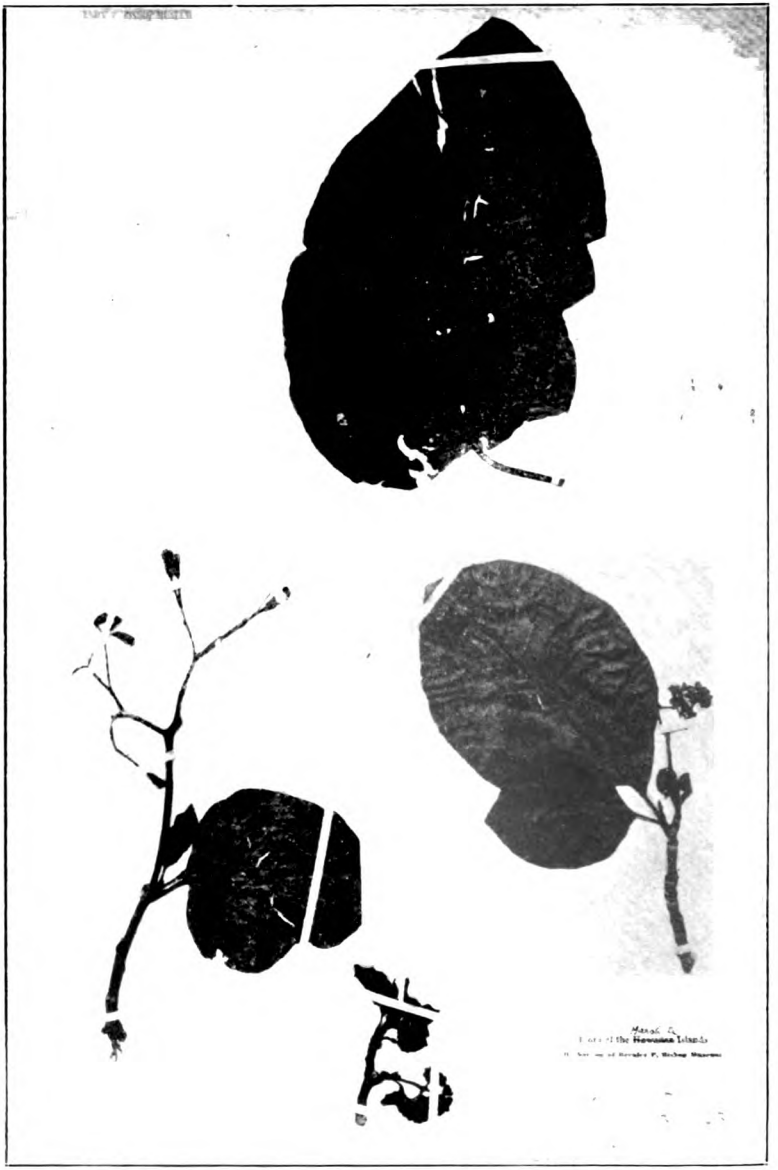


PLATE V.—*Ceodes* sp. Wake Island.