

ATOLL RESEARCH BULLETIN

No. 64

Canton Island, South Pacific
(Resurvey of 1958)

by

Otto Degener and Isa Degener

Issued by

THE PACIFIC SCIENCE BOARD

National Academy of Sciences--National Research Council

Washington, D. C.

May 15, 1959

Canton Island, South Pacific
(Resurvey of 1958)

Otto Degener^{1/} by and Isa Degener^{2/}

The present paper is based on observations made on Canton Island in February 1958, and resulting recommendations. It chiefly supplements observations made by Degener & Gillaspay on this atoll in 1950-1951, and to get a better perspective of the situation the reader is advised first to study Atoll Research Bulletins 41-43 if he has not already done so. The present survey was made through arrangements with Mr. John M. Beardslee, Regional Administrator, Sixth Region, Civil Aeronautics Administration, Honolulu, Hawaii, aided by Canton residents Dr. Owen King and Mr. Earl King.

CLIMATE

A table of meteorological data was published in Bulletin #41, pp. 7-8, taken from the U. S. Weather Bureau's publication, Local Climatological Data, ... Canton Island, South Pacific, for 1954. More recent editions of this Weather Bureau summary, through 1957, are available from the U. S. Superintendent of Documents, Washington 25, D. C. for 15 cents.

SOILS

It is said that Canton was once so covered with guano that its harvest was long a lucrative export during the latter half of the Nineteenth Century. Even though most of the island has been disturbed by bulldozers, certainly some few areas must have escaped their turmoil as well as that made by the earlier shovels of the guano diggers. Yet, in company of the soil expert Dr. Lyle T. Alexander of the Soil Conservation Service, U. S. D. A., the writers could not find a speck of guano in February 1958. Has wetter weather leached guano out of the soil? Or has the coming of man so decimated the bird population that bird droppings now are washed away by rain faster than they can accumulate on the ground?

A few small groves of trees, growing in a 2 to 4 inch thick loam, occur on Canton. Their probable origin began with a moderate guano deposit stimulating herbaceous plant growth. This resulted in the formation and accumulation of decomposing organic matter. As the soluble material washed out, a blackish soil high in phosphate remained suitable for the survival of trees. One of the soil samples collected yielded 11.4% phosphate on analysis. Perhaps it was such a phosphatic soil that was exploited by the "guano" diggers, rather than true guano.

^{1/}New York Botanical Garden.

^{2/}Formerly Botanisches Museum, Berlin-Dahlem.

Borrowing Dr. Alexander's soil auger, we entered one Messerschmidia grove near the old guano wharf to take soil samples. This was near the lagoon. Here the humus-stained layer was four inches deep, an estimated accumulation of 1,000 years. The second place for samples was a Cordia grove near the British Settlement. This was near the ocean. The humic layer was shallower; the age, less. The samples, mailed to Dr. F. R. Fosberg, were assayed by the Geochemistry and Petrology Branch of the U. S. Geological Survey, Washington 25, D. C. The results are as follows:

Sample 1 (Lab. No. 153526), top horizon in Messerschmidia grove, a dark brown sandy loam with some coral gravel that is somewhat weathered but internally clear white.

Sample 4 (Lab. No. 153527), top horizon in Cordia grove, a dark brown loamy sand with light grains, very weak structure.

Rapid rock analysis by Paul L. D. Elmore and Samuel D. Botts (methods similar to those described in U.S.G.S. Bulletin 1036-C.

	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Sample 1	1.3	31.0	.26	.03	11.4
Sample 4	2.0	44.6	.44	.02	.72

Quantitative spectrographic analysis by Nola N. Sheffey (in percent on a moisture-free basis. Dried material was ignited at 900° C for 15 min.)

	% Loss on ignition	Cu	Mn	Ni
Sample 1	46.6	.0033	.0006	.0075
Sample 4	47.3	.0018	.0002	<.0002

	Fe	Cr	Sr	Ba	B
Sample 1	.013	.0002	1.2	.002	.010
Sample 4	.004	<.0002	.50	.001	.008

Elements looked for but not found: Mo, Zn, Co.

The above quantitative results have an overall accuracy of ± 15 percent except near limits of detection where only one digit is reported.

In addition to these soil samples, foraminiferal sands were collected and the species identified. They will be reported on in a later paper together with other members of the animal kingdom.

LOCAL LANDMARKS

The SS President Taylor, briefly mentioned in Bull. 41, p. 2, is a prominent, rusting hulk near Musick Light. It still dominates the wreckage-strewn British Settlement. Why the attempt to remove it failed is an interesting tale we owe to Mrs. Betty P. Defibaugh, former postmistress.

The SS Granite State, 10,500 gross tons and an overall length of 522 feet, was launched in 1921. Two years later she was purchased by the Dollar Steamship Line and rechristened SS President Polk. She made about a hundred round-the-world trips during the next five years with passengers and freight. Dec. 5, 1941, when in San Francisco, she was requisitioned by the Government to carry 200 military personnel to Manila, the planned sailing day being December 8. As the attack by Japan on Pearl Harbor intervened, plans were changed. The vessel was rechristened SS President Taylor, quickly remodeled, and sent to Honolulu December 27 with 600 officers and men of the U. S. Tanks Corps. She then returned to San Francisco with Army wives and children.

February 3, with about 1,400 troops and equipment and accompanied by a destroyer, she sailed for Canton Island. As two Japanese submarines caught up with this little convoy near Canton, the President Taylor was ordered to steam close to the atoll. While the destroyer chased the submarines away, the ship ran aground, the troops disembarking the following day, February 15. Various attempts were made to refloat her, the last one in May, without success.

Canton being now an important war base, many of the troops stationed there visited the wreck, helping themselves to whatever they could carry away to make their living quarters ashore more comfortable. The wreck itself remained a pleasant spot to visit until gutted by fire May 1948.

The Caronia, a 300 ton steel pleasure yacht reputed to have cost \$750,000 to build in 1927, was taken over by the Navy for the duration of the war. William Cooney, formerly in the Navy, and friends, finally purchased her for a few thousand dollars. They purchased the President Taylor for \$5,200 at auction from the U. S. Maritime Commission. Incorporated as "Taylor Salvors," the eleven partners with wives and children to swell the total to 25, sailed on the Caronia for Canton with abundant salvage equipment and with food to last nine months.

The salvagers cut off most of the ship above the waterline to lighten her, and patched the holes in the hull. Thereupon they planned towing her to Japan to sell for about \$250,000. But as an irreparable crack in the hull made refloating impossible, they had to be satisfied with salvaging as much metal as possible and selling it on Canton. Expenses just about ate up profits. Then real disaster struck.

The night of July 11, 1956, the barking of dogs aboard the Caronia awakened the six sleepers just in time to enable them to jump overboard and swim ashore. The vessel was ablaze and soon a total loss. Salvage operation of the President Taylor ended, the last

partner forsaking Canton January 1957. Then March 31 the Coast Guard towed the wreck Caronia from the lagoon out to sea and sank her. The SS Granite State, alias President Polk and President Taylor still lies on the reef of Canton.

The old Pan-American World Airways hotel, where the senior writer spent a few days in 1950, has been abandoned. It had become a shambles by 1958.

Canton has improved since 1950-51 in respect to housing for CAA personnel. Many more attractive, modern homes have been built south of the Terminal Building. Some of these are surrounded by well kept gardens; a few by native vegetation and naturalized weeds.

FLORA: SPERMATOPHYTA

Bulletin 41 describes fully the native flowering plants, and lists the plant introductions made in 1950-51. Here we shall note pertinent observations about both categories, arranging the species in taxonomic order. Species which have not materially changed in status since the earlier survey will not be discussed here.

Following instructions from CAA officials in 1950, most of the early introductions were made about the CAA housing area and Terminal Building. Though we were dismayed to see most of these plants with bare, dead stems in February 1958, we were gratified to notice some of them putting forth healthy shoots from the base. The reason was not clear to us until a resident explained that this very area had been thoroughly sprayed; but instead of using the insecticide desired, the workmen in error had used a weed killer!

PANDANACEAE

Pandanus tectorius Park. of the Hawaiians is now represented by quite a number of specimens. All are restricted to gardens, and most probably stem from the 1950-51 introductions.

GRAMINEAE

Cenchrus echinatus R. Br. the sandbur, a terrible nuisance, is ubiquitous as before in areas where man is active. We mention it here because of the strange fact that it has hardly if at all increased its range since 1950-51. Near the plant nursery, now demolished west of the Terminal Building (Bull. 41, p. 39), two plants are killing and displacing this painful weed. Pennisetum setosum, because of its perennial habit, preempts areas where the annual sandbur dies of age, and takes over the ground before the germinated, bur-enclosed seeds can establish themselves. The other beneficial plant is the teaselgourd vine (Cucumis dipsaceus), which simply grows over the sandbur and smothers it to death.

Chloris inflata Link, a fingergrass, conspicuously extends over neighboring vegetation. It is common about the old plant nursery, north of the "native" village inhabited by Gilbert and Ellice Islanders, and about the British Settlement near Musick Light.

Cynodon dactylon (L.) Pers., Bermuda grass, thrives in several patches near the Terminal Building. The beautiful, green lawn existing about the home of a Hawaiian family in 1950 is gone as is its careful tender. He watered it from a brackish well he had sunk in his own garden.

Digitaria henryi Rendle, a 1950-51 introduction, is established and forms small mats in the shade of the coconut trees about the guest house near the lagoon, British Settlement (Deg. & Deg. 24,647).

Digitaria pacifica Stapf, the native bunch-grass, is variable, as mentioned in the previous bulletin. Along the lagoon, north of the native village, is a form (Deg. & Deg. 24,638) that extensively creeps to build up a huge, loose clump about 50 feet across. At the east end of the north Landing Strip, on the other hand, grows a very compact, dwarf specimen. Residents should keep such aberrant plants under observation to determine whether they are merely ecological forms or, instead, genetic ones worth describing.

Digitaria sanguinalis (L.) Scop., crabgrass, if this difficult grass is correctly identified, grows here and there about the nursery area. It is reseeding itself.

Digitaria timorensis (Kunth) Bal. is still growing in the same areas as in 1950-51. Now, however, it is likewise naturalized in dense but localized patches in the plant nursery area (Deg. & Deg. 24,645). Because of its perennial nature, it appears to be crowding out sandbur.

Eragrostis amabilis (L.) W. & A., the feather lovegrass, is a delicate annual thriving here and there about the British Settlement. In the garden of the Terminal Building it forms a dense, tangled lawn, tending to crowd out all other herbs. Just before our departure from Canton in late February 1958, we were amazed to see all this grass being uprooted and hauled away to leave a glaring white surface of coral shingle. Such an area becomes ideal for sandbur to take over. This little garden spot, seen by every voyager, needs a two to three inch covering of screened soil, still quite plentiful near the old guano wharf. Then the area should be mowed regularly every month by a light hand lawn mower, whether it appears to need it or not, the gardener being careful not to let the wheels of the machine cut into the soil. Taller herbs will thus be discouraged from growth and, if the original workmen in February 1958 were not too efficient in eradicating every trace of it, perhaps the lovegrass will establish itself again from random seeds left in the neighborhood.

Eragrostis whitneyi Fosb., the lovegrass named for my young friend, the late Leo Whitney, has perfected a means of racial survival in this sun-scorched atoll by having shortened its life cycle to a scant three or even two weeks. February 1 we discovered a single tiny plant beginning to flower at the swimming hole near the lagoon, northwest side.

By February 16 the species was very common locally, also actually on the Fighter Strip where no other flowering plants could gain a foothold, and here and there on the road at the southeast side. In the latter place it was among blue-green algae (Microcoleus acutissima and a little Schizothrix longiarticulata) that were binding the dusty sand together. This native grass does not grow in rubble, like Lepturus, but in firmly compacted sand and coral fill. Perhaps in such terrain, soil moisture can more easily rise by capillary action to where the shallow roots are located. The life span of this grass is even too short for the scale insect (Antonina graminis (Maskell) det. Miss Amy Suehiro) to grow to maturity about its rootstock.

Lepturus pilgerianus Hansen & Potztl (1954) is of special interest. It is the only annual in the genus. Fosberg states, "The supposed annual habit of L. pilgerianus is especially meaningless to any one who has seen L. repens extensively in the field, as this feature is a purely facultative one, depending on the climate at certain stages in the life of the plants." This is a bold statement, particularly as the critic admits not having seen the type specimen. O. Degener spent a total of ten weeks botanizing on Canton; E. Degener spent three. The Degeners here reaffirm their previous finding that L. pilgerianus is annual. Furthermore, this annual plant differs from the perennial Lepturus growing with it in having culms red-violet not green toward the base, in forming a narrower and less congested tussock or "bunch," in having leaves smooth rather than rough, in lacking obviously the dead culms and leaves of previous years' growth found in the perennial, and in the inflorescences at a distance appearing more conspicuously separate from the rest of the tussock. L. pilgerianus grows on both sides of the lagoon, being especially abundant near the Fighter Strip. Though passage was available for the asking on a Government vessel to neighboring Enderbury Island in February, due to an oversight the writers missed the opportunity of going there to ascertain the possible presence of L. pilgerianus.

Lepturus repens (Forst. f.) R. Br., though recorded from Canton in practically all previous papers, actually does not occur there in the narrow sense (var. repens). The Canton plant is either the variety subulatus, originally described from Ujelang, Marshall Islands and widely distributed in the Pacific, or a variety still undescribed. The Ujelang plant "tends to be stoloniferous," a tendency foreign to the Canton plant.

Panicum distachyum L. (Deg. & Deg. 24,649) is a new record for the atoll. It forms dense mats in the British Settlement. One large clump (Deg. & Deg. 24,656) grows against the ruins of the PAA hotel, in a spot that receives rainwater from the roof.

Panicum miliaceum L., growing near the PAA hotel in 1950 and thought to be derived from spilled birdseed, has disappeared.

Pennisetum setosum (Swartz) L. Rich., introduced in 1950-51, covers an acre or two near the plant nursery to the exclusion of almost every other plant. Clumps occur sporadically elsewhere in the general neighborhood. Largely because of its perennial habit, as already

mentioned under Cenchrus, it crowds out the annual sandbur. Like so many other introductions, Pennisetum has not extended its range extensively. These writers therefore in 1958 gathered many seeds, better termed grains, and scattered them in likely places. This grass and Cucumis dipsaceus (p. 16) vie among themselves as the most valuable introduced sand binders.

Setaria verticillata (L.) Beauv., the bristly foxtail was, next to the sandbur, the most troublesome weed in 1950-51. It was everywhere near human activity, the coarsely hairy, fruiting inflorescences tangling themselves in socks and stockings of anyone straying from the center of a pavement. But during a three weeks' stay on Canton in February 1958 the writers found only two or three clumps. One of these was about a box of garbage that had been dumped on the roadside northwest of Turtle Beach. We do not know why this annoying weed has suddenly almost disappeared.

Tricholaena rosea Nees, Natal grass, is now naturalized widely in the nursery region, about where it was first introduced in 1950-51.

CYPERACEAE

Cyperus javanicus Houtt., introduced in 1950-51, grows well in clumps between the nursery and the ocean (Deg. & Deg. 24,650).

Cyperus polystachyos Rottb. (Deg. & Deg. 24,655) grows in several clumps in the shade of coconut trees near the lagoon about the British Settlement. It is a welcome addition to the local flora, not recorded before.

Cyperus rotundus L., the nutgrass, still grows about the old PAA hotel site; now also about the Terminal Building.

Fimbristylis dichotoma (L.) Vahl, growing in 1950-51 near the outdoor theater of the time, south of the British Settlement; and F. pycnocephala Hbd. growing on a barren plain near the CAA housing area of the same time, are still there. By 1958 they had spread to the northwestern part of the atoll, conspicuous and valuable sand binders of open areas everywhere. The latter resembles a coarse pincushion. The two species often grow together, and we noticed evidence of hybridization.

ARECACEAE (PALMAE)

Cocos nucifera L., the coconut, now grows abundantly in gardens. Many are given a little care and hence are thriving. Only one tree, however, is now old enough to begin bearing. The healthiest trees, even though infested with scale, are in Dr. King's garden. They had been set in pani or depressions below the surface of the ground, holes dug deep enough to penetrate the hardpan. They were surrounded by large slabs of limestone tipped so as to lead an unusual supply of water to them at every rain, and were occasionally supplied with a little water left over after household use. This last treat will be hardly necessary after the roots have penetrated to near the brackish ground water table.

Phoenix dactylifera L., the date palm, was considered such a valuable food plant in case of emergency on Canton that thousands of its seeds were scattered in 1950. Many germinated and Dr. S. G. Ross set out a score or so seedlings about his hospital in 1951 south of the British Settlement. In 1958 only two small date palms were growing on Canton, cultivated in a garden.

COMMELINACEAE

Rhoeo spathacca (Sw.) Stearn, the white-flowered tradescantia or "oyster plant," was introduced in 1950-51. It grows well in some gardens.

Setcreasea purpurea B. K. Boon is cultivated about one home, and doing well.

LILIACEAE

Sansevieria cylindrica Bojer and its relative S. guineensis (Jacq.) Willd. introduced in 1950-51 are planted in gardens. None has become naturalized.

AMARYLLIDACEAE

Crinum asiaticum L., or a species thus called in Hawaii and elsewhere, is planted commonly about homes. It is often grown crowded together, although it needs to be thinned to individual plants to get best results.

Furcraea foetida (L.) Haworth, incorrectly listed as F. gigantea in Bull. 41 and by botanists in general, was introduced in 1950-51. It is growing in a few gardens.

MUSACEAE

Musa nana Lour., the Chinese banana, was cultivated in a few gardens in 1958 to the exclusion of other kinds also grown in 1950-51.

CASUARINACEAE

Casuarina equisetifolia L. and C. glauca Sieb. are both thriving without care, the latter increasing its area slightly by producing from its spreading roots adventitious buds that grow into new trees.

POLYGONACEAE

Coccoloba uvifera (L.) L., the seagrape, was already growing and fruiting about the PAA hotel in 1950. But as Degener had a thriving tree in his garden at Mokuleia Beach, Oahu, he gathered the abundant seeds fallen on clean sand. This was more practicable than searching for and gathering the few that fell among sandbur and foxtail under the Canton Atoll trees. The Oahu seeds were planted on Canton. By 1958, the old original seagrape trees had formed a beautiful, small shady grove about the hotel grounds. Ripening fruit was everywhere, and "native" urchins were gathering them into tin cans as a source of food. The trees were reseeding themselves and can furnish sufficient seedlings to form shaded roadsides

and gardens throughout the atoll if given a minimum of care. Volunteer seedlings, if left under the old trees die within a few years. Seed scattered about by Degener in 1951 had grown into a few low, spreading bushes about the bird refuge, and those planted south of the housing area were healthy and thriving. A few were planted at the Gillaspys home and, according to reports, were six feet tall in 1958 before they were uprooted and discarded by a new resident.

AMARANTHACEAE

Amaranthus dubius Mart. was not observed during our 1958 stay.

AIZOACEAE

Sesuvium portulacastrum var. griseum, first described by Degener & Fosberg as new from Canton, is still growing in the same areas as before. But in 1958 at the Dock a patch of the species, var. portulacastrum. (Deg. & Deg. 24, 651) was found naturalized. It is obviously of recent accidental introduction, seeds presumably reaching this spot with shipping. The difference between the slender, red-stemmed, red-flowered, glossy, terete-leaved var. portulacastrum and the stocky, yellow-stemmed, pale-flowering, dull, angular-leaved variety griseum is striking when the two grow side by side.

PORTULACACEAE

Portulaca cyanosperma Egler, a Hawaiian purslane with pretty violet-red flowers, was introduced in 1950-51. Mr. & Mrs. Albert Lincoln reported the former occurrence of large mats of this succulent near Turtle Beach, northeast side of Canton. They transplanted some to their garden near the lagoon where the writers happened to see it and its escaping offspring. A visit to the former Turtle Beach stand disclosed that waves of a recent, severe storm had washed over this area, sweeping all vegetation in their path, except Suriana, into the lagoon.

CARYOPHYLLACEAE

Spergularia marina (L.) Griseb., a pale, fleshy halophyte (Deg. & Deg. 24, 612), was collected on Johnston Island January 30, 1958. Its seeds were scattered about the new hospital in the CAA housing area on Canton a few days later.

CASSYTHACEAE

Cassytha filiformis L., the love-vine, is native to Canton. It now covers like a huge greenish throw-net several acres near the Shark Pool, parasitizing Portulaca lutea, Boerhavia and Sida.

CRUCIFERAE

Lepidium o-waihiense Chua. & Schlecht., introduced from Oahu in 1950-51, is surprisingly abundant (Deg. & Deg. 24, 636) and even crowded in 1958 on part of the elevated side of the causeway south of the "native" village. The writers gathered several handfuls of seeds to scatter in other likely places.

CRASSULACEAE

Bryophyllum pinnatum (Lam.) Kurz, the air-plant so famous for producing plantlets from notches in its leaf even when the latter is pinned on a window curtain, is now growing in a few gardens. It has not escaped, but should be encouraged to do so.

LEGUMINOSAE

Desmanthus virgatus (L.) Willd., the slender acuan, was introduced in 1950-51. Numerous branches of this shrub stand stiffly upright about the nursery area, killed by the weed spray. Luckily two or three root-stocks survived the poison, and in February 1958 bore flowering branches.

Leucaena glauca (L.) Benth. (haole koa in Hawaii) was already represented by a few fruiting plants in 1950 at the PAA hotel entrance. Degener in 1950-51 introduced many seeds. Now this plant is sparsely re-seeding itself about the British Settlement, and fairly well in the nursery area, even though recently exposed to the weed spray.

Prosopis chilensis (Molina) Stuntz, the algaroba, is a shallow-rooted tree related to the deep-rooted mesquite of the southwestern part of the United States and northwestern Mexico. As stated previously (Bull. 41, p. 33), the Degener-Gillaspy policy was to introduce no plants that might be poisonous or painfully thorny "such as the . . . algaroba (Prosopis chilensis)". Nevertheless, in 1958 we were pleased to see a dainty algaroba growing in a flower pot on a resident's porch. There is a vast difference between algarobas growing under proper confinement and such trees growing wild to scatter their cruelly efficient thorns where such a large proportion of the population goes barefoot.

EUPHORBIACEAE

Acalypha wilkesiana M. -A., the painted copperleaf, had disappeared by 1958, but the three Chamaesyce species were as common as before. They had not materially extended their range.

Phyllanthus "niruri", "growing in 1951 in and about a box of soil imported from Fiji," had established itself about the British Settlement, but was rare in 1958. When this specimen (Deg. & Deg. 24,646) is studied further it will probably be shown to be another species, as according to G. L. Webster (1956) P. niruri L. though widely reported, does not occur in the Pacific Islands.

Poinsettia cyathophora (Murr.) Kl. & Garcke), the fiddle-leaved poinsettia, in 1950 was sparingly naturalized and protected in the British Settlement; but not observed elsewhere. In 1958 this modest ornamental was growing wild and common in the housing area. When the plants flower, thirsty flies and other insects are attracted to the nectar. Some housewives therefore keep the plants from growing near their homes. The garden poinsettia (P. pulcherrima (Willd.) Graham) was nowhere to be seen. It is worth introducing again as a garden plant.

ANACARDIACEAE

Schinus terebinthifolius Raddi, the Christmasberry tree, is represented by a small healthy plant in a garden near the airport.

MALVACEAE

Gossypium brasiliense Macf., the kidney-cotton of commerce, was introduced in 1950-51 about the CAA housing area. Several years later it was abundant, and conspicuous with its untidily spilling seeds and white lint. After the disastrous spraying of the area with weed killer, this choice ground cover was killed except for a few score plants. These were producing their crop of cotton in 1958, and some of the seeds were planted at that time. The endemic Hawaiian cotton (G. tomentosum), likewise introduced in 1950-51, is nowhere to be seen.

Hibiscus rosa-sinensis L., the common Chinese hibiscus, is growing in a few gardens as before. The plants are chlorotic.

Pariti tiliaceum (L.) Britton (hau in Hawaii) was already on Canton when Degener introduced many seeds from Oahu in 1950-51. In 1958 the tree was rarer than before; the old one at Musick Light still lives.

Sida fallax Walp. is almost everywhere as before. Near the garbage dump south of the housing area grows a freak bush with almost white flowers.

Thespesia populnea (L.) Sol. (milo in Hawaii) still grows on Canton. In spite of the numerous seeds introduced in 1950-51, it is represented by only a few more individuals in 1958.

CLUSIACEAE (GUTTIFERAE)

Calophyllum inophyllum L. (kamani in Hawaii) was already on the island before Degener imported seeds and potted plants in 1950-51. The old trees of 1950 about the PAA hotel are growing well.

TAMARICACEAE

Tamarix aphylla Karst., the European tamarix, is represented by the same beautiful, large trees that were growing about the hotel in 1950. Cuttings from Oahu set out by Degener in 1950 about the Weather Station had been accidentally killed by the weed killer except for one tree that has become ten feet tall. This represents a growth of almost one foot per year.

PASSIFLORACEAE

Passiflora foetida L., the foetid passionflower, was represented by a single plant in 1950 before Degener introduced and scattered hundreds of seeds. In 1958 it was naturalized about the plant nursery and British Settlement. The long vines are flowering, bearing their edible fruit, and reseeding themselves.

CARICACEAE

Carica papaya L., the papaya, was planted as before without following the writer's suggestions of adding humus in the soil about it (Bull. 41, p.26). As expected, the trees were chlorotic and non-fruiting.

COMBRETACEAE

Conocarpus erecta L., introduced in both the glabrous and silvery varieties by Degener in 1950-51, are beautiful shrubby trees in the Terminal Building garden. The ground under the trees is covered with seedlings available for replanting. They have not been used and gradually die due to competition with the parent plants.

Terminalia catappa L., the Indian almond, was already on Canton when Degener introduced seeds and seedlings in 1950-51. The Degener introductions were nowhere to be seen in 1958, whereas the old trees of 1950 about the PAA hotel are not only growing well but reseeding themselves. Young plants up to a foot high are under the old ones just waiting to be transplanted.

ARALIACEAE

Polyscias guilfoylei (Bull) L. H. Bailey, the panax of Hawaiian residents, is now growing in a garden or two in the housing area.

APOCYNACEAE

Plumeria rubra L., the frangipani, was introduced in a cultivated form previous to 1950, and died that year due to scale insects. Offspring of wild trees originally gathered in the Bahamas by Degener and planted by him on Canton in 1950-51 have disappeared. These bore small, white flowers. A single plant of a cultivated form, obviously recently introduced, now grows in a garden.

Calotropis gigantea (L.) Ait. and its white-flowered form wilderi Degener, the crown flowers, are grown with success in both the British Settlement and the CAA residential area. As these milkweed are host for the caterpillar of the monarch butterfly, some residents destroy their plants rather than bother to kill the insect with a spray or by hand picking. We are not certain whether the lavender crownflowers in gardens come from cuttings imported in 1950-51 or are from the ancient bush still growing between Musick Light and the wrecked "President Taylor."

The variety wilderi, in the original description by the senior writer in 1937, was stated to have been introduced into the Hawaiian Islands "by Gerrit Wilder "from Tahiti, where he found it, growing in the garden of Robert Keable, writer." More recent evidence indicates that Wilder erred in claiming he had first introduced this plant into Hawaii. It had been growing there years before his introduction. Whether it originated in the Hawaiian Islands, Tahiti or elsewhere is still an open question.

CONVOLVULACEAE

Ipomoea tuba, which was not identified with certainty in Bulletin 41, p. 27, is a correct scientific name for the native moonflower. This twiner is represented by the same old plants observed in 1950-51 along the northeastern rim. It has not spread of its own accord since that time. The few seeds lying about the dormant plants in 1950-51 were gathered and planted about the CAA housing area. It was refreshing to see this night-bloomer cover now almost an acre of rubble where the two Landing Strips meet, and to see a patch a hundred feet wide covering Sesuvium just south of the housing area. A few moonflowers are being successfully trained on trellises. The plant is beautiful at night with its large, gleaming white flowers facing the stars overhead.

Ipomoea batatas (L.) Poir., the sweet potato, was observed in 1958 planted in the open in the housing area. It thrives except for chlorosis.

Ipomoea pes-caprae (L.) Roth, the beach morning-glory, frequently recorded from Canton, is probably represented only by the subspecies brasiliensis. We do not know whether we should classify it as native or introduced; it is a borderline case. So far as its seeds drift to Canton and germinate there, it is a native. But due to the terrestrial hermit-crab (Coenobita perlatus), such plants never survive. We now believe the only plants able to mature receive some human protection. In this sense, the beach morning-glory must be classed as introduced. In February 1958, hundreds of thousands of beach morning-glory seeds were seen washed up in an almost solid line along the north shore of Canton. With several other species of various families, they germinated well enough to mark a thin greenish line along the beach. The characteristically shaped cotyledons were soon devoured and not a seedling was observed with normal, goat-footprint leaves. Yet about the hotel area and CAA housing area, where Degener planted Oahu seeds in 1950-51, the vine was common, covering the ground with its long, flowering, creeping stems. These even covered the bare floors of the large Quonset huts near the lagoon beach. Though a prostrate creeper, not a high twiner like the moonflower, the slender stems were successfully trained by some residents over fences near the Terminal Building to produce a truly charming effect.

BORAGINACEAE

Cordia sebestena L., the geigertree, thrives in spite of neglect in the old PAA hotel grounds. Its roots, like probably those of all the various kinds of older trees in the vicinity, may have reached to near the watertable. There, one must remember, the water is but mildly brackish. The ground under the geigertrees is covered with healthy seedlings, material that could be nicely planted in gardens and along the roads of the CAA housing area.

Cordia subcordata Lam. (kou in Hawaii) may be native according to some evidence; originally introduced by man according to other. For example, during our rather thorough search for drift material we failed to find a single kou fruit, notwithstanding that they are corky and hence admirably suited for ocean transport. About the present kou groves, where hermitcrabs congregate mainly to enjoy the shade, the seeds

readily germinate but the writers have yet to find a single one escape crab destruction to grow to maturity. The opportunity for a rare seed during the atoll's life-time to reach a favorable spot, to be covered with sand and germinate, and finally to mature in spite of hungry crabs is entirely possible but unlikely. Furthermore, clusters of kou trees about the old guano wharf "are said to have been planted years ago (Bull. 41, p. 28)." That leaves the two groves, less than one mile south of Musick Light, to consider. The one covers about 3500 square feet and the other about 2700 (Bull. 43, p. 3). The soil in the former, according to Dr. Alexander's estimate to us on the spot, is several hundred years old. Do these old kou groves, each probably derived from a single fruit, represent an introduction several hundred years ago by ocean currents or by early Pacific Islanders, perhaps those who may have erected coral rock edifices (Bull. 41, p.6)?

Even though the kou was already there, Degener shipped a large quantity of fruits from his Mokuleia Beach, Cahu, trees to Canton in 1950-51 to add to fruits gathered by him locally. Then while hunting for and studying specimens south of the housing area, he was wont to wander over the area, a shovel in the right hand, and a pail with vials, killing bottle, flask of water and kou fruits in his left. At various spots he thrust his shovel a few inches into the friable soil, moved it back and forth a few times, threw a small handful of fruits in the gaping hole, and tamped the soil about them. In 1958, the landscape, thanks to this early planting, was dominated by vigorous clumps of kou trees, each about six feet tall and seven or eight years old. The very minimum care in planting combined with isolation, that made it difficult for crabs to find everyone of the thousands of tasty seedlings, was sufficient to establish groves of this tree. Defoliation by caterpillars, an ugly nuisance to which all kou are presently subject, will be lessened thanks to Territorial Entomologist G. C. Chock of Honolulu. He is preparing to ship the proper parasite for control.

VERBENACEAE

Stachytarpheta jamaicensis Vahl, called oi in Hawaiian, is native to tropical America. The small quantity of seed available was scattered in 1951 mainly about Degener's cottage near the lagoon south of the PAA hotel. In 1958 the oi was locally abundant and naturalized. The only other station observed that year was at the garbage dump, south of the CAA housing area. This consisted of a single large plant, in that area decidedly ornamental with its pale lavender flowers. Because of their contrast against a field of yellow Sida, its scanty sprays were being picked for ornament. Its popularity may yet cause its death. At the abandoned cottage, on the other hand, the plants can continue to blossom and reseed themselves undisturbed.

SOLANACEAE

Capsicum frutescens L., the common redpepper often called "Chili pepper," is more than holding its own in a garden.

Lycopersicon esculentum var. commune Bailey, the common tomato, was evidently recently introduced and thriving in a garden. L. esculentum subsp. galeni (Mill.) Buckwill, a wild tomato with small fruits naturalized on Oahu, was hopefully introduced in 1950-51. Not a single plant was to be seen in 1958. "Lycopersicon esculentum var.", collected near the Airport by Degener & Hatheway (No. 21,307) in 1950, was likewise gone. It resembles a plant from the Galapagos (Alban Stewart No. 3,380), and like it is a straight variant of L. esculentum.

Nicotiana glauca R. Grab., the tree tobacco, already in Canton in 1950, was reintroduced by Degener the following year. In 1958 one huge plant, a respectable tree, grew in a depression north of the north Landing Strip close to the ocean. It had been badly mauled by a storm, but was recuperating well from its injuries. It had reseeded itself prolifically during the past years, and the younger plants, likewise injured during the same storm, were likewise growing lustily. Other plants growing elsewhere often become chlorotic.

Petunia hybrida Nilms, the common garden petunia, grows nicely in a window-box. Such prized plants almost always receive a little care, some water left over after rinsing a vegetable or the dishes, perhaps even a little commercial fertilizer. Such ornamentals are well worth growing, but hardly can be expected to escape into the wide open spaces where such little extra care is denied them.

Physalis angulata L., the husk tomato, is found, as in 1950, sparingly naturalized at the British Settlement. This time it has spread to the Terminal Building garden. Here the plants suffer from the attacks of red spiders.

Solanum melongena var. esculentum Nees, the eggplant, grows in a garden. It promises a crop.

RUBIACEAE

Casasia clusiifolia (Jacq.) Urban, perhaps best named the Bahama gardenia, was introduced as small plants in 1950-51. Seeds, collected by Degener many years ago along the arid coral coast of New Providence, British West Indies, were sent to Colin Potter, custodian of Foster Botanical Gardens, Honolulu, for cultivation and distribution. In 1951 Mr. Potter kindly donated some healthy, six-inch plants for Canton, which were forthwith set out at the Terminal Building. In 1958, though somewhat infested with scale insects, the Bahama gardenias had developed into beautiful compact shrubs, three to four feet high, with dark, glossy leaves and sweetly fragrant, gardenia-like flowers. Even the large orange fruit, edible in an emergency, was setting but we do not know whether its seeds will be viable. This ornamental evergreen is highly recommended for planting in local gardens.

Morinda citrifolia L., (noni in Hawaii) was known to Degener in 1950 by a single large tree near the old guano wharf. It had disappeared by 1958. At that time, however, a large, but dilapidated tree was growing in the "native" village and, according to a Gilbertese, several more were growing east of the north Landing Strip. The variegated var. potteri Degener, introduced by Degener originally from Viti Levu, Fiji, planted in 1950-51, was nowhere observed.

CUCURBITACEAE

Citrullus vulgaris Schrad., the watermelon, was planted in one garden.

Cucumis dipsaceus Ehrenb., the teaselgourd of Arabia, was introduced in 1950-51. At the old nursery in 1958 it had covered one area 50 feet across, and was growing in several more places in the vicinity. In the former locality this vine formed a luxuriant, densely leafy ground-cover, smothering out every other plant in the area, including the obnoxious sandbur (p. 4). The ground was covered with golden yellow gourds, many of which were gathered, sliced and scattered in likely places. Though this interesting plant finds Canton to its liking, it seems not to spread much farther than its slender extending vines can drop their seed-filled gourds upon the ground. An efficient animal for proper seed-dispersal is wanting. Grown for ornament and curiosity in many lands, it is strange no island resident has trained the teaselgourd over fences and trellises like the moonflower and the less adapted beach morning-glory.

Cucumis melo L., the muskmelon, thrives in one garden, the vines covered with unripe melons two to three inches in diameter. Even if they do not ripen, they can be made into a conserve or pickle. According to Mr. Beardslee, many ripened.

GOODENIACEAE

Scaevola, the naupaka of Hawaiians, consisted of two kinds of plants on Canton in 1958: the native one, common almost everywhere; and the Hawaiian one, consisting of less than a dozen plants derived from Oahu seeds scattered in 1950-51. To have these two kinds growing together under identical conditions was ideal for their comparison and study. The Canton plant becomes ten feet tall; has glossy, hairless leaves; and white flowers in which the corolla lobes are marginally narrow-winged and slightly fimbriate. The Hawaiian plant, on the contrary, rarely attains half that height; has finely velvety leaves; and white to more or less lavender flowers in which the corolla lobes are marginally broader-winged and more prominently fimbriate. Residents of Canton, without any botanical knowledge, had noticed the difference between the two even before our arrival from Honolulu.

The coastal species of Scaevola on Canton and other Pacific Islands has white fruit and has most often been called S. frutescens (Mill.) Krause. Fosberg (1956) has demonstrated that this name can be applied only to the Atlantic coast Scaevola with black fruit, which the writer knows well from Bermuda and the Bahamas. Fosberg concluded that the only name available for the Pacific species is Scaevola sericea Vahl (Symb. Bot. 2: 37, 1791). This was described from Niue (Savage Island) east of Tonga and the name can best be translated as silky scaevola. While the Canton plant is nowhere silky, we tentatively call it S. sericea until further studies determine whether another name is necessary.

The common Hawaiian plant has been called variously S. lobelia, S. frutescens, S. frutescens var. sericea and S. fauriei. We know it cannot bear any of the three first names. We likewise believe it is not sufficiently distinct from the Niue plant to have a specific name of its own. We therefore (Phytologia 6(6): 321, 1958) named the Hawaiian plant Scaevola sericea var. fauriei Degener & Degener.

Now that two related naupaka grow on Canton, it will be interesting to note whether they will hybridize.

COMPOSITAE

Conyza canadensis (L.) Cronq. (Deg. & Deg. 24,961) is represented by about a dozen plants. These grow about a warehouse southwest of the Terminal Building, mostly under the eaves of the roof, perhaps because of the additional water that occasionally drips from them. This plant is new for Canton, an accidental introduction.

Gaillardia picta Sweet, a variable form of hybrid origin naturalized on dunes about Laie, Oahu, was sown around the Terminal Building in 1950. In 1951 several plants had already flowered, most of them under the eaves of old shacks. In 1958 the shacks were gone, and the Gaillardia as well. With a little care, this ornamental would reward the gardener with an abundance of pretty flowers varying from yellow to orange-red.

Pluchea indica (L.) Less. , the Indian pluchea, was introduced in 1950-51. It is thriving and common about the Turning Basin. It now grows among its coarser, grayer relative P. odorata (L.) Cass.

Tagetes sp., the marigold, was observed cultivated in a window box.

CYANOPHYTA^{1/}

Cyanophyta (Myxophyceae, Cyanophyceae) commonly called blue-green algae because of their prevailing color, are extremely important in keeping the sand and the coral dust of Canton Island from blowing away.

Some "blue-greens" form a felt-like covering near the surface of the soil; some cover the soil with a gelatinous matrix; others evidently combine with bacteria to form a thin layer of stone; while still others are apparently of no value at all as soil binders. When Canton suffers from an exceptionally long drought, some of the felt-like blue-green algae curl up in leaf-like flakes and eventually may crumble into dust, thus exposing the loose sand and soil as well as themselves to wind erosion.

Of course a ship or plane may have unwittingly transported different kinds of blue-greens from one island to another. Perhaps because of such agency of man, Entophysalis deusta and Microcoleus

^{1/}Remaining groups of algae in the Degener Collection are described by E. Yale Dawson as Bull. 65.

chthonoplastes were collected on both Canton Atoll and Johnston Island (Deg. & Deg. 24,580 and 24,580a, Jan. 30, 1958). The consensus of botanists, however, is that such microscopic organisms are readily transported even by high air currents throughout the world. To be wafted from Canton to Johnston or vice-versa is not a difficult feat, one that probably occurred time and time again. Many blue-greens are capable of survival on sun-scorched rocks, as found on Canton, on the Equator; and in the thermal springs, as in Yellowstone and New Zealand. Such plants are likewise capable of survival and growth in frigid regions.

Thanks to Dr. Francis Drouet's efficient advice on the collecting of Cyanophyta received before our February 1958 stay on Canton and thanks to his expert determinations, we have the following to report:

CHROCOCCACEAE

Anacystis aeruginosa (Zanard.) Drouet & Daily (Deg. & Deg. 24,744).

Anacystis dimidiata (Kütz.) Dr. & Daily (Deg. & Deg. 24,584, Feb. 16, 1958), with Entophysalis deusta, was found along the southeast beach of the lagoon in shallow water gently rippled by wave action. It imparted to the fine, almost muddy, white sand, a pale pea-green color. Mixed with Johannesbaptistia pellucida and Lyngbya aestuarii which see.

Anacystis montana (Lightf.) Dr. & Daily (Deg. & Deg. 24,571, Feb. 3, 1958) occurred as a thin mat about one mile east of the Fighter Strip along the wet edge of a more or less permanent shallow, narrow pond. Various kinds of fish must have washed over the beach into this pond during severe storms but we found only mullet. The reason they could survive while the others did not was evident on tasting the water. It was almost fresh.

Johannesbaptistia pellucida (Dick.) W. R. Taylor & Dr. (Deg. & Deg. 24,573, Feb. 8, 1958), commixed with Entophysalis deusta, Anacystis dimidiata and Plectonema terebrans, formed an almost black blue-green mass at the bottom of a fresh-water pond behind the beach near the Messerschmidia woodland shown on Matheway's map (Bull. 43) near the center of the north shore.

CHAMAESIPHONACEAE

Entophysalis deusta (Menegh.) Dr. & Daily (Deg. & Deg. 24,594, Feb., 1958) is the microscopic plant that by its astronomical numbers imparts to the atoll a dark grayish somberness excepting where displaced by the green of other vegetation, the gleaming pale yellow to pink of the beach sand, the white of wave-worn coral slabs, and the indescribable pale greens to aquamarine blues of lagoon and ocean. This so-called blue-green alga covers the upper surface of coral slabs, barely penetrating beyond superficial interstices. Though useful in cutting down the glare of the otherwise alabaster-white coral rock, no one has yet worked out to what extent its absorption of the sun's rays raises the temperature of its surroundings. Considering the climate, these primitive plants are sun-scorched and dormant most of the time, springing

into life during occasional rains and ocean mists; or at night when much of the atoll is covered by a film of moisture readily formed on surfaces impregnated with ocean salts. This same plant, in conjunction with bacteria on and about decaying plant and animal debris, formed a firm 8 mm. thick crust about a drying, brackish pool on Spam Island (Deg. & Deg. 24,593, Feb. 19, 1958). Even an arid undermined ledge of limestone overhanging the lagoon bore this persistent, difficult-to-kill plant on both its surfaces (Deg. & Deg. 24,568, Feb. 8, 1958). It (Deg. & Deg. 24,564, Feb. 14, 1958) even blackened the limestone bottom of a drying, shallow arm of the lagoon six miles east of the Fighter Strip. It is almost everywhere, and hence it would be repetitious to list all our collections.

To realize fully the frequency and island-wide distribution in various habitats of this species, it is merely necessary to peruse the paragraphs below concerning other species and to learn that E. deusta was growing with many of them.

OSCILLATORIACEAE

Hydrocoleum comoides (Harv.) Gom. (Deg. & Deg. 24,918, Feb. 1958) was found on the lagoon side east of the north Landing Strip. For another collection (Deg. & Deg. 24,576a, Feb. 3, 1958) see under H. glutinosum of same number.

Hydrocoleum confluens (Setch. & Gardn.) Dr. (Deg. & Deg. 24,727, Feb. 2, 1958) grew on reef rocks, in shallow water at low tide, northwest of the Gilbert-Ellice Village.

Hydrocoleum glutinosum (Ag.) Gom. (Deg. & Deg. 24,578, Feb. 2, 1958) stained patches of muddy sand a light green. This was common on the ocean reef, shallow at low tide, southwest of the Terminal Building. The same species (Deg. & Deg. 24,576, Feb. 3, 1958) and some H. comoides were collected about 10,000 feet east of the northwest tip of Canton. Here on the ocean side is a limestone reef so flat and smooth as to remind one of a concrete sidewalk. In many areas a very fine white sand with a light bluish green color covered this rock to a depth of about one centimeter. Instead of being washed away by the waves of the open ocean, this sand remained, probably held in place by the gelatinous secretion of H. glutinosum and the less abundant H. comoides.

Hydrocoleum lyngbyaceum Kütz. (Deg. & Deg. 24,916, Feb. 18, 1958) grew on the ocean reef, south shore, in company with the former species; and (Deg. & Deg. 24,785, Feb. 6, 1958) with Spirulina tenerrima Kütz.

Lyngbya aestuarii (Mert.) Liebm. (Deg. & Deg. 24,577, Feb. 7, 1958) occurred for a depth of half a centimeter or less in the calcareous sandy mud exposed at low tide along the artificial channel southwest of the Turning Basin. Another collection (Deg. & Deg. 24,583, Feb. 14, 1958) was made six miles east of the Fighter Strip in a fresh to brackish water puddle, slowly drying out. This Lyngbya, with an admixture of Entophysalis deusta, covered the area with a dark bluish green, somewhat gelatinous mat a few millimeters thick. With Anacystis dimidiata, it (Deg. & Deg. 24,565, Feb. 18, 1958) formed a

very dark blue-green covering over the bottom of a slightly saline, shallow pool on the lagoon side of the southeastern tip of Canton. Regarding still another find of L. aestuarii (Deg. & Deg. 24,592a, Feb. 19, 1958) see Phormidium gardnerianum.

Lyngbya confervoides Ag. (Deg. & Deg. 24,770, Feb. 17, 1958) grows on old coral on the ocean reef, shallow at low tide. The spot is on the south side, two miles east of the Kou forest.

Lyngbya infixa Freymy (Deg. & Deg. 24,745) on L. majuscula (Dillw.) Harv.

Lyngbya majuscula (Dillw.) Harv. (Deg. & Deg. 24,749).

Lyngbya semiplena (Ag.) J. Ag. (Deg. & Deg. 24,575, Feb. 5, 1958) grew along the north shore, quite a distance inland from the beach. Though exposed to full sunlight, it bound the sand together for a thickness of three to five millimeters. A quite different habitat for this species (Deg. & Deg. 24,917, Feb. 8, 1958) was old coral forming the submerged part of the guano wharf in the lagoon. At the bird reservation, on the other hand, it (Deg. & Deg. 24,775, Feb. 16, 1958) formed a thin brown film on that part of the ocean reef that is partly exposed at low tide.

Microcoleus acutissima Gardn. (Deg. & Deg. 24,579, Feb. 14, 1958) with Schizothrix longiarticulata, grew on the flat bulldozed rubble surface of the Fighter Strip, to some extent inhibiting the formation of dust clouds. In part of this area, among the alga, grew the native dwarf lovegrass, Eragrostis whitneyi.

Microcoleus chthonoplastes (Fl. Dan.) Thur. (Deg. & Deg. 24,597, Feb. 13, 1958), with Entophysalis deusta, was collected at the southeast end of the lagoon. At low tide these extensive mudflats, here and there inhabited by colonies of gaudy fiddlercrabs (Uca tetragonon), are sun-baked and occasionally even entirely dried. Here one or both of these blue-green algae, perhaps in conjunction with bacteria, form a stiff, brittle crust of rock about one millimeter thick. One mile west of Shark Pool, southeast tip of Canton, M. chthonoplastes (Deg. & Deg. 24,581, Feb. 15, 1958) formed a hard crust of the surface mud of a drying fresh-water puddle. For another collection (Deg. & Deg. 24,572a, Feb. 2, 1958), see Scytonema hofmannii.

Microcoleus paludosus (Degener 21,341; reported in Bull. 41, p. 40, is a misidentification for M. chthonoplastes, mentioned above.

Microcoleus tenerrimus Gom. (Deg. & Deg. 24,595, Feb. 1, 1958). On the coral slabs cast up onto dry land by storm waves and there left to rest undisturbed for many months and even years, the dark Entophysalis deusta thrives, as described in detail under that species. Nearer the beach, however, are similar coral slabs, somewhat more often tumbled about by wave action and hence alabaster-white. Such flat stones, because of their coral origin, are translucent and of course more or less porous, the degree depending upon the precise species of animal. Due to the intensity and the drying effect of the sun, perhaps the upper nine-tenths or even more of the slab is relatively devoid of

plant life. But the remaining area, as in a greenhouse or fernery, supplies an environment of diffuse light and relatively constant moisture, particularly if lying on moist sea sand. For this reason it is a pleasant pale green. An occasional cuttle-bone, the inside shell of the cuttle-fish, lies among such coral. As it has the same general appearance, we suspected it to be a similar locus for the growth of Cyanophyta. Stone-like coral being difficult to handle, we sent the cuttle-bone to Dr. Drouet for dissection. Here he found Microcoleus tenerrimus, Plectonema terebrans, Entophysalis deusta and some Calothrix crustacea.

Phormidium gardnerianum Dr. (Deg. & Deg. 24,592, Feb. 19, 1958), with Lynghya aestuarii, colored spinach-green most of the bottom of a brackish pool on Spam Island.

Phormidium papyraceum (Ag.) Gom. (Deg. & Deg. 24,592, Feb. 19, 1958), associated with Nodularia sphaerocarpa and Plectonema nostocorum, was collected about a mile east of the Landing Strip, northern Canton. Here the Armed Forces during the Second World War had constructed a cement trough three by six feet in area and a few feet deep. This was permanently rain-filled and here P. papyraceum formed dark, paper-thin, blue green pellicles more or less attached to the trough sides. Among this well-named alga lived the bloodred larva of the midge Tendipes esakii, originally described from Saipan.

Porphyrosiphon fuscus Gom. (Deg. & Deg. 24,598a, Feb. 11, 1958), see Schizothrix lamyi.

Schizothrix creswellii Harv. (Deg. & Deg. 24,574, Feb. 8, 1958). Tridacna shells are everywhere; but the living mollusks, standing upright above the general surface of the water shallow at low tide, are rather localized. The shells are agape, exposing to the sun their voluminous mantles which are of strikingly beautiful pastel shades, almost gleaming in the sun. These vary from purples and dark browns to yellows, greens and blues. It is reliably reported that the unusual color of the mantle is caused by microscopic blue-green algae living in symbiotic, almost captive, relationship, with the tridacna. We killed no tridacna for samples of blue-greens; living tridacna we knew only from the ocean reef. Then Mr. & Mrs. Albert Lincoln brought us to an unusual stand of these living baptismal fonts, located in shallow water in the lagoon, about 16,000 feet east of the northwest end. Along the muddy bottom was a rusting pipe, its surface as though whitewashed. This encrustation was pale green with S. creswellii. The species (Deg. & Deg. 24,910, Feb. 1958) likewise impregnated a cuttle-bone lying dry on the beach.

Schizothrix heufleri Grun. (Deg. & Deg. 24,580, Feb. 11, 1958), with Scytonema hofmannii, grew in a drying, rain-filled depression one mile east of the north Landing Strip. It formed a thin mat over the sandy, cocoa-colored loam. Regarding another collection (Deg. & Deg. 24,600a, Feb. 10, 1958), see Nostoc calcicola.

Schizothrix lamyi Gom. (Deg. & Deg. 24,598, Feb. 11, 1958) grew one mile off the north Landing Strip with Porphyrosiphon fuscus and Entophysalis deusta in a drying depression once filled with rain water.

The tough, 1-2 mm. thick, greenish film was exfoliating due to shrinkage induced by drying, and curling upward and inward to expose the cocoa-colored underside and the now bare, similarly colored, exposed ground.

Schizothrix longiarticulata Gardn. (Deg. & Deg. 24,567, Jan. 31, 1958), with some Scytonema hofmannii, grew inland, namely near the ancient guano railroad wharf. It formed a firm covering over the brownish sun-baked loamy sand, but was beginning to crack here and there, and exfoliate. The same species (Deg. & Deg. 24,585a, Feb. 11, 1958), found with Calothrix crustacea, was about three miles east of the Landing Strip. Additional collections are Deg. & Deg. 24,596a, Feb. 11, 1958, with S. taylorii; and Deg. & Deg. 24,579a, Feb. 14, 1958, with Microcoleus acutissima.

Schizothrix taylorii Dr. (Deg. & Deg. 24,596, Feb. 11, 1958), along with S. longiarticulata and Scytonema hofmannii, was collected one mile east of the north Landing Strip. These plants covered the loamy bottom of a drying depression of rain water with a thin film. This acted as a dustbinder only until thorough drying caused the film to crack, curl and exfoliate. Another collection (Deg. & Deg. 24,582, Feb. 10, 1958), formed a greenish film over the cocoa-colored mud of a shallow arm of the lagoon, on the south side of the atoll.

Spirulina subsalsa Cerst. (Deg. & Deg. 24,753, Feb. 12, 1958) was brought from a depth of ten to fifteen feet for us in the lagoon by Mr. Albert Lincoln by skin diving.

Spirulina tenerrima Kütz. (Deg. & Deg. 24,785, Feb. 6, 1958) grew in association with Hydrocoleum l yngbyaceum Kütz., on a smooth, limestone, ocean reef along the north shore.

Sumploca hydroides Kütz. (Deg. & Deg. 24,750) was collected under similar circumstances as Spirulina subsalsa.

NOSTOCACEAE

Nodularia sphaerocarpa Born. & Flah. (Deg. & Deg. 24,599a, Feb. 11, 1958), see discussion of Phormidium papyraceum.

Nostoc calcicola Breb. (Deg. & Deg. 24,600, Feb. 10, 1958), in association with Schizothrix heufleri, grew near the ruins of the PAA hotel, south of Musick Light. Here we found a concrete platform, exposed to full sunlight. A few of the cement squares had tipped in settling, enabling a rain puddle to form. Here grew the above plants.

SCYTONEMATACEAE

Plectonema nostocorum Born. (Deg. & Deg. 24,599b, Feb. 11, 1958), see discussion of Phormidium papyraceum.

Plectonema terebrans Born. & Flah. (Deg. & Deg. 24,573c, Feb. 8, 1958), see discussion of Johannesbaptistia pellucida; for Deg. & Deg. 24,595a, Feb. 1, 1958, see treatment of Microcoleus tenerrimus.

Scytonema hofmannii Ag. (Deg. & Deg. 24,572, Feb. 2, 1958) is probably the most persistent sand-binder on Canton, and fortunately common. It is to be seen about the CAA residential area along and even on the white roads, where pincushion-like tufts of Fimbristylis pycnocephala and the more open F. dichotoma grow. Omitting the larger projecting pebbles, gleaming white in contrast, it covers the surface of the ground with an almost black matrix. When we drew the attention of several residents to these Scytonema areas over which they had been walking day after day, they were astounded to learn that what they had always considered a tar-rich asphalt was actually a colony of "seaweed or limu." With the Scytonema grew some Microcoleus chthonoplastes. These areas in February were alternately sun-scorched and rain-drenched. Additional collections of this species are Deg. & Deg. 24,567a, Jan. 31, 1958, with Schizothrix longiarticulata; Deg. & Deg. 24,580a, Feb. 11, 1958, with Schizothrix heufleri; and Deg. & Deg. 24,596b, Feb. 11, 1958, with Schizothrix taylorii.

RIVULARIACEAE

Calothrix crustaceae Thur. (Deg. & Deg. 24,585, Feb. 11, 1958), with Schizothrix longiarticulata and the almost ubiquitous Entophysalis deusta, was loosely holding the white, muddy sand in a drying depression three miles east of the north Landing Strip. It (Deg. & Deg. 24,581a, Feb. 15, 1958) grew with the same E. deusta in a drying fresh water puddle one mile west of Shark Pool, southeast tip of Canton. For specimen Deg. & Deg. 24,595c, Feb. 1, 1958, see discussion of Microcoleus tenerrimus.

- - - - -

Lichens, mosses and ferns have not been found on Canton.

REFERENCES CITED

- Dawson, E. Y. Some marine algae from Canton Atoll. Atoll Res. Bull. 65: 1-6, 1959.
- Degener, E. and Degener, I. The Hawaiian beach Scaevola (Goodeniaceae). Phytologia 6(6): 321, 1958.
- Degener, O. and Fosberg, F. R. A Central Pacific Sesuvium. Occ. Pap. Bishop Mus. 21: 45-47, 1952.
- Degener, O. & Gillaspay, E. Canton Island, South Pacific. Atoll Res. Bull. 41: 1-50, 1955.
- Fosberg, F. R. Pacific forms of Lepturus R. Br. (Gramineae). Occ. Pap. Bishop Mus. 21: 285-294, 1955.
- Fosberg, F. R. and Sachet, M.-H. The Indo-Pacific strand Scaevola. Taxon 5: 7-10, 1956.
- Hansen, I. and Potzal, E. Beiträge zur Anatomie und Systematik der Lepturaceae. Bot. Jahrb. 76: 250-270, 1954.
- Hatheway, W. H. The natural vegetation of Canton Island, an equatorial Pacific atoll. Atoll Res. Bull. 43: 1-9, 1955.
- Van Zwaluwenburg, R. H. The insects and certain other arthropods of Canton Island. Atoll Res. Bull. 42: 1-11, 1955.
- Webster, G. L. Studies of the Euphorbiaceae. Phyllanthoideae II. The American species of Phyllanthus described by Linnaeus. Jour. Arnold Arb. 37: 1-14, 1956.