The Journal of the Polynesian Society

THE COLONIZATION OF THE PHOENIX ISLANDS

By H. E. MAUDE, O.B.E.

[Mr. Maude was formerly Resident Commissioner of the Gilbert and Ellice Islands Colony and is now Member for Social Development on the South Pacific Commission Research Council.]

In his recent report on research needs in Polynesia and Micronesia, Dr. F. M. Keesing emphasizes the importance of recording details of the various colonization experiments which have taken place in the area, since the experience gained is likely to prove of practical value to other administrations faced with similar re-settlement problems.[1] Attention has also been drawn to the subject of population displacement by Dr. Leonard Mason's authoritative article on the migrations of the Bikini Islanders,[2] and by the Society for Applied Anthropology, which held a special symposium on the subject at their annual meeting last year.

Having pioneered more than one experiment in folk migration in the Central Pacific region during the years 1935-1945, I feel that I should give some account of a page of Pacific history which has its own intrinsic interest as well as showing how former traditions of race migration, common to all peoples of Polynesia and Micronesia, can be successfully revived, even at this late stage, leading to the re-drawing of racial maps.

During these ten years I visited most of the uninhabited British islands in the Central and Eastern Pacific and was instrumental in purchasing or otherwise acquiring no less than 14 islands for colonization purposes, thus commencing a revolutionary trend which I believe will result, before the present decade is over, in virtually all European-owned or leased land in the region reverting to native ownership and user.

The present article tells the story of the first of our colonization ventures—the Phoenix Islands Settlement

[1] South Pacific Commission, Project S.5 (a), Report No. 1.

[2] Mason, Leonard. "The Bikinians: A Transplanted Population." *Human Organization*. Vol. IX, No. 1, pp. 5-15.

Scheme—and has been divided into three rather distinct parts:—

(i) the inception of the colonization scheme;

(ii) a description of the Phoenix Islands and their history; and

(iii) a brief account of the actual colonization itself.

It is, I am afraid, inevitable that the account should consist, to a large degree, of personal narrative: the transplantation of a native community from their ancestral homes to a new land cannot be successfully accomplished by secretariat direction, but only by enthusiasm and an absolute trust between the leaders and those who follow. In these enlightened times we call such schemes by the term "community development," and special techniques have been developed for creating and maintaining group enthusiasm. I have yet to learn, however, of a venture which did not, in the long run, depend for its success on the twin factors of leadership and affectionate trust. In the case of the Phoenix Islands Settlement Scheme, that quality of leadership was provided, particularly in the later stages, by G. B. Gallagher, a young cadet in the Colonial Service, whose devotion to duty led to his own death on the islands to which he had brought his people.[3]

PART I.

The Inception of the Settlement Scheme.

Shortly after the main voyages of discovery in the Pacific it became apparent that most, if not all, the island peoples then in contact with Europeans were in process of more or less rapid numerical decline. In the years which followed, much thought was devoted by missionaries, sociologists and Governments to this problem of depopulation and a variety of convincing reasons were advanced as to the cause underlying it: in general, the gradual disappearance of the Polynesian and Micronesian peoples was considered to be as inevitable as it was regrettable and the

[3] The following pages are based on papers read to the Fiji Society of Science and Industry and the Seventh Pacific Science Congress, to whom acknowledgment is due for permission to reproduce.

task of the missionary and administrator was essentially to smooth the pillows of dying races.

In the year 1927, however, Dr. S. H. Roberts showed, in his *Population Problems of the Pacific*,[4] that earlier predictions had been too pessimistic. The islanders had, for the most part, survived the dislocation caused by their early contacts with European civilization and were now well on the way to racial regeneration. Dr. Roberts showed that, of the then total native population of 315,105 in Polynesia and Micronesia, no less than 300,395 were increasing, 9,562 were stationary, 3,398 decreasing, and only 1,750 regarded as hopeless. Since that time, moreover, the entire population has moved into the category labelled "increasing" and some, for example the Samoans, should be in a special class marked "multiplying rapidly": even the two former hopeless cases, the Marquesans and Easter Islanders, are showing unmistakeable signs that they have passed their population nadir.[5]

This statistical vindication of the effectiveness of their several policies was naturally one on which the various Governments of the Pacific could afford to congratulate themselves. Practically every administration possessed a number of "high" (or volcanic) islands; and where there were "high" islands there was reasonable room, in the mountainous interiors, for future population expansion. What need had Samoa to worry, for example, even if her population graphs did bear an ominous resemblance to those of Java in the early days of European administration, for surely her mountain valleys could take many times her present numbers.

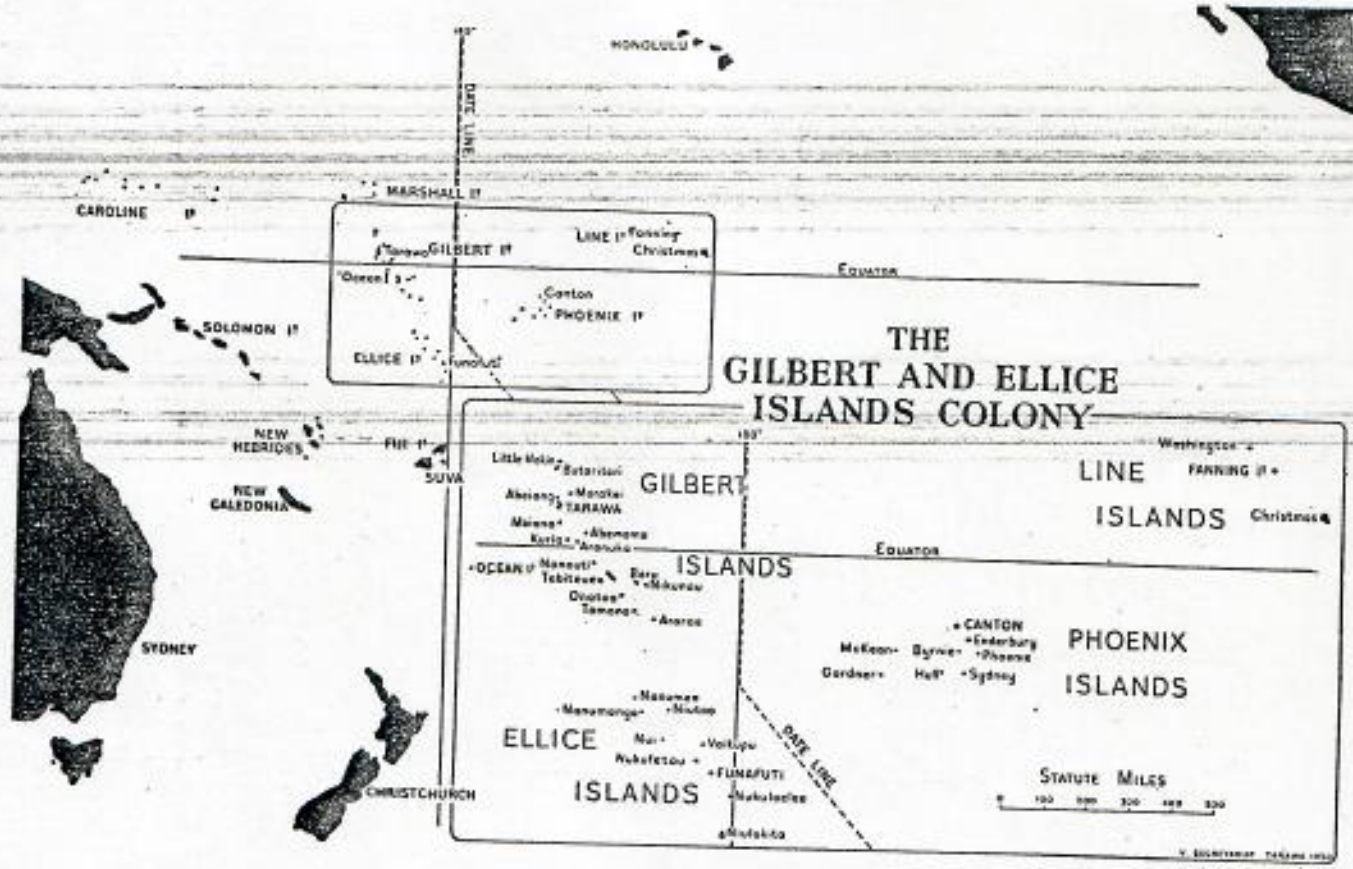
In one Pacific administration, however, this resurgence of native life was a problem from the very start, whether it was recognized at the time or not. The Gilbert and Ellice Islands Colony comprised Ocean Island (the administrative headquarters), the 16 islands of the Gilbert Group, 9 in the Ellice, and Fanning, Washington and Christmas in the Northern Line: of the 29, 4 were owned or leased to European

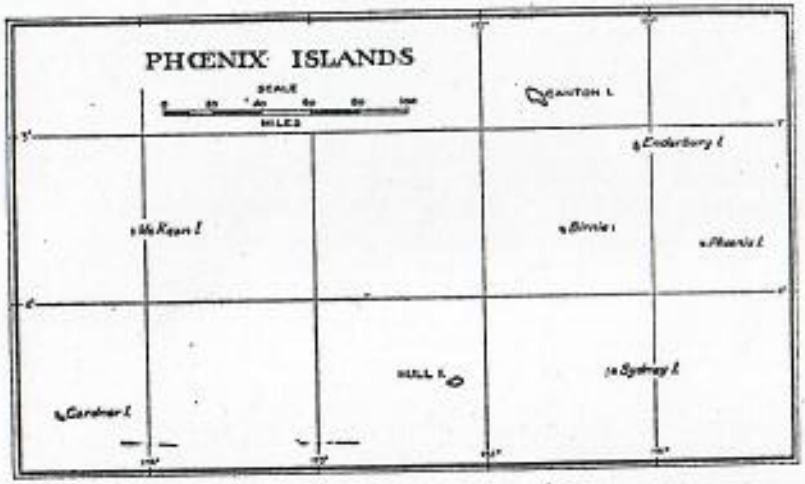
[4]London, George Routledge and Sons, Ltd., 1927.

[5]See, for example, Valenziani, C. "Enquête démographique en Océanie Française." *Bulletin de la Société d'Etudes Océaniennes*, Vol. VII, No. 17-18, pp. 658-685.

Top: McKean: "We did not omit the ceremony of hoisting the flag."
Bottom: Water is found—Sydney Island.

Top: Karaka—the first village to be built on Gardner Island.
Middle: The first house is built on Sydney Is.
Bottom: An emergency cistern built for the colonists—Hull Island.


THE
GILBERT AND ELLICE
ISLANDS COLONY
HONOLULU
DATE LINE
MARSHALL Is
CAROLINE Is
GILBERT Is
LINE Is
Fanning
Christmas
Equator
Canton
PHOENIX Is
Ocean Is
ELLICE Is
Funafuti
SOLOMON Is
NEW HEBRIDES
Fiji Is
SUVA
NEW CALEDONIA
SYDNEY
CHRISTCHURCH
Little Makin
Butaritari
Abaiang
Maiana
Kuria
Aranuka
TARAWA
Abemama
GILBERT
ISLANDS
OCEAN Is
Nanouti
Tabiteuea
Beru
Nikunau
Onotoa
Tamana
Arorae
LINE
ISLANDS
Washington
FANNING Is
Christmas
CANTON
Enderbury
Phoenix
McKean
Birnie
Gardner
Hull
Sydney
PHOENIX
ISLANDS
Nanumea
Nanumanga
Niutao
ELLICE
ISLANDS
Nui
Nukufetau
Vaitupu
FUNAFUTI
Nukulaelae
Nudakita
STATUTE MILES



firms, leaving 25 inhabited by the indigenous population. Here were no fertile volcanic islands, but low and flat coral atolls; barren as sandbanks and minute in size. Ocean Island, the one exception, certainly rose to the towering eminence of 300 feet but compensated for it by being in many ways the most barren of the lot. Virtually nothing edible grew from end to end of the Colony except the coconut, the pandanus (or screw pine) and a coarse calladium termed "babai": this, with fish, constituting the native diet from infancy to death. It required no gift of second sight to predict, then, that these 25 islands had either been considerably under-peopled during recent decades or else would exemplify, long before the rest of the South Seas, the problem of over-population.

In the event we had not long to wait for an answer. In 1931 I took the first detailed census of the Gilbert and Ellice Groups, which showed, when compared with previous estimates and counts, that the population of the 7 Southern Gilbert Islands (by far the most thickly-inhabited part of the Colony) had scarcely altered throughout the present century, whereas the rest of the Colony had witnessed increases, in some cases of a substantial nature.

Subsequent investigations made among the natives of these islands, where, incidentally, my wife and I had our permanent home, showed that they had always been unconscious exemplifiers of Mendelian laws, in so much as the total numbers on each island had to be kept strictly within the fixed limit set by the local means of subsistence. The optimum population density on each island had been reached by the year 1840, if not long before, and since then the natives had been relying on the population checks of infanticide, warfare, compulsory emigration and abortion to prevent their natural prolificity outrunning their food resources. The position was, however, fast becoming serious: firstly, because the Government had successfully prohibited all the controls with the exception of abortion, which it discouraged without being able to prevent, and, secondly, since the effects of the Medical Department in reducing the infant morality rate had resulted in a larger percentage of the population than hitherto being young people who would later be marrying. Furthermore, owing to a variety of fortunate circumstances, the shock of European

contact in the Gilberts had passed off with less effect than usual.

Investigations in the villages showed a hitherto unsuspected degree of poverty among certain families, resulting in minute subdivisions of inherited land and continual litigation on land matters. So great was the land hunger that there was an estimated 76,000 pending land cases among a population of under 27,000. Matters were not improved by the fact that since the advent of the Government and Missions the native could not longer consume the entire produce of his lands: he had now to have a surplus to pay his Government tax, the various mission subscriptions, for clothing himself and his family, as well as for the numberless other necessities of modern life. With what might be described as a rising standard of living, the islands could naturally support an even smaller population than before.

Here, then, was a clear call for Government action. We ourselves had largely created the problem and the native, prevented from solving it in his customary manner, looked to us for a solution. Migration seemed the obvious answer, and from 1931 onwards we combed the Central and Eastern Pacific for suitable uninhabited islands. High islands there were a-plenty in Fiji, Tonga, and elsewhere—but the Gilbertese are one of the most highly-specialized races on earth and, even had any been available for colonization purposes, it seemed a pity to settle them on fertile volcanic islands when they would far rather live on the barren sandbanks they were accustomed to.

Confining our quest to coral islands, therefore, and to these included in the British Empire—for the Gilbertese strenuously declined to consider any migration project which involved a change of allegiance—we found our choice limited to a grand total of 22. Apart from the 8 Phoenix Islands these included Howland and Baker, slightly to the north of this Group; Fanning, Washington and Christmas in the Northern, Malden, Starbuck and Jarvis in the Central, and Flint, Caroline and Vostok in the Southern Line Group; and Nassau, Suwarrow and the Herveys in the Cook Group. We were in any case in no position to pick or choose, as most of the Islands were in the freehold or leasehold possession of some European firm, while Howland, Baker and Jarvis were claimed, and later taken over,

by the United States. From the very start the Phoenix Islands seemed the best Group to commence operations on, since they were the nearest and had a soil and climate markedly similar to the Gilberts; and in the 1931 Census Report I wrote that "these Islands, with their comparatively fertile soil and abundant supply of fish, may well become of great value in the not-distant future as an outlet for the population of the Gilbert Islands, which threatens to increase rapidly beyond the slender means of subsistence afforded by the inhospitable environment."[6]

Convinced of the problem and its solution, my wife and I embarked on a campaign to persuade the authorities that a migration scheme was a practical proposition, and a succession of letters, interviews and petitions (the island of Beru sent one signed by no less than 750 intending colonists) finally led to the local administration recommending in 1936 that the possibility of colonizing the Phoenix Islands should be officially investigated. We were working in Hawaii at the time but unfortunately the news had hardly reached us when we also heard that I was to be transferred to Africa, on health grounds: as no one else at that time was sufficiently *au fait* with the project, its realization thus seemed as far off as ever.

But to cut a long story short my health had so far improved by July, 1937, that we were able to return to the Gilbert Islands, and in the following September I was directed by Sir Arthur Richards, then High Commissioner for the Western Pacific, to lead a pioneering expedition to the Phoenix Group to report on the suitability of the various islands for permanent colonization, the Colony Schooner "Nimanoa"[7] being assigned to me for the projected work, together with Mr. E. R. Bevington, a Cadet newly arrived from England who was to act as Assistant.

On 18 September I said good-bye to my wife, who was off for three months' work collecting string figures on

[6]Maude, H. E. "Report on the 1931 Census of the Gilbert, Ellice and Phoenix Islands." W.P.H.C., 1932. Tss. The population of the Phoenix then consisted of a European plantation manager and 30 labourers from the Ellice.

[7]A wooden ketch-rigged auxiliary vessel, with a length of 108 feet, a beam of 22 feet and a speed, when all went well, of about 8 knots.

Nauru, and set sail for the Southern Gilberts and Northern Ellice, where we spent some time conducting a first-hand investigation into the extent of the over-population problem and collecting delegates to accompany the expedition to the Phoenix. At each island visited we called a meeting of the people at which the aim of the expedition was explained and the island invited to choose delegates to accompany it and assist in the work. In all 16 delegates were taken: 5 from Beru, 2 from Onotoa and 3 from Arorae in the Gilberts; and 2 from Nanumea and 4 from Nuitao in the Ellice. Despite the intense excitement evinced at each of our meetings, somewhat natural under the novel circumstances which occasioned them, the island delegates were chosen from among the more cautious elements in the population and at the outset none of them were particularly prepossessed in favour of the scheme. We were pleasurably surprised by the business-like way in which they set about their work and by the concise and accurate manner in which they summed up the merits and disadvantages of each island. Good though the delegates were, however, the mainstay of the expedition was undoubtedly my own personal staff, consisting of Tem Mautake, the first Assistant to the Native Lands Commission and an acknowledged expert on all aspects of native custom; Teng Koata, the Magistrate of Onotoa, whose exceptional qualities of loyalty and leadership had been proved in the Onotoa religious troubles of 1931; and Tutu, the doyen of the Colony Native Medical Practitioner Service. A finer trio it would be hard to find in the Central Pacific.

Leaving Nuitao on 9 October we set sail due east for McKean and Canton and the following day crossed the International Date Line which, to the astonishment of the delegates, gave us a couple of Sundays. And at this stage of the narrative it would seem desirable to give an account of what little was known at the time about that most remote of Pacific Groups and its history.

PART II.

THE PHOENIX ISLANDS.

The Phoenix Group is situated just south of the equator in the centre of a horse-shoe shaped ring of similar coral

islands which together comprise the Central Equatorial Islands of the Pacific. To the west lie the Gilberts and Ellice, to the south the Tokelaus and Northern Cooks, and to the east the Line Group, the north being open sea. The islands are 8 in number and fall into 3 clearly-defined subgroups; the comparatively fertile islands of Sydney, Hull and Gardner to the south, the three minute satellite islets of Phoenix, Birnie and McKean, which match them in the centre, and the "dry" islands of Canton and Enderbury in the north. All being of coralline structure, their most marked differences are as regards size and lagoon formation. Canton, Hull and Gardner are typical lagoon islands; Sydney is an "intermediate" type island where the access between the lagoon and the sea has become blocked up, though the channel is still discernible, leaving a large and intensely salt lake in the centre; while the remainder have only small depressions, usually filled with salt water to show where the lagoons once lay. I would observe, in passing, that, although the geological formation of all the 57 Central Pacific Equatorial Islands is similar, the question of what happens to a lagoon, once its access to the sea has been cut off, appears to depend on the rainfall of the area where the particular island lies. If it is a "wet" island, like Washington, the lagoon will become a fresh-water lake; if a "dry" island, like Jarvis or Enderbury, the lagoon will tend to disappear altogether, leaving a deposit of salt and gypsum; and if an "intermediate" island, like Sydney, the lagoon will remain, though with diminished size and increased salinity.

All the Phoenix Group are low and flat, nowhere more than 20 feet in height. Those with lagoons are of typical atoll formation; mere ribbons of land, averaging about 300 yards in width, surrounding a central lagoon, which in the case of Canton Island, the largest, covers an area approximately 9 miles by 4½. Apart from rectangular Enderbury, the others are saucer-shaped, the land rising abruptly from the shore to a beach crest (which is naturally highest on the weather side) and then sinking gently to the central depression.

Being nowhere more than 5 degrees south of the equator, the climate of all the islands is naturally warm, but tempered by the almost constant trade winds which

blow throughout the year. The general direction of wind is east, usually south-east, and occasionally the west, which brings rain and rough weather (the "Westerlies" of the Gilberts). The temperature averages about 82 degrees, with maxima and minima varying only a few degrees above and below this figure, and a variation of less than 3 degrees between the monthly means.

The rainfall of each island varies roughly in proportion to its distance from the equator, and its fertility, where all have a similar geological structure, is dependent almost entirely on its rainfall. Gardner, the furthest south, has the greatest rainfall and is by far the most fertile; after Gardner follows Hull and then Sydney; next, the three central islets, Phoenix, Birnie and McKean; and, finally, the dry and barren northern islands of Canton and Enderbury. The rainfall is, in any case, extremely variable as between one month and another or one year and another, dependent on changes in the trade winds: at a guess I would estimate that the northern islands average about 25 inches and Gardner up to 100 inches.

The soil throughout the group—if you can call it soil—is a light brown coral sand with a low percentage of organic matter: on Gardner alone it has a darker and moister appearance, at times resembling the peat bogs of Washington Island in the northern wet belt. It supports a somewhat sparse flora consisting of some 20 to 30 species, of which the principal are the "Ren" (*Tournefortia argentea*) and "Mao" (*Scaevola frutescens*), growing immediately behind the beach crest; followed by the "Non" (*Morinda citrifolia*), "Buka" (*Pisonia grandis*) and "Kanawa" (*Cordia subcordata*). Underfoot, the main grass is the tufty *Lepturus repens*, interspersed with thickets of the "Koura" bush (*Sida fallax*), while the lagoon shores and salt flats are covered with the fleshy green pigweed or "Boi" (*Sesuvium portulacastrum*), which was found to be an invaluable emergency food during the early days of settlement. This vegetation is seen ideally only on Gardner, since Canton and Enderbury are too rainless to support any "buka," or indeed any trees at all except a few stunted "kanawa," "ren" or "mao"; the three central islets are too small to support any but procumbent grasses and pigweed, with an occasional windswept

"koura" plant; while on Hull and Sydney coconut plantations have largely taken the place of the former "buka" forest.

The fauna of the Group can be dismissed briefly as consisting of seabirds by the million, who breed there; and in particular the frigate bird, boobies or gannets, the red-tailed tropic bird and the white and sooty terns, with lizards, rats and crabs. Phoenix Island has a large number of very poor-looking rabbits, released many years ago by a visiting ship, of which more anon; and Gardner some of the largest coconut, or robber, crabs in the Pacific.

To turn now to the history of the Phoenix Islands; the archaeological evidence, as examined by the Bishop Museum Templeton Crocker Expedition, indicates that Sydney Island at one time supported a considerable population, while both Hull and Gardner were occupied for at any rate a short period in their history. According to Emory, the remains found are definitely Polynesian and closely related to marae and house foundations on Necker, Nihoa, Malden and some of the Tuamotuan Islands. The islands must have been either temporary resting-places for voyagers between the high and fertile islands, as in the case of Fanning and Christmas, or else abandoned as unsuitable, for when first discovered they were in every case uninhabited.

The question of the actual discovery of each island by Europeans is still unsettled and the subject of considerable controversy. Let it suffice here that they were almost certainly all discovered by British or American whaling skippers between 1820 and 1830. The seas round the Phoenix Group were much frequented by whalers between 1820 and 1850, but the masters of whaling vessels were not explorers and anything but punctilious in reporting their discoveries when they got home, especially as theirs was a secretive trade and they were reluctant to disclose where they obtained their catches. Furthermore, they regarded the islands as little more than obstructions to navigation and landings were seldom made except to collect seabirds' eggs.

The islands first became known to the outside world through the accidental discovery of their phosphate-guano deposits by the master of one of the later whaling ships, a

Captain M. Baker, who landed on the island to the north of the Phoenix Group proper bearing his name, in 1839, for the purpose of burying a member of his crew. Baker's enterprise led to the formation of the American Guano Company in New York, to whom he sold his claim to the island. Samples of what later came to be known as "American Guano" were sent to the States in 1855 and the following year the American Guano Act was passed by Congress, by which islands containing phosphate deposits discovered by American Citizens might, if not within the jurisdiction of any other Power, be declared by the President to be "appertaining to the United States". The island could then be "bonded" and exclusive extraction rights granted to the discoverer of the deposits.

With the exception of Hull, all the islands of the Phoenix Group were "bonded" under the American Guano Act, usually by persons representing the American Guano Company, or its subsidiary, the Phoenix Guano Company. Only three islands, however, were actually worked: McKean, from 1859 to 1870; Phoenix, from 1860 to 1871; and Enderbury, from 1862 to 1877. Supplies and workers were taken to the islands about four times a year by schooner from Honolulu, while a large number of vessels of various nationalities loaded the phosphate-guano for American and foreign ports.

From 1877 to 1881 the Group remained uninhabited, and probably unvisited. In the latter year, however, Mr. John T. Arundel, a British subject with large guano-mining and coconut-planting interests, landed on Sydney, and the permanent exploitation of the islands began. John T. Arundel's name is comparatively unknown to the general public and yet he is undoubtedly one of the greatest men who have influenced the history of the Central Pacific: a true Empire-builder, his pioneering work has never received proper recognition and a biography of him is, I suggest, long overdue.

As far as the Phoenix were concerned, Mr. Arundel soon obtained control of the whole Group, with the possible exception of McKean, apparently acting either as an agent of the former American companies, as on Canton and Enderbury, or as the direct transferee of any shadowy interests they might still be considered to have, as on Hull,

Sydney, Gardner and Phoenix. During the course of the next decade, Messrs. John T. Arundel and Company proceeded to work the phosphate-guano deposits on Canton and Sydney; completed the working of those on Enderbury; and planted coconut trees on each of these islands, as well as on Hull, Gardner and probably Phoenix. In each case, with the exception of Enderbury, Mr. Arundel acted under Guano and Coconut Planting Licences granted by the British Government. I should add that the planting operations on Hull were in charge of Mr. James Ellis, of Auckland, and his brother, the late Sir Albert Ellis, who was also associated with the phosphate working on Canton.[8]

The activities of Mr. Arundel were in marked contrast with those of the Americans who had preceded him, since it was his fixed policy to turn the islands into permanent assets by developing plantations which would come into bearing as the guano deposits became exhausted. However, on only two islands, Hull and Sydney, have the plantations survived to the present day, the rest dying in the exceptionally severe drought which affected the whole area from 1890 to 1894.

During the year 1889, Phoenix, Birnie, Sydney and Hull were placed under British protection by Commander Oldham, of H.M.S. "Egeria," as it was thought at the time that one of them would probably be required in connexion with the then proposed trans-Pacific Cable. In 1892 Captain Gibson, of H.M.S. "Curaçoa," similarly annexed Gardner, presumably owing to the activities of Mr. Arundel, who had already commenced planting there. In March, 1937, or shortly before my first visit, the whole Group was included, as a new District, within the boundaries of the Gilbert and Ellice Islands Colony, by Order in Council.

No purpose would be served in detailing the transactions by which the islands passed through the successive hands of John T. Arundel and Co.; the Pacific Islands Co. Ltd.; Lever's Pacific Plantations Ltd.; and the Samoa Shipping and Trading Co. Ltd.; to Messrs. Burns, Philp (South

[8]Sir Albert Ellis has given us a fascinating account of his early work in the Phoenix in his book, *Adventuring in Coral Seas*. Sydney, Angus and Robertson Ltd., 1936.

Sea) Co. Ltd., who were the lessees from the British Government at the time of my first visit. Suffice it to say that after 1893 the only islands exploited in any way were Hull and Sydney. Although even these plantations had been abandoned for some years, we found a Mr. J. W. Jones working them again in 1937 with a few labourers from the Tokelau Islands.

PART III.

The Phoenix Islands Settlement Scheme.

After this digression, which I hope will have conveyed an impression of the locale of the colonization experiment, we can now resume the main thread of the narrative where we left off: making in the "Nimanoa" for McKean and Canton. We did not reach either island, however, for contrary winds forced our little under-powered schooner to make across the wind to Gardner. We arrived at this atoll on 13 October and tied up to the wreck of the "Norwich City," near the main lagoon entrance. I remember stepping out of the canoe into the shallow water on the edge of the reef with a feeling of pride at being the first to land on this remote shore for many years; but this was soon cured by a young lagoon shark, which knocked me over in its pursuit of a school of fish. The lagoon and shore waters of Gardner teemed with fish, like those of all uninhabited coral islands, and in the hold of the "Norwich City" they were swimming around in thousands: the officers of the "Nimanoa" used to shoot them by torchlight with revolvers.

Once ashore, we proceeded on the work of the expedition: the island was thoroughly explored from end to end; holes were dug and the soil examined; wells were sunk and the water tasted; the flora, fauna and fish were studied from the point of view of future settlers; the lagoon was explored in the canoes which we had brought with us and anchorages and landing facilities discussed and recorded. We soon found that the Admiralty chart of the island was quite inaccurate, and those of the delegates who had volunteered to walk round the lagoon on the first day ashore, on the strength of it, had to be rescued by canoe during the night.

I shall always remember that first night in the Phoenix Islands. We lay in a circle under the shade of the giant "buka" trees by the lagoon, ringed by fires as a protection against the giant robber crabs, who stalked about in the half-light or hung to the branches staring balefully at us.[9] Birds were everywhere and for the most part quite tame, and the noise they made until well into the night was deafening. Unfortunately for them, both the crabs and birds were very good eating and we gorged ourselves on a diet of crabs, boobies and fish. Until I stopped them, the delegates would walk up to the boobies, seize them by the neck and crack them like a whip before roasting them on one of the fires. The fish were so plentiful and unaccustomed to man that they were literally scooped out of the water by hand.

We spent three days on Gardner and then proceeded on our tour; visiting Canton, Enderbury, Phoenix, Birnie, Sydney, Hull and McKean in turn and spending from one to three days on each island. There is no necessity to give an account of our work island by island, as it was essentially little different from that on Gardner. Thanks to Captain M. L. Singleton, known throughout the islands as the "Admiral," who was a real master of the very specialized art of coral sea navigation, we discovered an anchorage of sorts off each island, a feat of considerable importance to any settlement project. On most islands the relics of the old phosphate-guano days were very much in evidence, and disused tramways and ruined houses kept one's imagination busy trying to recapture bygone scenes.

The only human beings we found in the eight islands were Messrs. F. H. Rostier and G. V. Langdale, two European wireless operators who, with their Fijian servant, had been placed on Canton a couple of months previously by the British Government; and Mr. Jones, with his 30 Tokelau labourers (including 9 women) on Hull and 11 on Sydney. The Group had therefore achieved the very respectable population of 45, all of whom were, however, strictly temporary residents: a year previously there had been none.

[9] The Nive Islanders called Gardner by the appropriate name of "Motu Aonga" (the land of coconut crabs). See Ellis, ibid., p. 58.

One of our most important duties was that of christening the islands found suitable for colonization, since obviously the European names would not do for what were to become purely native islands: for one thing they could not even be pronounced by the Gilbertese. Fortunately, the islands almost christened themselves: Hull was called "Orona," the old Polynesian name by which it was known to the Niue Islanders who worked there for Mr. Arundel. Sydney was called "Manra," the name of one of the Gilbertese ancestral homelands in Indonesia whence they had migrated many generations previously—Manra was known to have possessed a lake similar to Sydney's lagoon.[10] Canton was called "Aba Riringa," the land of sunshine, which all who know the island will admit to being appropriate. Gardner was even more inevitably called "Nikumaroro," after the home island of a Gilbertese ancestress Nei Manganibuka, who swam from her land "i-an Tamoa" (under the lee of Samoa) to Nikunau in the Southern Gilberts, bearing the branch of the first "buka" tree in her mouth. Nikumaroro was known to have been covered with "buka" trees and the delegates were firmly of the opinion that it was none other than Gardner, now rediscovered by her descendants.

The names of Orona, Manra and Nikumaroro have stuck firmly to the three islands with their settlement and indeed are now the only names by which they are known outside a small circle of Europeans. If today one posts a letter addressed to Manra, Phoenix Islands, it will be delivered without question.

Before completing our work on each island we did not omit the ceremony of hoisting the flag. A wooden flagstaff was erected, a substantial cairn built round, and the Union Jack nailed to the top with a notice board commemorating our visit.

On Phoenix we found the only rabbits I have ever met with on any coral island. They appeared to be sharing their burrows with the petrels and shearwaters and one had to step carefully to avoid crushing rabbits and birds

[10]Sir Arthur Grimble, however, considers that Manra was the Banda Sea. See his "From Birth to Death in the Gilbert Islands." *J.R.A.I.*, Vol. LI, Jan.-June, 1921, p. 54.

wherever one went. They were in very poor condition and, although when chased they would be off like a rocket for a hundred yards or so, they soon gave a despairing squeak and lay still with their ears back, ready to be captured. The delegates, who had never, of course, seen such animals, called them "pussies" and refused to eat them. We took 25 away with us with a view to breeding them in the Gilberts, but were unsuccessful as they were killed by dogs before they had time to establish themselves. I am told that rabbits never drink, certainly those on Phoenix could not have, for, though we dug 6 wells down to 12 feet, we found nothing but salt water.

We should have liked to have stayed longer in the Phoenix Group, but supplies and water were giving out, so we had perforce to leave McKean on 26 October and make for my home island of Beru. As it was, our diet for the last week consisted almost entirely of boiled rice and tinned pigs' trotters, of which the "Admiral" appeared to have an unlimited supply.

Our welcome from the people of Beru was enthusiastic and the meetings never seemed to tire of hearing over and over again the exploits of the expedition as given by the delegates, who were for the most part enthusiastic boosters of the new land. Though they were told that even if the colonization scheme was eventually approved, it would take months before it could be carried into effect, not a few natives immediately packed their boxes and wound up their affairs, lest they be found not ready when the eagerly-awaited day arrived.

There followed two months on Ocean Island writing up the results of the pioneering expedition and working out the blueprints for the proposed migration. The romance of these little lone islands, lying out under the equatorial sun far to the east, had quite taken possession of me and I felt that I could not rest till I had seen them the home of a contented and prosperous community. All day long I would be busied with the multitudinous details of any colonization experiment: problems connected with the selection of settlers, the basis of land distribution, the social and political organization of the new colonies, administrative control, stages of settlement, and estimates of the costs

and financial provision required; and at night I could still hear the crash of the waves on Sydney's reefs and the cries of the white terns circling over the lagoon at Gardner.

Space does not permit even a brief summary of my conclusions and recommendations, but those interested in the practical side of group migration can read them in detail in my printed *Report on the Colonization of the Phoenix Islands by the Surplus Population of the Gilbert and Ellice Islands.*"[11] The early settlement of Hull and Sydney was recommended, together with the experimental planting of Gardner and Canton with a view to future colonization. It was estimated that Hull would take an immediate population of 350 and Sydney 400, while ultimate maxima, when the islands had been planted and become fully productive, would be Hull 1,100, Sydney 900, Gardner 1,100 and Canton 1,200. The estimated cost of settlement and planting was worked out at £5,660 and a grant requested for that amount.

Having completed this work I once again said good-bye to my long-suffering wife, who went down this time to Auckland, and departed to live on the small island of Tamana, in the extreme Southern Gilberts. One of the most isolated islands in the Pacific, no European had lived there before, and the people certainly took me to their hearts. We had plenty of work to do but made a point of completing it by four o'clock, and after that there was ample time for whatever was the programme for the day—games and contests of all kinds, community singing, canoe racing, or wrestling on the beach in the moonlight. My great achievement was teaching the islanders deck tennis: they simply went mad on it, built six courts side by side, and every evening you would find some 200 young men and girls playing for all they were worth. I could never get them to lose gracefully, however, and one simply had to get used to having the quoit hurled at one's head by some infuriated player or being chased the length of the marae by an excited girl waving a palm frond.

As illustrating their different way of looking at things I may mention that I could get very little fish to eat,

[11]Suva, Govt. Printer, 1938. This was originally marked confidential, but later derestricted.

although I paid a good price for it. On mentioning my troubles in the council house an old man got up and informed me with some heat that unless I gave up my revolting habit of paying for things he supposed that I would starve. I gave it up; and the fish never failed. But one should not conclude from this that by adhering to their customs the European can live like a king for nothing. I had to give a series of feasts to the island which cost me double what I would have had to pay for my fish.

While my main task on Tamana was a land settlement of the island, I took advantage of the opportunity to work out the details of the proposed colonization scheme with the islanders and ensure that it was correctly orientated with their own customs and traditions regarding migration. I asked them, for example, what was the first thing to be done when making arrangements for colonizing an island. One would never guess the answer; which was, reasonably enough, the composition of a theme song. We set to work with a will and in a few days had produced a really stirring "Song of the Phoenix Islands Settlers," based on a Maori tune called, I believe, "The Warriors' Departure". This song is now sung from end to end of the Central Pacific, a very free rendering of its three verses and chorus being:—

1. We are about to sail for Orona,
good-bye, O people of our homeland;
we have got our lands,
in the new Group of Islands.

2. We shall step ashore at Orona,
we shall dig our wells;
we shall build our dwelling-houses,
so that we may live well.

For the third verse the girls come in with—

3. Stand up, O people of the Gilberts,
grasp your working tools;

and the young men answer—

We shall stand up and clear the undergrowth,
and plant coconut trees.

The chorus runs:

We are happy, for we shall now live.
Do not forget us, O people of our homeland.

It does not sound particularly inspiring, I imagine, when translated; but sung in Gilbertese by 150 voices on the deck of the emigrant ship it was really moving.

After three months on Tamana, during which I had become quite unaccustomed to speaking or hearing the English language, for I had no wireless set in those days, a warship suddenly appeared off the island and fired three guns. The populace, with one accord, made for the bush, thinking the Japanese were attacking their village. Though they tried to drag me with them, I noted the White Ensign flying and succeeded in reaching the ship, to be greeted by the captain with, " Congratulations, Maude, your wife bore you a son in Auckland—two and a-half months ago." He also explained that Naval Custom prescribed a 3-gun salute for a boy and 2 for a girl!

The warship stayed only half an hour but a week later a schooner took me back to Ocean Island, where I learned that the Phoenix Islands Settlement Scheme had been approved, the reversion of Burns, Philp and Co.'s lease purchased from them, and the necessary funds for carrying on the scheme provided by a free grant from the Colonial Development Fund. Sir Arthur had appointed me Officer in Charge of the Scheme, with what he termed " carte blanche " to settle all details as to how it was to be carried out: as far as I remember, his main admonition was the welcome one that there should be the minimum of red tape and paper work!

All was now bustle in preparation for the first expedition of pioneers, who were to blaze the trail for the main parties of colonists; and on 8 December, 1938, we again set sail from Ocean Island in the " Nimanoa," with our decks cluttered up with materials for demarcating boundaries, clothing, cooking utensils, fishing equipment, rations, surveying instruments, tools and two locally-made condensing plants for use until we could find drinkable well water. Mr. G. B. Gallagher, another young Cadet from England (or, rather, Ireland) was to be my assistant from now on, and proved to be exactly the right man in the right place. His industry and enthusiasm was phenomenal and infected everyone with whom he came into contact.

We were committed to be in the Phoenix by a certain date and so had to make all haste. I shall never forget how we landed at our first island, Nonouti, at dusk and immediately called a meeting in the council house. About a thousand islanders must have listened while I stated the reason

for our visit and called for volunteers for the first expedition, explaining that the islands were unknown and untested, that, though the descendants of the settlers might possibly achieve prosperity, those that came with us could only expect the toil and hardship of the pioneer. I added that there could be no return and no revisiting of relatives or friends but that the settlers would be treated by native custom as if they had drifted out to sea in canoes and been lost, and their lands on Nonouti would therefore be divided up amongst their next-of-kin. Although no one on Nonouti had ever so much as seen the Phoenix Islands, some five hundred stood up immediately. From these we selected two notoriously poor families and told them to be ready at the boats, with all their goods and chattels, within two hours. Before the appointed time they were all ready and waiting, and out of the 10 leaving only one young woman showed a tendency to tears. She was sternly rebuked by the Native Magistrate of the island, who observed that " this is no time for weeping. This is a time for brave thoughts and brave deeds." Yet one wonders how many Europeans, leaving all that was near and dear forever—at two hours' notice—would have kept smiling faces?

From Nonouti, we sailed to Beru, Nikunau, Onotoa, Tamana and Arorae, picking up in all 61 pioneer settlers for the three islands—Hull, Sydney and Gardner: Canton was no longer available for settlement. There were 23 men, 13 women, 10 boys and 15 girls; and real pioneers they were too. There must have been close on 80 persons on the little " Nimanoa " and scarcely room to move, let alone to sleep. Some slept by night and some by day, yet we never heard a grumble or complaint the whole voyage. In wet weather they came crowding into our cabins and I remember Gallagher giving up his berth to an old woman and the floor to two others with their children. The Magistrates for the new islands were chosen with especial care: to Sydney and Gardner went our old and tried friends, Tem Mautake and Teng Koata, and to Hull, Ten Eritai, the highly-respected Magistrate of Beru.

After five days at sea we again reached Gardner, and slept our first night under a large tarpaulin, ringed by fires as before. Those who slept at all, that is, for the majority

were too excited by novel sights and sounds, and spent most of the night feasting on the robber crabs and boobies.

Leaving a working party of 10 men on Gardner to commence clearing and planting, we went on to Hull and Sydney. At Hull we left 4 families, totalling 10 persons; and at Sydney 9 families, totalling 41. At each island test lands were demarcated, to ensure that our theoretical methods could be carried out in actual practice. A reserve was marked out for the Island Government station, including sites for the various Government buildings, gaols and Administrative Officers' transit quarters; and further reserves for the hospital, council house, co-operative society and recreation area. Land was allotted for a Church, teacher's house and school for each of the two religious denominations represented. Two village sites were selected on Sydney, the names chosen by the colonists being Mauta, after myself, and Ona, after my wife. I say chosen by the people, for it was certainly through no act of mine that the churches happened to be in Mauta and gaols in Ona. The village in Hull was called Arariki, after our son Alaric, and that on Gardner Karaka, after Mr. Gallagher.

I should explain here that the basis of land allocation finally agreed upon was to give two pieces of land, each containing approximately 25 bearing coconut trees, to every adult, whether male or female; one land to be near the Government station and anchorage. To each child were granted two pieces of unplanted bush land, each 25 fathoms square, on condition that the parents cleared and planted the lands within 5 years of their taking possession. The colonists were also given similar grants of unplanted land on behalf of friends and relations in the Gilberts nominated by them, on the understanding that they guaranteed to support these people until the lands came into bearing and the newcomers undertook to renounce all their lands on their home islands in favour of their next-of-kin. All grants were, of course, freehold.

We opened Post-offices on each island for the settlers' letters. Unfortunately, however, the cancellation stamps did not arrive in time, so for the first few months all letters were pen cancelled and initialled either by myself or the Native Magistrates. I read a learned article on these pen

cancellations in an Australian philatelic journal not along ago, illustrated with actual specimens which, I believe, are now fetching quite a high price. So I can at any rate look forward to a lucrative employment for my old age in pen cancelling Gilbertese stamps for the philatelic market.

Leaving Gallagher to carry on with the land allotment and other work on Sydney, we set sail once more for the Gilberts, calling in at Gardner on our way. Here we found dire trouble among the 10 men left there: the well water was considered undrinkable, one condensing plant had burnt out and they were afraid the other would go too. They demanded to be taken home forthwith. Argument appeared useless and we had a final and sad meeting prior to departure, in which I happened to mention how sorry I was at the turn of events as I was returning to the Gilberts to bring their wives back with me on the next ship. The effect was instantaneous and ludicrous. "Wives, did you say?" said their spokesman. "Why, the water here is not so bad, after all. We're staying on." And stay they did. Apparently, all that was wrong was that the men had got so homesick for the company of their families that they could not bear the thought of further indefinite separation.

On arrival at Tarawa on 21 January, 1939, I was assigned to accompany an exploratory expedition to Fanning, Washington, and Christmas, in the Line Group, and it was not until March that I was able to continue with the work of selecting the main party of colonists, who were to leave by a small chartered steamer, the M.V. "Moamoa," at the end of the following month. Leaving Ocean Island on the "Nimanoa," this time with my wife and infant son, we called at all the Southern Gilbert Islands, taking down the names of volunteer colonists and selecting those who were to go, on a basis of relative poverty. The amount of sheer want this survey disclosed was disconcerting: families of from 7 to 10 children had a total apparent source of food supply consisting of less than 20 coconut trees, supplemented by such fish as they could catch. On asking how one Beru family with six children managed to live I was informed, "by begging in the day and thieving at night". Altogether, 4,611 applications to migrate were registered on the seven islands visited, making an estimated

total of not less than 6,500 for the whole of the Gilbert Group.

The selected settlers were all brought to Beru, where my wife acted as the receiving end. She had quite an assembly line on the work and each child was paraded and given a good scrub with soap and water, before being passed on for medical inspection and finally presented with a real feast of boiled rice. It was a joy to watch the children getting steadily fatter and fitter as the days went by.

The " Moamoa " arrived on 22 April and by the following day we had embarked the 195 new settlers, with all their personal effects, canoes, etc. The voyage to the Phoenix passed off without incident, though it was full of excitement for the colonists, who were all agog to see their new homes. Stopping at each of the three islands in turn, we landed 12 settlers at Gardner (the long-awaited wives and families of the pioneer party), 75 at Hull, and 108 at Sydney. Everything appeared to be progressing well and at the last island Gallagher was found busy and happy, though he had evidently had a tough time by the standards of civilization. His shoes, to give an example, had long succumbed to the sharp coral rock and his feet were bound up in layers of rags. If I remember rightly he wore size thirteens, so the provision of shoes for him was a perpetual difficulty.

The main trouble of the Sydney settlers appeared to have been fish-poisoning, and most of them had been down with it for varying periods. On coral islands certain of the reef fish tend to be poisonous for portions of the year, the types of fish and times during which they are poisonous changing from island to island. In the Gilberts, of course, these periods are well known to the local inhabitants, but when they reached the Phoenix they had to learn afresh by bitter experience what fish could be eaten and when.

I was very pleased indeed by the way in which the little community on Sydney had developed, led by the enthusiasm of Gallagher. During the three months that had elapsed since I left the whole face of the island had changed. Where before we had to cut our way through thick bush, two prosperous villages were now situated, with neat and attractive homes fronting both sides of the broad road. To

the south of the villages had been built a large school, where over 50 children received daily instruction from a full-time master: to the north lay the Island Government station, with its offices, storehouses, homes for the resident officials, and two small gaols, which still remained happily untenanted. Close to the Government station was the hospital with its resident Native Dresser, facing the sea, and the new transit quarters for the visiting European officers. In the centre was a large cistern, which provided water for the hospital and an emergency supply for the whole island in the unlikely event of the well water supplies failing. All around were evidences of peaceful progress, and the impression of general contented well-being was increased by a walk through the newly-opened bush lands along the " Richards' Highway " (named in honour of Sir Arthur Richards, the sponsor of the settlement scheme), where through the day could be heard on all sides the ring of axes and the cheerful chatter of families engaged in preparing their new lands for planting.

I must confess that I had anticipated that once the novelty of their new homes had worn off, many of the settlers would be seized with a somewhat natural nostalgia for their ancestral lands and I was, accordingly, prepared to face a number of requests for repatriation. That these did not, in fact, eventuate is I think a vindication not only of the natives' claims to be over-crowded and poverty-stricken on their former islands but also of the effectiveness of the settlement scheme in meeting their needs. We were reluctantly compelled, at the request of the entire island, to repatriate one settler with his family, as he had been guilty of several crimes (including adultery, theft, and assault), and his strenuous efforts to escape showed, better than words, how much he valued his new life.

Gallagher characteristically gave all the credit for the good work done to the natives themselves, but it was easy to see his sympathetic guidance underlying it all, ably seconded as he was by Tem Mautake. The pioneers, certainly, were a fine body and I cannot do better than quote this tribute to them from Gallagher's report to me on my arrival:—

> "The wonderful spirit of enthusiasm, gratitude and self-sacrifice which has been apparent on Manra during the last

few months has, indeed, been a revelation. It is unhesitatingly stated that this alone has made the whole settlement scheme worth while, without considering any other advantages which have accrued therefrom. These settlers indeed deserve the happiness and prosperity which is now within their grasp, for their lot has been harder, far harder, than will be that of any subsequent settlers who will, at least, land on the island assured of a roof to shelter them and lands to provide for themselves and their children. Although every man who comes to the island must be prepared to face several years of unremitting hard work, it has been the lot of the first settlers only to face the full terrors of an unknown island and take the initial and often wearying and monotonous steps required to pave the way for the establishment of a new home for the Gilbertese race."

If Hull Island had not achieved the same progress as Sydney, it was only to be expected in view of the smaller number of the pioneering party there and the fact that neither Gallagher nor myself had been able to give it the attention it deserved. However, Mr. Jones, who was, as I have explained, already living in the Phoenix Islands when I first visited the Group, had stayed on there to superintend the settlement and had done all he could to promote the welfare of his little community. Their troubles were fortunately soon ironed out and Hull, with its greater fertility and teeming supply of fish in the lagoon, is now the most prosperous of the three islands.

Steady progress had been made with the clearing and planting of Gardner Island and a pretty little village had been built by the colonists on the shores of the lagoon. Gardner will, of course, long remain a pioneer settlement, as there were no coconut trees there to form the basis of immediate colonization, whereas on Hull we had 15,000 in bearing and on Sydney 7,000 to 8,000. The first lands to be planted are, however, already coming into bearing and the island should now gradually become self-supporting.

I spent over a month in the Phoenix on this visit, much of the time being occupied in organizing the Co-operative Societies, which we established on each island. Owing to the distance of the Phoenix from the main centres of commerce and the small amount of copra available for trade, it was not possible to persuade any commercial firm to include the islands within their sphere of trading activities. As a consequence, we had to establish co-operative societies for the colonists, and stock them with a full range of those

articles, such as soap, kerosene, fish hooks, tobacco, etc., for which they were dependent on the outside world. These societies have up to the present been run as Government undertakings; but the profits made should soon extinguish the original loans for their establishment, when they will be handed over to the natives of each island as debt-free, going concerns.

We were glad to see that the new settlers on the "Moamoa" appeared more than satisfied with their new homes. I had intentionally played down the islands when speaking about them in the Gilberts, for it is far better to give a colonist more than you promise, rather than less. I felt justified, therefore, when one of the leaders of the new party accused me of being a "born liar" in my descriptions of his future home.

By a Proclamation dated 21 June, 1938, the three small islets of Phoenix, Birnie and McKean had been declared to be sanctuaries for birds. It was realized, however, that they possessed a definite value as tributary islands of Sydney, Hull and Gardner respectively and they were, accordingly, handed over to the colonists of these islands to be held in common. Before leaving the Phoenix we planted 600 nuts on Birnie—it is estimated that the island would support up to 3,500 coconut trees. The others, led by the indefatigable Gallagher, actually did the planting, as it was too rough to go ashore except by swimming through a high surf, and I spent a pleasant day catching sharks by their tails with a rope noose. These islets will in all probability never be permanently inhabited, but should any plantations made on them reach maturity, and a few families elect to make their homes there, there would appear to be no reason against it. Small storage cisterns and catchment areas would provide the necessary water.

Gallagher returned with me to the Gilberts in the "Nimanoa" and proceeded on to Fiji, as he had developed tropical ulcers on his legs as a result of being tipped into the surf on several occasions when trying to get ashore, while his constitution had been undermined by the hardships he had been through. Landings at all the Phoenix Islands, with the exception of Canton, are apt to be dangerous and we were swamped and had to swim for it more

than once. Our final call was at Gardner, where the "Nimanoa's" engines stuck at dead centre while we were anchoring and we gradually drifted on to the reef. We had an exciting quarter of an hour endeavouring to start the engine while the schooner gradually heeled over on her side and the high surf started to break over her counter. However, all was well in the end and we gradually eased off the reef into deep water.

Soon after returning to my home on Beru I also became ill and was unable to return to the Phoenix. The work of managing the settlement scheme passed into the capable hands of Gallagher, and despite temporary difficulties and set-backs too numerous to mention the colonization programme proceeded surely and steadily. During 1940 Gallagher succeeded in again chartering the M.V. "Moamoa," which took 276 settlers to the islands and, in addition, made two journeys on another chartered vessel, the M.V. "John Bolton," taking a further 154. On 30 September, 1940, when further settlement was finally suspended owing to the war, a grand total of 729 colonists had been transported to the Phoenix, of whom only 7 had had to be returned. A census taken in the same month showed a total of 727 residents, excluding temporary military and airport personnel.

By the end of 1940, both Sydney and Hull Islands had become normal self-contained island communities. The islands were administered by their own Native Governments, a system to which the colonists were accustomed in their former homes, supplemented by occasional routine visits by the European Administrative Officer in charge of the District. On Sydney Island the villages were completed, the church site prepared, and boat sheds and a copra store erected. A Women's Committee had succeeded in reducing the infant morality rate while the newly-formed Matangarengare Welfare Club was proving a progressive influence in local affairs. Over 1,000 lands had been demarcated for division among the settlers. On Hull, now a populous community, a new suburb of the main village had had to be built and the colonists were reported to be a happy and industrious community, busily engaged in house-building and planting.

Gardner had been chosen by Gallagher as the headquarters of the new Phoenix Islands District and an excellent headquarters residence had been built by him there from native materials. As a result of the first year's work on the island, some 8,000 trees were found to be in healthy growth and in March, 1941, work was commenced on the demarcation and plotting of land holdings, about 20 lands being taken over by labourers who had elected to remain as settlers.

Gallagher himself returned to the Phoenix on several occasions, but the hardships he had been through proved too much for his indomitable spirit and he finally succumbed and was buried at Gardner on 27 September, 1941, aged 29. Universally beloved by the natives and characteristically cheerful to the last, it can be truly said of him that he gave his life for his people and that in his work and the manner of his death he upheld throughout the best traditions of the British Colonial Service.[12]

I think it can be fairly claimed that the Phoenix Islands Settlement Scheme has proved a success: the settlers themselves would certainly say so. Under commercial exploitation this remote group of islands provided, at best, a precarious livelihood for a single European and a handful of native labourers: now we have a thousand peasant proprietors leading happy and contented lives on their own lands, administered by their own Island Governments, buying their wants and selling their produce in their own Co-operative Societies. This surely is sufficient justification for our efforts and for the money which the Imperial Government has provided to finance the venture.

Whether settlement schemes can provide a permanent solution to the Colony's over-population problems is, of course, another matter. In the period since immigration into the Phoenix Group ceased the population has increased from 724 to over a thousand; that of Hull alone from 394 to about 560. Colonization measures are, in fact, palliatives only and for more permanent means of population control we must look elsewhere.

[12]Mr. P. B. Laxton, who carried on Gallagher's work after the war, has written an admirable account of life on Gardner Island and the history of the settlement there since the war. See "Nikumaroro" in *J.P.S.*, Vol. 60, Nos. 2 and 3, June and September, 1951.

A masterly performance! We shall miss a man of his ilk. He was, in more ways than one, larger than life.

DON STEWART
Sydney NSW
Australia

Malden's historian makes an appeal

Eight years ago, on a visit to Fiji, I happened to read an article in a 1933 issue of PIM and it introduced me to the Line Islands, which hitherto I had not heard of, and to Malden Island in particular.

This place struck me right away as unusual, and subsequent research confirmed it as unique. The central lagoon is of terrific depth (probably the cone of an extinct volcano) and on the barren flat surface of Malden are the most extensive Polynesian stone ruins of any uninhabited island in the Pacific.

I am now getting ready to write a book on Malden Island. It is most unlikely that there will be another one; so it will need to be as good as it can be. 'Complete' would not be possible, but it has to read convincingly, at least.

A brief summary of Malden's story might hint at the fascination which has sustained me throughout the often wearisome search for information about this remote and somewhat forbidding spot.

It was officially discovered by HM's frigate *Blonde* in 1825, and named for the surveying officer, Lieutenant Charles Malden, who went ashore with a party. For the next 30 years it was one of the many low islands known to whalemen, useless for 'comforts' of any kind, and to be avoided because of strong tidesets. But with the demand for guano as a cheap fertiliser in the late 1850s, these unlovely equatorial coral lumps were occupied, and their immense bird colonies disturbed, by American interests operating from Honolulu — with the exception of Malden, or Independence Island, the most valuable of the lot.

The right to exploit Malden's resources came into the hands of B. B. Nicholson, a shipping agent in Melbourne. Trying to set the island up broke Nicholson financially (six vessels lost in under two years) and broke his health as well. He died at the age of 34, by which time the firm of Grice, Sumner & Co had inherited the lease — and the problems.

After the loss of a large German ship in bizarre circumstances in 1873, insurance companies refused to underwrite vessels going to Malden. The next year, however, Grice, Sumner had good fortune for a change, when they signed up a 36-year-old Ulsterman, Abraham McCullough, to be manager.

He was to serve on the island for 23 years. He is buried there, near the memorial to his infant son, who according to the inscription, had been 'taken by the wild wave'. Under McCullough's rule — and that is the right word — Malden Island was a going concern, and a well ordered little outpost of the British Empire. The field-labourers and boatmen were recruited from the northern islands of the Cook Group. McCullough fined them for infractions, but would permit no abuse of them by the white overseers or the crews of ships.

By the time of McCullough's death, all the other low islands had long been abandoned, or were being sporadically worked for tailings by the tireless John T. Arundel. Of course the opening up of Ocean Island in 1900, and later Nauru, put Malden in eclipse. But Grice, Sumner held on to the lease, and continued to work the deposits, with only New Zealand remaining as a market. It was not until 1927 that Malden Island ceased to operate as a guano station — and the buildings of the beach-crest and inland settlement were left to become the island's second collection of ruins.

During the late 1930s Malden was one of the islands disputed by Britain and the USA, both in quest of possible seaplane bases between North America and Australasia. The Japanese attack on Pearl Harbor cancelled all that, and the Cold War brought aircraft of stupendous technological advancement to the mid-Pacific. In 1957, Malden, and Christmas Island, were the sites of 'Operation Grapple', the first British H-Bomb tests. Five years later, the USA made similar use of them.

The most recent chapter (or paragraph) in Malden's story, as reported in PIM, November 1979, is that along with 13 other islands so earnestly staked-out by RN and USN warships 45 years ago, it is now part of the new nation of Kiribati. But two Kiribati Government expeditions had earlier concluded that Malden could not be made suitable for habitation except at prohibitive expense.

So the birds, their numbers depleted by guano mining, imported pigs and cats now run wild, and the flashes of super bombs, have the island again — with the ocean billows, the westerly trade wind, and the *marae* and house-sites of the people who lived there centuries before the first grave of European or Cook Islander.

Ordnance huts stand with the coral-stone foundations of the guano storage sheds and staff quarters, succumbing to weather; drums of dieselene are stacked along a section of splitting railway track. The loading pier that proceeded on shear-legs from the beach-crest out over the reef, where the guano sacks, the millions of them, were winched off flatcars into lighters, lies scattered under the sea.

Tracking down information on Malden has been anything but straightforward business, yet worth all the trouble, for the co-operation and trust which I have been given by so many people. It will be my pleasure as much as duty, to acknowledge all who have thus contributed, within Australia and from six other countries, in the credits which will appear in the book.

I would now like to ask of PIM readers whom I do not know and have not reached, if there are any who might have material, however minor, to do with this out-of-the-way island: family letters, diaries, reminiscences, photographs, newspaper items, etc. — anything at all.

Correspondence, from anywhere in the world, will be promptly answered.

JOHN C. ORR
KOA Productions,
41 Correy Avenue,
Concord 2137 NSW
Australia

Ancient Polynesian ruins on the uninhabited island of Malden. The extent and nature of the coral slab structures has suggested to researchers that a community of about 200 once lived on the island. This drawing is based on a photograph published by the Bernice P. Bishop Museum, Hawaii.

Invasion by the Mozambique Tilapia (*Sarotherodon mossambicus*; Pisces; Cichlidae) of a Pacific Atoll Marine Ecosystem

PHILLIP S. LOBEL

Museum of Comparative Zoology
Harvard University
Cambridge, Massachusetts 02138

Abstract—The cichlid fish, *Sarotherodon mossambicus*, native to southern Africa and introduced into many other areas of the world, was released by personnel of the U.S. Bureau of Commercial Fisheries in a saltwater pond on Fanning Atoll and in a freshwater lake on nearby Washington Island, Line Islands, in 1958 from stocks obtained in Hawaii. Since then, this exotic fish has become established and has dispersed into several estuaries and the lagoon of this atoll. The range of this fish, two decades after its introduction, encompassed approximately 16 km of lagoon coastline at Fanning Atoll. Resident islanders have not utilized this tilapia except to kill them when the fish becomes too abundant; they are not used as baitfish or as food. *S. mossambicus* is preyed upon by predatory fishes and piscivorous birds, but such predation has failed to stem the range expansion of this exotic fish.

Introduction

In 1951, the Hawaii Division of Fish and Game imported a stock of the Mozambique tilapia, *Sarotherodon mossambicus* (Peters), from Singapore and successfully introduced this exotic fish to all major islands of Hawaii (Hida et al. 1962). Although the rationale for this introduction is unclear, this species was subsequently used as skipjack bait (Brock and Takata 1955; King and Wilson 1957). In the interim, the U.S. Bureau of Commercial Fisheries, at the request of the Hawaii Division of Fish and Game, made what Murphy (1960) considers to be the first successful introduction of an exotic marine fish, the Marquesan sardine, *Harengula vittatus* (Cuvier and Valenciennes), to Hawaii. The rationale for this introduction was stated as "suitable for tuna fishing. . . to supplement the somewhat tenuous supply of the nehu, *Stolephorus purpureus* Fowler", a native bait-fish used for tuna, . . . and the "attendant vacant niches" (Murphy 1960), an often-used rationalization for introductions of exotic species to which Murphy attributed successful establishment there and of other fishes elsewhere.

The U.S. Bureau of Commerical Fisheries began experiments in the late 1950s on the potential of the Mozambique tilapia as tuna bait. Two research vessels, the HUGH M. SMITH and CHARLES H. GILBERT, were supplied with this tilapia from Hawaiian stocks as late as the end of 1959 (Hida et al. 1962). Although there is no official mention of introducing tilapia at Fanning Atoll and neighboring

Micronesica 16(2): 349–355, 1980 (December)

Washington Island in either the ship's scientist or deck logs during cruise 42 of the CHARLES H. GILBERT (8 October to 17 November 1958). Paul Strusaker (pers. comm.) located a crew member on that cruise who remembered the releasing of this tilapia at both locations.

The purpose of this report is to document the status (as of 1978) of the Mozambique tilapia at Fanning Atoll, two decades following its release. Preserved specimens of *S. mossambicus* collected at Fanning Atoll are deposited at the Museum of Comparative Zoology, Harvard University.

Distribution at Fanning Atoll

Fanning Atoll is one of the Line Islands, Central Pacific Ocean (3°55'N; 159 23'W). Chave (1970), Chave and Kay (1973), and Chave and Eckert (1974) provide comprehensive survey data on the fauna, flora and geology of this atoll. The saltwater estuarine environment, including both biotic and physical parameters, were described by Guinther (1971). The estuaries typically are equal in salinity with the lagoon except during periods of heavy rainfall. The salinity, however, never drops below a level usually tolerated by native estuarine fishes.

During the summer of 1978, every major estuary on Fanning Atoll, with one exception, was surveyed for the presence of Mozambique tilapia. We found extensive dispersal from the original site of introduction (Fig. 1) but this exotic fish had not yet succeeded in spreading throughout the atoll. *S. mossambicus* was absent in the estuaries in the northeast sector possibly due to water barriers at North Pass and Teharoa Iti. The dispersal of this species is a natural phenomenon as resident islanders do not collect the fish except to kill them when they become too abundant; they are not used as a baitfish or food fish.

We also surveyed the freshwater lake at nearby Washington Island. The Mozambique tilapia was abundant throughout the lake but, unfortunately, time was not available for a more thorough survey.

Predation on Tilapia

It is clear that the introduced *Sarotherodon mossambicus* has adapted to the marine environment of Fanning Atoll with respect to reproductive habits and to the extent that this species has been able to expand its range, despite the presence of several predators. The risk of predation by larger predators varied with the tidal cycle.

Water depth in the estuaries fluctuated tidally between 0.5 and 1 m. Consequently, different sections of the estuaries were either flooding or draining. Predaceous marine fishes entered the estuaries from the lagoon during rising tides. At high tide, tilapia were pursued by piscivorous fishes. During low tide, however, tilapia trapped in shallow pools or on nests (Fig. 2) were vulnerable to predaceous seabirds.

At low tide, the estuaries were too shallow for jacks (*Caranx* spp., mostly *C. ignobilis* [Forskål]) and juvenile blacktip sharks (*Carcharhinus melanopterus* [Quoy

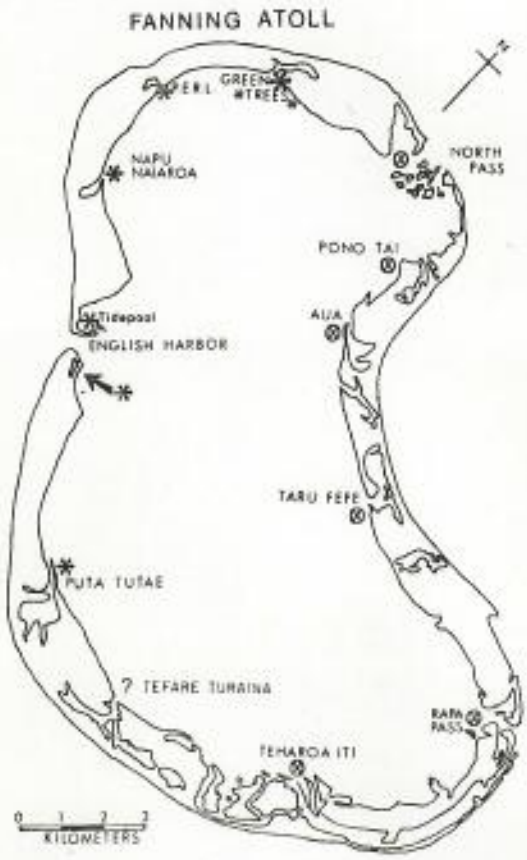


Fig. 1. Distribution of tilapia at Fanning Atoll June-September, 1978. The arrow with asterisk identifies the pond into which tilapia were released in 1955. A limited number of tilapia were also released in the tidepool on the other side of English harbor at the same time. Other locations marked with an asterisk identify estuaries where tilapia are present. The Green Trees estuary with smaller asterisks is the site where schools of juvenile tilapia were frequently observed migrating into the lagoon. Locations marked with a circled X are estuaries that did not contain tilapia. One estuary marked with a question-mark was not inspected. P.E.R.L. is the site of the Pacific Equatorial Research Laboratory.

and Gaimard]) to enter them or the surrounding reef area. Tilapia occupied nest-pits in the deeper sections at this time; nest-pits in the shallow sections were semiexposed and vacant. Juvenile tilapia moved in large schools into the lagoon but remained in shallow water.

On the incoming tide, juvenile tilapia moved back into the estuaries first, followed later by the adults as water depth increased. Once the water was sufficiently deep, numerous jacks and blacktip sharks entered the estuaries. At this time, tilapia

Fig. 2. Tilapia in nests at Napu Naiaroa estuary.

crowded into the shallow sections of the estuary, shaded by low, overhanging palm fronds and other vegetation. Tilapia stranded in shallow areas beyond this cover area were exposed to piscivorous birds that we observed frequently swooping to catch these fishes. Jacks and sharks were observed attacking tilapia aggregations, often splashing as they invaded the shallows.

The Mozambique tilapia was the predominant prey of predatory fishes collected at high tide in the estuaries between 0900 and 1500 hrs in August 1976 and July 1978 (Table 1). Other estuarine species present in abundance are listed in Table 2. The relative abundance of estuarine fishes was estimated by seining an area of approximately 3050 m^2 in the Green Trees estuary (Fig. 1). The collection yielded 447 fishes of which 7% were tilapia, 33% juvenile mullet and 60% juvenile bonefish. Thirteen *Caranx* spp. were also collected in the same site. Although the tilapia was the least numerous fish in this single seine sample, this fish was the most frequent prey of the piscivores (Table 1). One explanation for this is that the Mozambique tilapia is particularly vulnerable because of its habit of crowding along shallow shorelines. Bonefish and mullet, however, aggregated at the surface over the deepest sections in the estuaries or moved into the lagoon during high tide.

Table 1. Specimens of piscivorous fishes collected in estuaries of Fanning Atoll.

	Caranx spp.	*Carcharhinus melanopterus*
specimens collected (n)	41	5
standard length: $\bar{Y}$ (range) in cm.	19 (12–30)	49 (46–69)
specimens containing tilapia	14 (34%)	3 (60%)
stomach contents:		
Sarotherodon mossambicus	45	4
Oxyurichthys lonchotus (Jenkins)	4	0
small octopus	0	1
unidentifiable (including invertebrate parts)	7	0
stomachs empty	15	1

Table 2. Common native fishes occurring in estuaries at Fanning Atoll.

Family	Species	Notes
Albulidae	*Albula vulpes* (Linnaeus)	mostly juveniles
Chanidae	*Chanos chanos* (Forskål)	"
Gobiidae	*Oxyurichthys lonchotus* (Jenkins)	adults & juveniles
Lutjanidae	*Lutjanus vaigensis* (Quoy and Gaimard)	"
	L. monostigma (Cuvier)	"
Mugilidae	*Mugil cephalus* Linnaeus	mostly juveniles
	M. engeli Bleeker	"
Tetraodontidae	*Arothron hispidus* (Linnaeus)	adults & juveniles

Discussion

Sarotherodon mossambicus is tolerant of estuarine environments in its native southern Africa (Jubb 1967; Whitfield and Blaber 1978) and other locales where it has become established such as California (Knaggs 1977) and Florida (W. R. Courtenay, Jr., pers. comm.). Bond (1979) cited salinity tolerances to 69 ppt for this fish. Brock (1954) first noted that the Mozambique tilapia in Hawaii was capable of growing and reproducing equally well in freshwater and seawater (see also Neil, 1966). Knaggs (1977) reported a reproducing population in California's marine waters with salinities up to 34.5 ppt at Colorado Lagoon in Long Beach. Popper and Lichatowich (1975) stated that *S. mossambicus* reproduced prolifically in saltwater ponds in Fiji with salinities up to 49 ppt.

One might expect saltwater environments with a variety of predatory fishes to be inhospitable to invasion by the Mozambique tilapia. Popper and Lichatowich (1975) speculated that the spread of *S. mossambicus* in Fiji was curtailed mainly by the predator *Elops hawaiiensis* Regan. In South African estuaries where *S. mossambicus* is native, Whitfield and Blaber (1978) found mullet to be the major prey of predators, particularly *Caranx ignobilis* which ate only mullet. *S. mossambicus* there was eaten

by *Argyrosomus hololepidotus* (Lacépède) and *Elops machnata* (Forskål), but mullet was the preferred food of these predators. *S. mossambius* was found in less than 10 percent of all predator stomachs examined. Whitfield and Blaber (1978) also noted that juvenile Mozambique tilapia and other estuarine fishes inhabited shallow marginal areas, perhaps in response to roving predators. Jubb (1967) suggested that invasions of *S. mossambicus* from one estuary to another along the east coast of South Africa was via marine waters.

At Fanning Atoll, the Mozambique tilapia occupied the estuaries at low tide and retreated to shallow, covered areas on the incombing tide. Tilapia trapped in exposed shallows during low or high tides were preyed upon by seabirds. *S. mossambicus* was the major prey species of piscivorous fishes collected at Green Trees estuary in August 1976 and July 1978 (Fig. 1; Table 1). Despite predation by seabirds and predatory fishes, the Mozambique tilapia has successfully occupied 16 km of coastline in 1978 from its original site of introduction in 1958.

Haphazard or otherwise thoroughly untested introductions of exotic species to new habitats can produce devastating consequences to native communities (Courtenay 1979; Laycock 1966). Despite the obvious dangers, tilapias and other cichlid fishes are being introduced throughout the tropical areas of the world. Careful assessments of the real and potential impacts of cichlids, particularly tilapias, on native fish communities should be required prerequisites for any consideration toward introduction. The demise of much of a freshwater fish community in Gatun Lake, Panama, resulted from the introduction of the peacock cichlid, *Cichla ocellaris* Schneider (Zaret and Paine 1973). Knaggs (1977) has indicated a decline in native fishes in the San Gabriel River, California, and attributes this decline to increases in the population of *S. mossambicus*; he also suggests similar future effects on coastal marine fishes.

Although no quantitative data are available, Fanning Atoll fishermen claimed that the introduction and subsequent spread of the Mozambique tilapia has resulted in a decrease of mullet, bonefish and milkfish. These fishes utilize the estuaries as nursery grounds and Fanning islanders are dependent on these species for food and bait. Therefore, any decrease in supply can have serious consequences for Fanning islanders. Furthermore, these fishes represent a viable but, as yet, an unexploited fishery that could provide a profitable industry, particularly as the present copra industry declines.

Clearly, the careless and needless introduction of the Mozambique tilapia at Fanning Atoll has had no beneficial effects. It is vital that tilapias, other euryhaline exotic fishes or nonindigenous marine fishes not be released to other Pacific island ecosystems unless the benefits of such releases can be shown through careful and thorough research to outweigh any negative impacts. Nevertheless, as the result of a release in 1958 with subsequent establishment and range expansion by an exotic fish in marine waters, Fanning Atoll provides an ideal site for future studies on impacts of *S. mossambicus* in central Pacific marine ecosystems.

ACKNOWLEDGMENTS

I am grateful to Martin Vitousek, Director of the Pacific Equatorial Research Laboratory at Fanning Atoll, University of Hawaii, for his generous support of my research. I thank Cynthia Putchat, Deetsie Chave, Kam Chou Yee-on, Johnny Tarawa, and Talia Kafe for helping with the field work, Bill and Marina Frew for their hospitality, Paul Strusaker for uncovering the historical information, and P. H. Greenwood for comments and for identifying the cichlid. My appreciation is extended to Walter R. Courtenay, Jr. for his many valuable suggestions and the generous amount of time he spent reading the manuscript. This project was conducted incidentally to studies on reef fishes supported by NSF Grant OCE 7806624.

References Cited

Bond, C. E. 1979. Biology of Fishes. W. B. Saunders, Co., Philadelphia. vii + 514 p., 180 figs.

Brock, V. E. 1954. A note on the spawning of *Tilapia mossambica* in sea water. Copeia 1954 (1): 72.

Brock, V. E., and M. Takata. 1955. Contribution to the problems of bait fish capture and mortality, together with experiments in the use of tilapia as live bait. Industrial Research Advisory Council, Hawaii, final rept., Grant 49, 39 p.

Chave, E. H., and E. B. Eckert. 1974. Ecological aspects of the distribution of fishes at Fanning Island. Pac. Sci. 28: 297–317.

Chave, K. E. (ed.). 1970. Fanning Island Expedition, January 1970. Hawaii Institute of Geophysics, Univ. Hawaii, final rept., H16–73–13, 320 p.

Chave, K. E., and E. A. kay (eds.). 1973. Fanning Island Expedition, July and August 1972. Hawaii Institute of Geophysics, Univ. Hawaii, final rept. H16–73–13, 320 p.

Courtenay, W. R., Jr. 1979. The introduction of exotic organisms. In: Wildlife and America, H. P. Brokaw (ed.). Government Printing Office, Washington, p. 237–252.

Guinther, E. B. 1971. Ecologic observations on an estuarine environment at Fanning Atoll. Pac. Sci. 25: 249–259.

Hida, T. S., J. R. Harada, and J. E. King. 1962. Rearing tilapia for tuna bait. Fish. Bull., U.S. 62(198): 1–20.

Jubb, R. A. 1967. Freshwater fishes of southern Africa. A. A. Balkema, Cape Town. vii + 248 p. 272 figs, 57 pls.

King, J. E., and P. T. Wilson. 1957. Studies on tilapia as skipjack bait. Spec. Sci. Rept., U.S. Fish and Wildlife Serv. 225, 8 p.

Knaggs, E. H. 1977. Status of the genus *Tilapia* in California's estuarine and marine waters. Cal-Nev Wildl. Trans. 1977: 60–67.

Laycock, G. E. 1966. The alien animals. Natural History Press, Garden City, NY. 240 p., 17 figs.

Neil (Chave), E. H. 1966. Observations on the behavior of *Tilapia mossambica* (Pisces, Cichlidae) in Hawaiian ponds. Copeia 1966(1): 50–56.

Murphy, G. I. 1960. Introduction of the Marquesan sardine, *Harengula vittata* (Cuvier and Valenciennes), to Hawaiian waters. Pac. Sci., 14(2): 185–187.

Popper, D., and T. Lichatowich. 1975. Preliminary success in predator control of *Tilapia mossambica*. Aquaculture 5: 213–214.

Whitfield, A. K., and S. J. M. Blaber. 1978. Food and feeding habits of piscivorous fishes at Lake St. Lucia, Zululand. J. Fish Bio., 13: 675–691.

Zaret, T. M., and R. T. Paine. 1973. Species introduction in a tropical lake. Science 182: 449–455.

CHRISTMAS ISLAND

Come Fishing

KIRIBATI

INFORMATION

AIRLINES
Kiribati National Airline AIR TUNGARU operates 11 services from Honolulu to Tarawa and Papeete via Christmas Island. Details of schedules and tariffs from Air Tungaru Office, P.O. Box 43, Bairiki, Tarawa or Air Tungaru Corporation, 3049 Ualena Street, Suite #801, Honolulu, Hawaii 96819.

IMMIGRATION & CUSTOMS
A valid passport is required by all visitors to Christmas Island. Non British/non Commonwealth subjects are also required to obtain an Entry Visa. All visitors must possess return or onward tickets. Entry Visas will be issued upon arrival to persons in organized tour groups. Firearms, ammunition, explosives, drugs, and indecent publications are prohibited. There is also a strict quarantine on the import of plants and animals.

ACCOMMODATION
Captain Cook Hotel is situated in the north of the island some four miles from the airport in an ocean-side position with its own fine sandy beach. It has 24 rooms, 12 of which are air-conditioned. Each room has a private shower and toilet. The hotel has a restaurant, bar and shop. Room service is available during restaurant hours.

There are no facilities on the island for camping.

Tipping is not permitted.

There are no service charges or taxes.

CURRENCY
The Australian dollar is the legal currency of Kiribati. Travellers cheques and U.S. dollars may be exchanged for local currency at the hotel. There are no facilities for the use of credit cards or personal cheques on Christmas Island.

COMMUNICATIONS
There are no telephones on Christmas Island for either local or overseas use. No telex facilities exist that may be used by visitors. Overseas telegrams are received and dispatched daily via Tarawa.

LANGUAGES
I-Kiribati is the native tongue of the local inhabitants of Christmas Island. The majority of people have a good command of spoken and written English.

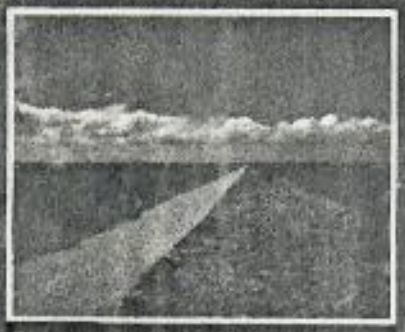
CLIMATE
With a maritime equatorial climate the mean annual temperature is 80°F (26.7°C). Easterly trade winds provide a pleasant cooling breeze throughout the year. Average rainfall on Christmas Island is 30 inches per annum.

For further information regarding visitor facilities on Christmas Island write to:

The Office of Tourism,
Ministry of Natural Resource Development,
Christmas Island (Republic of Kiribati),
Central Pacific

Design and photographs by A. Whincup

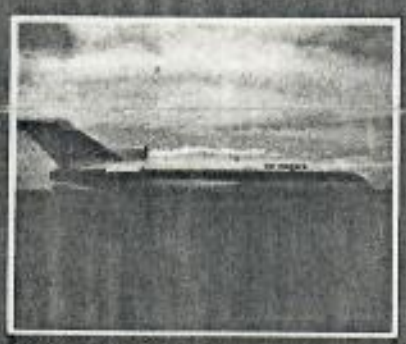
Balazs - see the last page about Turtles! at Christmas Island.
D. Crear



Good roads link most places

The hotel dining room

Captain Cook Hotel



Weekly jet connection

1 BIRD SANCTUARIES (Closed areas)

2 AREAS OF SPECIAL WILDLIFE INTEREST

3 FISHERIES DEVELOPMENT (Prohibited areas)

Asphalt roads
Lagoon-mud roads
Unmade roads.

From the day of your arrival on Christmas Island until your departure you will be assured of one thing:—This is THE location for big fish.

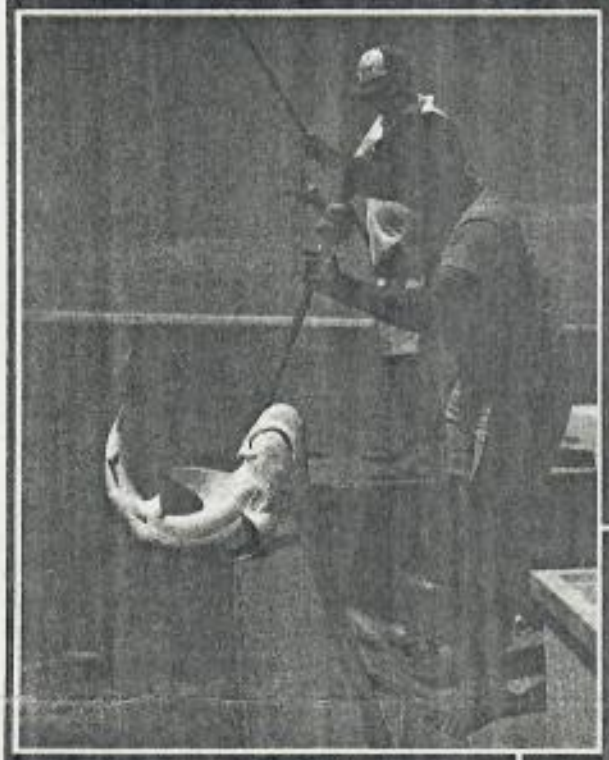
For both diving and fishing, pick-up trucks and boats with crew are available for hire from Atoll Plantations Ltd., who also have facilities for supplying air at 3,000 psi at 3 cu.ft./min. Nearly all of the island's 100 miles of coastline are easily accessible by boat and road, with many areas suitable for shorecasting around high and low water, and even inexperienced snorkelers will find excitement watching fish in the shallow waters near Paris.

Very large Trevally and Snappers live in the reef waves, many are potential record breakers—many will break you!

Harvesting milkfish at the Huff Dam for export. The fish trap operates at a sluice gate to an 11-square kilometer culture system. Lobsters, lagoon and reef fish are exported weekly to Hawaii and the Republic of Nauru.

NOTE

For the experienced scuba diver, the corals and fish life are spectacular. Christmas Island has a large population of Grey Reef Sharks, and the reefs are full of totally unexploited fauna; Turtles and Giant Wrasse, Triggerfish and large Snappers abound.



Christmas Island is a Nature Reserve with many bird sanctuaries. Resident Wardens of the Kiribati Wildlife Unit will assist visitors in viewing the bird colonies.

There is also a full-time Tour Liaison Officer who can arrange such special activities as journeys by traditional sailing canoe, picnics and expeditions to distant parts of the island.

Boats are available for lagoon fishing for large Trevally and Bone fish or you can try trolling for big game fish in the ocean. Yellowfin tuna, Kingfish (Ono), Sailfish and Marlin are among those to be caught locally.

AECOS
46-132 Kahuhipa Street
Kaneohe, Hawaii 96744

8/28/77

George -

Here are some pictures of Turtle spawning tracks on Christmas Island. I've had them lying around for about two years. I gave them ~~to~~ to Lois who forgot to deliver them to you. Finally, I decided to mail them or else you'll never get them.

Tiata,

Dave

Crear
% ECI
46-132 Kahuhipa St
Kaneohe 96744

Talked to Dr. Martin Vitousek HIG
on 11-14-79 948-7668
Pop. - 2500
He goes to Fanning Is - every 6 wks
will stay for 3 weeks this next time and
fly over to Palmyra.
- He has never been to Flint or Caroline
- Goes to Malden alot now - never
seen evidence of turtles
- Report that many tracks have been seen
all around Vostok Pisonia - Gilbert crew
went ashore to get turtles -
At Palmyra - turtles are frequently seen
in "green (deep) hole" between East Reef
and Barren Islands - no reports of
nesting, but stated that maybe they nest in
inaccessible areas.

At Fanning - turtles are not abundant, but
one is always seen when boat is
taken across lagoon.
Some nesting takes place.
Gilbertese like turtles - like both
sexes (?)

- LINE ISLANDS -

from Weins -

Turtles were said to abound on Fanning Atoll half a century ago (Burnett 1910 p21).

Tresilian (1838 p245) told of numerous green turtles 50-300 lbs in weight at Christmas Atoll.

[Burnett, F. 1910. p21 Through tropic seas. London

[Tresilian, F. 1838 p245. Remarks on Christmas Island. Hawaiian Spectator, I.

from David Crear - Christmas Is.
Visited there frequently 4 years ago for Artemis project. Frequently saw tracks on beach, but no numbers less tangible given. Confirmed Gilbertese tradition of not being allowed to take turtles off the beach.
Estimates that ~ 100 people are there now. (over)

He saw only one turtle taken - left on it back for 5 days before being eaten.
See page 108 Gray Book daily log.

Notes on the Central and Southern Line Islands

These consist of [illegible] Vostock, Malden and Starbuck, and are administered directly by the High Commissioner for the Western Pacific [illegible] Article 3 of the Pacific Order in Council, 1893, and more recently in accordance with instructions from the Secretary of State in 1937, under Article 4 of the Order in Council.

MALDEN ISLAND was discovered by Lord Byron, Captain of H.M.S. 'Blonde' in 1825, after conveying the remains of the King and Queen of the Sandwich Islands back to Honolulu from England. It was named Malden Island after his surveying officer. At the time of its discovery about forty stone archaeological ruins were found on the island and it was established by Emory in 1924 that the pre-European population of the island (traditionally from Manihiki) was probably between one and two hundred. The guano deposits on Malden were licensed to and worked by British subjects from 1864 to 1927. It now remains unoccupied.

STARBUCK ISLAND was discovered in 1823 by Captain Starbuck of the Whaler 'L'Aigle', owned by a London company, while carrying the King of the Sandwich Islands to England. It was first worked for guano by a British company during the 1860's. Attempts to plant coconuts on the island failed and since 1920 it has been unoccupied and unworked.

CAROLINE ISLAND was discovered in 1795 by Captain W. R. Broughton of H.M. Sloop 'Providence', and it has been worked by various British companies since 1846. Although apparently uninhabited when sighted by Captain Broughton, there was evidence of habitation by Polynesians in the past and coconuts were already growing on the island, which is more fertile than the others here referred to.

VOSTOCK ISLAND was discovered by Captain Von Bellinghausen, the Russian explorer, during his expedition to the South Pacific and Antarctic in 1820 [illegible] his ship H.I.R.M.S. 'Vostock'. It has been worked [illegible] sporadically by British companies for guano [illegible] 1873. It now remains unoccupied and unworked.

FLINT ISLAND was discovered in 1801 by [illegible] to claim the honour of its discovery. Since 1857 it has been worked for guano [illegible] British companies [illegible]

Tresilian, F. (1838) Hawaiian Spectator I

ise to the westward in a small cutter, had well
; and he considered it highly dangerous.
so on this side, runs to an amazing height, par-
g the spring tides; and like that at Guam reach-
t of twenty feet, being as it were, continually
power, by the long heavy swell from seaward.
icularly remarked that during the whole time of
there had never been any surf on the south
and, while on the north or weather side, it was
once or twice in a fortnight that we dared at-
ng a boat, and even then ran a risk of being
hen coming in again. It was generally obs
had been no one instance of the surf having been
n the north side, as it was during the first three
e ship struck on the reef. I think the heavy
part of the island are attributable to the strong
to the northward setting the swell down on
. The general winds prevalent there are east-
rom east to E. N. E. and E. S. E.
and Hills, the highest part of the island, an ex-
ct is to be obtained; the southern shore is very
, as also the western group of cocoanut trees,
th the lagoons, which are both numerous and
is to be observed here the lagoons rise and
de, showing the sandy and perous nature of the
firm opinion that fiesh water is not by any
be obtained, even by digging in the neighbor-
ocoanut trees, as they only seem to thrive dur-
season.
r of the island is interspersed with extensive
d and muriate of soda (common table salt.)
mall lagoons from having been subjected to in-
ve become reduced to a state of crystallization
n their intricacy and apparently interminable
hly dangerous to the explorer; — for should he
enough to miss the proper tracks, there is
believe life would be jeoparded.
light are so powerfully reflected from the sand
e of Arabia, and the heat so truly oppressive

(being nearly situated upon the line) aided too by the most intense thirst, for there is no possibility of procuring water, otherwise, than by each man carrying a sufficient supply for his individual wants; that an excursion under such circumstances and in such a latitude, would be not only any thing but desirable, but really hazardous to a stranger.

Since Cook discovered this island, there have sprung up four large groups of cocoanut trees, one of which alone by a moderate computation may amount to about seven hundred: — they are situated almost on the banks of the great western lagoon, but are not very productive till the rainy season sets in, which is in March and April, when they yield abundantly.

About the centre of the island there is a remarkable plain of coral rock extending for at least a mile perfectly level and resembling Mosaic Pavement, — underneath a strata of black porous earth.

At the foot of the great western lagoon is a group of cocoanut trees, sufficiently handy to the beach for a ship to procure a sufficient quantity of cocoanuts in one day: — and it appears a number of ships have been there for that purpose as many of the trees were cut down, with a variety of English and American ship's names marked upon them, but none dated later than 1834.

The innumerable quantity of fish of various kinds which inhabit this lagoon and the environs of the island is quite astonishing; many of them sufficiently large for the harpoon. It is also much infested by sharks.

Turtle may be said to be numerous; they are of the green kind; weighing one with another from fifty to perhaps near three hundred weight, and probably as good as any in the world. While on the island we frequently caught fish with hook and line as much as we could consume. They consisted principally of cavallies of different sizes — mullet — large and small snappers, with two sorts of rock or parrot beaked fish; one with numerous spots of blue or green, and the other with whitish streaks scattered about. Eels and water snakes of a large size are also abundant, with craw fish and a species of cockle much larger than any I had hitherto seen. Oysters are likewise to be obtained. Shrimps

...ntered outside the caldera, to a ...ction resumed by the Administration ...the erection of a native hospital, and ... which there was considerable ...ble with the native owners, who re... to countenance the resumption, ... to this day claim the deal did not ...through.

...first, it was intended to erect native-...rial houses for the police barracks ...European officers; but, owing to the ...ght conditions, no kunai (native ... was obtainable, so it was found ...sary for the police-boys to dismantle ...ings at Rapindik and utilise the ...for the police barracks.

...DITIONS at the new capital must ...of necessity, for some time to come, ...be of a primitive nature. It is ac...ed that the temporary buildings to ...officials in the immediate future ...be erected on the flat near the ...at Lae, and that the town proper, ...an elaborate town-planning design, ...not be erected on the terraces, be... until after the war, when funds ...erected to be made available.

...ch depends upon the available sup... of building materials, of which, ...ently, there is a great shortage.

...Meanwhile, to make everyone feel ...h the volcano is quiet, there is no ... there has been some rain out of ...north-west and the trees and grass ...sprouting green again.

...**George Moore**, manager of BP's ...ch at Port Moresby, returned recently ...a few months' visit to Australia. ... Moore will return early in the New ...

...**Lee. Clout**, of the Public Works ...rtment at Salamaua, New Guinea, ...ly arrived in Sydney by airliner. ...nds to undergo a course of medi...ie in Australia.

RABBITS ON THE EQUATOR

Strange Colony at Phoenix Is.

THIS interesting nature note from the Pacific was given to me by Mr. N. H. Bevington (now an AO in the Gilbert Islands), who, with a number of other officials, was ashore on Phoenix Island (Central Pacific) three or four years ago.

Some time in last century, someone released rabbits on uninhabited Phoenix Island; and, although it is a waterless, tree-less, flat coralline island, the animals settled in, lived on the rough herbage, and multiplied.

Mr. Bevington says that they are there in large numbers. They are well-grown, in good condition, and they may be had in almost any hue—intensive inbreeding has produced a wide range of colours. They do not run away from men as fast as the average wild rabbit, probably because they are not accustomed to men; and, if they can be headed off from their burrows—which they share with the numerous seabirds—they can be caught by hand. The young men of Mr. Bevington's party ran down a satisfactory supply of fresh meat.

Mr. Bevington took 32 of the captives to Beru, in the Southern Gilberts, where he was AO for a time, and released them there, in the hope that they would start a colony and provide a supply of meat. But, although the rabbits fed eagerly upon coconuts, they did not prosper. Mr. Bevington said that when he was last in Beru, in January, 1941, there were only two or three left.

—R. W. R.

Mr. A. Olsen, planter, of Guadalcanal, Solomon Islands, arrived in Sydney recently to join the AIF.

RADIO COMMUNICATION[S] IN THE PACIFIC

PARALLEL with the development ... Pacific Territories has been the growth of the radio communication... the Islands. To-day, after little ... decade of pioneering work, Amalgam... lees (A/sia), Ltd., has linked ... major group in the South Seas and ... minor islands.

The difficult work of maintaining ... the outside world in war-time is ... unsung stories of the Pacific and ... account of what is being done cannot, ... be told at this stage.

Addressing the 33rd annual general ... in Sydney on November 17, AWA's ... of directors, Sir Ernest Fisk (wireless ... Australasia), told shareholders that ... profit had been £133,000, with a £[illegible] ... in revenue. Dividend was the usual ... He emphasised that the Co. had placed ... production resources at the service ... Commonwealth Government and that ... cent. of its output—radios, valves (... munitions of war) and other highly-... equipment—is for defence purposes.

Mrs. Colin Marr arrived in ... from Rabaul by the November ... She will reside in Australia ... husband, **Lieut. C. G. Marr**, ... inspector and instructor in the ... partment of Agriculture, is ... the AIF.

10°06'S, 152°23'W

TURTLES - P3

ATOLL RESEARCH BULLETIN

No. 144

THE VASCULAR FLORA AND TERRESTRIAL VERTEBRATES OF VOSTOK ISLAND, SOUTH-CENTRAL PACIFIC

by Roger B. Clapp and Fred C. Sibley

Issued by

THE SMITHSONIAN INSTITUTION

Washington, D. C., U. S. A.

February 16, 1971

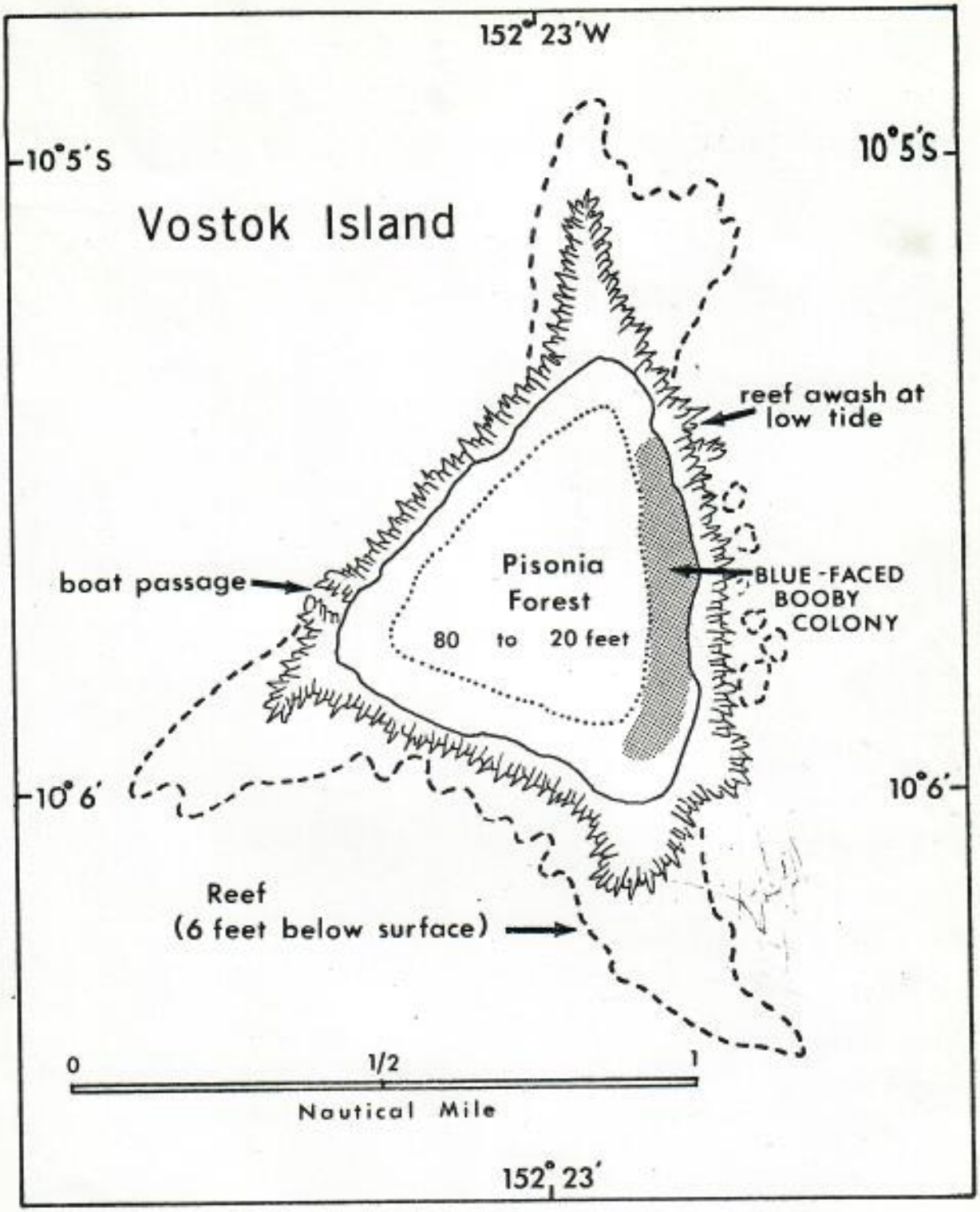


Figure 1. Map of Vostok Island (modified from Bryan, 1942).

THE VASCULAR FLORA AND TERRESTRIAL VERTEBRATES OF VOSTOK ISLAND, SOUTH-CENTRAL PACIFIC [1]

by Roger B. Clapp[2] and Fred C. Sibley[3]

In 1965 Vostok Island was visited briefly by Sibley and five members of the Pacific Ocean Biological Survey Program (POBSP) of the Smithsonian Institution. Observations were made from 0900 15 June through 1300 16 June and collections were made of vascular plants, fish, reptiles, birds, mammals, and avian ectoparasites. A small number of seabirds was banded.

Previous information on the biota of Vostok is remarkably scant, limited largely to a few semi-popular accounts (e.g., Bryan, 1942) and a short note on vegetation (Fosberg, 1937). No professional biologists had landed on the island and almost nothing was known of the avifauna, nor were the specific identities of the mammal and reptiles occurring there known.

This paper fills some of the gaps in our knowledge of the biota of Vostok, reports recent observations of the vascular flora, and provides a summary of earlier information.

DESCRIPTION

Vostok is a small, triangular coral island in the southern Line Islands, located at 10°06'S and 152°23'W (Figure 1). It lies 86 miles north-northwest of Flint Island and 125 miles west of Caroline Island. It is about 60 acres (Maude, 1953), or 0.24 square kilometers, in area, and the land surface is no more than 3 to 4.6 meters above sea level.

1/ Paper No.60; Pacific Ocean Biological Survey Program, Smithsonian Institution, Washington, D. C.

2/ Pacific Ocean Biological Survey Program, Smithsonian Institution.

3/ Point Reyes Bird Observatory, Bolinas, California.

The south and west beaches extend to a maximum width of about 45 meters and rise abruptly to a crest that coincides with the edge of the forest that occupies most of the interior of the island. At high tide waves reach the top of the west beach. Recently deposited sand at the top of this beach, and eroded soil at the forest edge, indicate that storm waves occasionally deposit salt water in the interior. The east beach ranges in width from 23 to 30 meters. Above it is a flat area of coral sand and beach rubble that is as much as 90 meters wide at the southeast point.

VEGETATION

Fosberg (1937) reported that the flora of Vostok consisted of but two plants, Boerhavia repens L. (as B. diffusa) and Pisonia grandis R. Br. on the basis of observations and collections made by Captain W. J. Anderson in 1935. These were also the only two vascular plants seen and collected by the POBSP in 1965. Specimens:

Boerhavia repens L.
Anderson s.n. (BISH, US); C. R. Long 3191, 3202, 3203, 3204, 3208 (all Univ. Hawaii).

Pisonia grandis R. Br.
Anderson s.n. (BISH, US); Long 3192 (Univ. Hawaii).

The central portion of the island is occupied by a triangular stand of Pisonia forest that has been wind-sheared by easterly winds (Figure 2). Moving westward from the eastern edge of the forest, the Pisonia becomes successively denser and taller, reaching a height of about 30 meters at the edge of the west beach. No seedlings were found, but sprouts from fallen trees and exposed roots were numerous. No fruits were found.

A few Boerhavia plants were found on the sandy edges of the clearings but the most vigorous growth was found in a stand running from the north to the southeast point. This stand varied from about 3 to 20 meters in width.

On the floor of the forest is a thick humus (to 35 cm) composed of decayed leaves and wood. Crusts of a blue-green alga were found on the humus, rotting tree trunks, and rocks. Occasional clearings within the forest are also covered with a thick humus that overlies a phosphatic hardpan.

NON-AVIAN VERTEBRATE FAUNA

The only reptile found on the island by the POBSP was the Azure-tailed Skink (Emoia cyanura) of which three specimens (USNM 158350-158352) were collected. These skinks were common and appeared to be most abundant on the forest floor. This species had not been previously recorded from Vostok, although Bryan (1942) reported that "lizards" occurred there. No geckos were seen, but no search was made for them after dark when they would have been most readily found. Several turtles, presumably the Green Turtle (Chelonia mydas), were seen swimming offshore but no nests or signs of their activity were found on the island.

Rats have been known to occur on Vostok since 1935 when they were seen (but not identified to species) by Anderson (undated). Twelve specimens (USNM 361438, 441-449) (two specimens were apparently lost in transit) collected by the POBSP proved to be Polynesian Rats (Rattus exulans). On a geographic and mensural basis (Table 1) these rats appear to belong to the race R.e. exulans, widespread in the Polynesian area. They were abundant throughout the forest but were apparently most numerous in areas where the large Pisonia were interspersed with shorter trees, and under Black Noddy colonies.

Rats were seen feeding on stems and leaves of Pisonia and Boerhavia and one was seen feeding on the carcass of a Black Noddy. A coconut crab (Birgus latro) was seen feeding on a dead rat.

AVIFAUNA

Prior to the POBSP survey only two species of birds were found from Vostok. On 22 October 1884 J.R.H. MacFarlane visited Vostok from the H.M.S. Constance and "obtained two specimens of the small Black-cheeked Noddy, Anous melanogenys [= Black Noddy, Anous tenuirostris], and some of their eggs" (MacFarlane, 1887). W. J. Anderson (ms.) noted that "white love birds" [= White Tern, Gygis alba] were present when he visited the island from the motor sampan Islander in 1935.

In the following annotated list of POBSP observations and collections of Vostok birds, the figures in parentheses are an estimate of the total flying population, i.e., breeding and nonbreeding adults, subadults and immatures. All specimens were collected on 15 June 1965 except the Golden Plover which was collected the following day.

Annotated list of birds

BLUE-FACED BOOBY (475 ± 50) — Sula dactylatra

Blue-faced Boobies nested solely on the coral rubble on the east side of the island. Nests were scattered uniformly over the area. A

Table 1. Measurements (mm) and weights (g) of specimens of Rattus exulans

Museum No.	Sex	Head and Body	Tail	Hind Foot	Ear	Weight
USNM 361442	♂	105	155	29	18	47
361445	♂	125	148	28	18	51
361446	♂	150	165	30	19	88
361447	♂	130	160	27	18	62
371448	♂	147	165	29	19	82
*	♂	138	162	29	19	82
361438	♀	128	155	26	17	47
361441	♀	132	163	29	17	70
361443	♀	118		27	18	65
361444	♀	140	160	29	18	65
361449	♀	110	143	26	17	30
*	♀	113	140	27	18	38

* Data from measurements of specimen evidently lost in transit.

complete count of nests revealed: 78 with 2 eggs, 19 with 1 egg, 5 with small young, and 9 with large young. The number nesting in mid-June 1965 was 111 pairs. The total number of breeding pairs for 1965 was undoubtedly larger, since many prenesting pairs were seen standing about. This observation and the data obtained by the nest count suggest that the primary period of egg laying is May through June or possibly July. In addition to the above birds, a small number of immatures were seen that were apparently no longer dependent on their parents for food. Presumably these were young that fledged late in the preceding breeding season. A roosting club of about 75 boobies was found at the south end of the nesting area. Five of these birds had been banded on islands of the Phoenix and Line groups 11 to 19 months previously. POBSP personnel banded 317 adults, 7 immatures and 6 nestlings. Two recaptures of Vostok banded birds have been recorded subsequently from the Phoenix Islands (Table 2).
Specimens: 3♀♀, all three were collected from nests with two eggs. USNM 495693, ovary 20x8 mm, largest ovum 13x5 mm, weight 1660 g; USNM 495694, ovary 35x10 mm, largest ovum 5 mm, weight 1373 g; USNM 495695, ovary 10x6 mm, largest ovum 2.5 mm, wt. 2020 g.

BROWN BOOBY (25 ± 5) Sula leucogaster

Seven nests were found, 4 with eggs, 1 with a small chick, and 2 with large chicks. This count was probably complete.

All nests were on the ground on the east side of the island near or under the forest canopy, and all but one were within one or two meters of its edge. The exception was 3.5 to 5 meters within the forest, but this nest adjoined a man-made lane.

Table 2. Movements of Blue-faced Boobies involving Vostok Island

Birds banded on other islands recaptured on Vostok 15-16 June 1965

Band Number	Where banded	When banded	Age when banded	Nautical miles traveled	Direction traveled	Recaptured as
737-21939	Jarvis I., Line Is.	14 Mar. 1964	Subadult	839	SE	Adult male* in roosting club
737-22604	Enderbury I., Phoenix Is.	17 Nov. 1963	"	1,172	ESE	Adult female in roosting club; had been banded in roosting club on Enderbury
737-48497	Jarvis I., Line Is.	14 Mar. 1964	Adult	1,172	"	Adult male in roosting club
757-66538	Birnie I., Phoenix Is.	8 Nov. 1964	Immature	1,186	"	Adult male* in roosting club
757-67888	Phoenix I., Phoenix Is.	12 July 1964	Adult	1,139	"	Adult female in roosting club
757-67904	" "	" "	"	"	"	Adult male; status undetermined

Birds banded on Vostok 15-16 June 1965 recaptured on other islands

Band Number	Age when banded	Where recaptured	When recaptured	Age when recaptured	Naut. miles traveled	Direction traveled	Remarks
587-82671	Immature	Phoenix I. in Phoenix Is.	10 Oct. 1966	Adult female	1,139	WNW	Captured in roosting club
757-89930	Adult	Enderbury I. in Phoenix Is.	14 Feb. 1966	Adult	1,172	"	Evidently not breeding

* These birds were sexed by voice at a period in the development of the Blue-faced Booby when differences in voice are not a reliable method of differentiating the sexes (POBSP unpub. data).

One immature and several nonbreeding adults were also seen. An adult, the immature, and the two large chicks were banded.
Specimen: ♂, USNM 495690, testes 14x5 mm, wt. 1065 g.

RED-FOOTED BOOBY (3,000 ± 1,000) — *Sula sula*

An estimated 1,000 nests were found in *Pisonia* trees throughout the forest. Nests ranged from *ca* 4.5 meters above the floor in the small trees on the east side of the forest to *ca* 27 meters in the taller trees further to the west. Members of the field party climbed to some of the lower nests and found eggs and young. From the ground young were seen in some of the higher, inaccessible nests.
Specimens: ♂, 2 ♀♀ . USNM 495103, ♂, testes 15x6 mm, wt. 803 g; USNM 495104, ♀, ovary 16x8 mm, largest ovum 3 mm, wt. 873 g; USNM 495701, ♀, ovary 18x10 mm, largest ovum 4 mm, wt. 766 g.

GREAT FRIGATEBIRD (4,500 ± 1,500) — *Fregata minor*

An estimated 1,500 nests, most of them at heights of 9 to 27 meters, were widely distributed in the trees. POBSP observations, though limited because of the inaccessibility of most nests, indicate that these Frigatebirds were in the early stages of their breeding cycle. Many males with expanded throat pouches and several birds gathering *Boerhavia* stems and *Pisonia* twigs for nesting material were seen. The few nests that were examined contained eggs. It is possible that very small young may have been present, but none could be seen from the ground.
Specimens: 2 ♂♂, 1 ♀. USNM 495089, ♂, testes 24x13 mm, wt. 990 g; USNM 495091, ♂, testes 13 mm, wt. 757 g; USNM 495090, ♀, largest ovum 30 mm, wt. 1358 g.

LESSER FRIGATEBIRD (500 ± 125) — *Fregata ariel*

Lesser Frigatebirds were seen sitting on nests in one compact colony in the tops of a few trees in the east-central part of the forest. An estimated 100 nests were present but their contents were not checked. Since no young could be seen from the ground and since displaying males were not recorded, the nests presumably contained eggs, small young, or both.
Specimens: 2 ♂♂. USNM 495082, testes 25 mm, wt. 800 g; USNM 495706, rt. testis 11x4 mm, wt. 614 g.

GOLDEN PLOVER — *Pluvialis dominica*

A flock of nine plovers was seen on 16 June on the sand at the southwest corner of the island. One was collected.
Specimen: USNM 495721, ♂, testes 2x4 mm, wt. 126 g.

BRISTLE-THIGHED CURLEW — *Numenius tahitiensis*

Four Bristle-thighed Curlews, one of which was collected, were seen foraging along the beach on 15 June. A single bird, probably one of the above, was seen the following day.
Specimen: USNM 495733, ♂, testes 7x1 mm, wt. 360 g.

WANDERING TATTLER — *Heteroscelus incanum*

A single bird was noted along the beach on 16 June. The flock of 19 unidentified shorebirds seen the previous day may have been of this species.

SOOTY TERN (40-50) — *Sterna fuscata*

During the two-day survey 40 to 50 Sooty Terns were flying low over the island in groups of 3 to 5 individuals. None were seen in the typical prebreeding swirls, and no evidence of previous attempts at nesting was found. Probably these terns were wandering individuals from nearby colonies, such as those on Caroline Atoll and Malden Island.
Specimens: 2 ♂♂, 1 ♀. USNM 495477, ♂, left testis 8x3 mm, wt. 159 g; USNM 495478, ♂, left testis 5x3 mm, wt. 183 g; USNM 495476, ♀, ovary 12x7 mm, largest ovum 4x4 mm, wt. 203 g.

BROWN NODDY (500 ± 100) — *Anous stolidus*

On the east side of the island about 50 Brown Noddy nests were found in dense, shrubby *Pisonia*, at a height of 1.5 to 3 meters. Nests contained both eggs and young. Relatively few birds were seen by day, but numbers increased considerably at dusk when foraging birds returned from the ocean.
Specimen: USNM 495561, ♀, ovary 12x8 mm, largest ovum 2 mm, wt. 172 g.

BLACK NODDY (3,000 ± 1,000) — *Anous tenuirostris*

Black Noddies nested in colonies throughout the forest at heights of 9 to 12 meters. An estimated 1,000 nests were present, containing eggs or young.
Specimens: 4 ♂♂, USNM 495580, testes 9x6 mm, wt. 98 g; USNM 495581, testes 6x3 mm, wt. 102 g; USNM 495582, testes 10x5 mm, wt. 100 g; USNM 495583, left testis 10x8 mm, wt. 106 g.

WHITE TERN (1,250 ± 750) — *Gygis alba*

Although common throughout the forest, only a few White Terns were found nesting. Only eggs were found, all in trees; young birds may have been overlooked

One adult was banded.

Specimens: 2 ♂♂, 3 ♀♀. USNM 495604, ♂, rt testis 5x3 mm, wt. 118 g; USNM 495606, ♂, left testis 5x3 mm, wt. 108 g; USNM 495603, ♀, ovary 13x5 mm, wt. 110 g; USNM 495605, ♀, ovary 10x8 mm, largest ovum 4 mm, wt. 105 g; USNM 495607, ♀, ovary 7 mm, ova granular, wt. 105 g.

SUMMARY

During a visit to Vostok Island in June 1965 a POBSP field party found two species of vascular plants (Pisonia grandis, Boerhavia repens), one lizard (Emoia cyanura), one mammal (Rattus exulans), and twelve species of birds including nine central Pacific seabirds and three shorebirds.

Eight of the seabirds were breeding (Blue-faced, Brown, and Red-footed Boobies; Great and Lesser Frigatebirds; Brown and Black Noddies; and White Tern) while the remaining species (Sooty Tern) apparently was a visitor. The three shorebirds (Golden Plover, Bristle-thighed Curlew, Wandering Tattler) are migrants to the islands of the central Pacific.

The specific identities of the lizard and mammal are reported for the first time. Of the birds, only the Black Noddy has been reported previously.

ACKNOWLEDGEMENTS

Robert R. Fleet, Lawrence N. Huber, Charles R. Long, Dennis L. Stadel, and Robert S. Standen were members of the POBSP field party that surveyed Vostok. We are particularly indebted to Long who made detailed notes of the vegetation which we have used freely in this account. E. H. Bryan, Jr. was helpful in obtaining a manuscript dealing with Anderson's earlier visit to Vostok. We also thank the late Doris M. Cochran who identified the lizards, Ralph D. Kirkpatrick who commented on the mammal specimens, and A. Binion Amerson, Jr., Patrick J. Gould, Richard L. Zusi, and George E. Watson who read the manuscript and offered many helpful suggestions.

LITERATURE CITED

Anderson, W. G. (Undated). My introduction to Vostok Island (5 page typescript ms. in the possession of Mrs. W. G. Anderson, Honolulu).

Bryan, E. H., Jr. 1942. American Polynesia and the Hawaiian Chain. Honolulu: Tongg Publ. Co., 253 p.

Fosberg, F. R. 1937. Vegetation of Vostok Island, Central Pacific. Bernice P. Bishop Mus., Spec. Publ. 30:19.

MacFarlane, J. R. H. 1887. Notes on birds in the western Pacific, made in H.M.S. Constance, 1883-5. Ibis, Series 5, 5:201-215.

Maude, H. E. 1953. The British Central Pacific Islands: a report on land classification and utilization. Proc. 7th. Pac. Sci. Congr. 60:89-97.

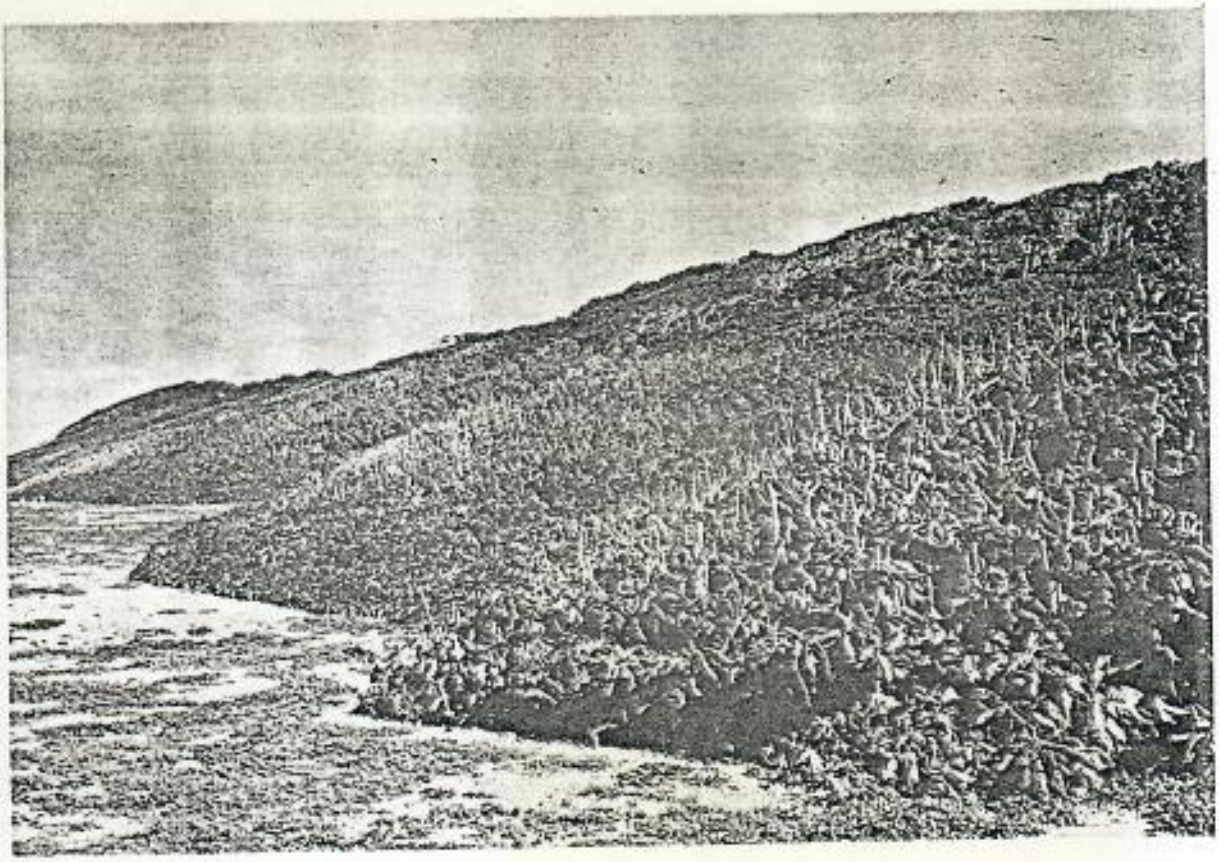


Figure 2. Wind-sheared eastern edge of Pisonia forest, viewed from northeast, Boerhavia repens in left foreground (photo by C. R. Long, June 1965).

Figure 3. East side of island, viewed from north, showing Boerhavia repens covering coral gravel flat in foreground, blue-faced booby nesting colony in distance (photo by C. R. Long, June 1965).

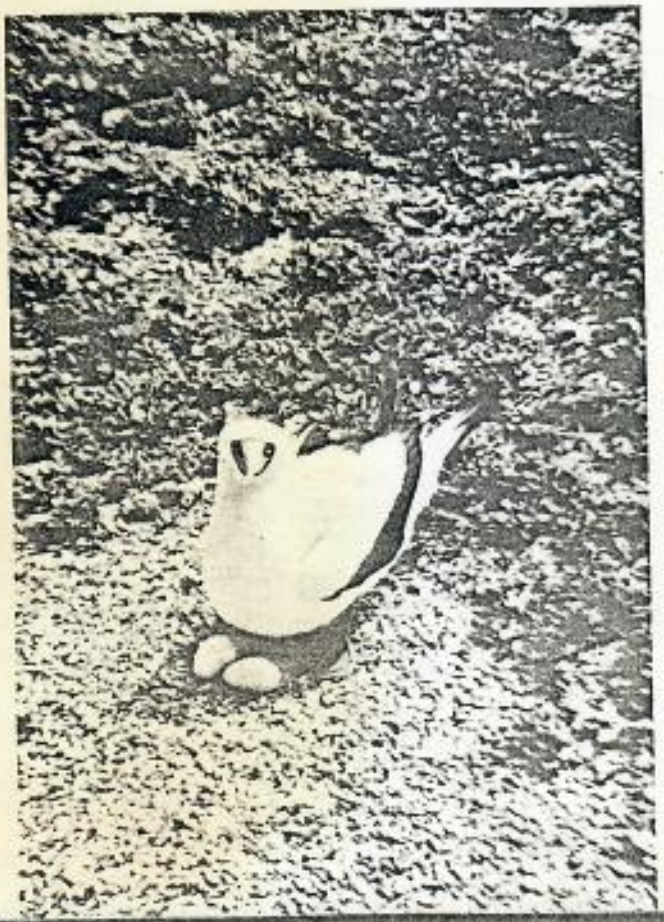


Figure 4. Blue-faced booby with eggs, on coral gravel with Boerhavia repens (photo by R. S. Standen, June 1965).

She *must* arise and do. And she is not required to do any thing more than she has already promised to do. The Savior asks nothing more now than when he lived on earth. The conditions of discipleship are ever the same and they never will be any less — the terms of salvation are *obedience*, or destruction with his enemies.

And let it be kept in mind that all unhallowed coalitions with the world — all benevolent operations based upon mere popular opinion — all consulting of expediency in opposition to the command of God — the deference paid to the opinion of those who have no part or lot in the matter; though it may serve for a season, will eventually prove most disastrous to the cause of Christ. He needs no such assistants, he never employed them while on earth, and left no directions about employing them. And history shows, that wherever they have been employed, instead of being of real help, they have created more work for the real disciples to do.

Moreover, it must be expected by those who are enterprising as Christians in the bible sense of the term and come up to the bible standard, that they will receive no quarter from the world, and they must lay themselves out for it. They will be termed bigoted, rigid, enthusiastic, &c. not to mention harder names. The world will hate them. So the Savior said. The world will hate them, for like the Prophet Micaiah they cannot speak well of it. They must be unyielding in respect to sin for they have an unyielding Lord to obey — they must be unyielding in morals for they have a holy book to follow. They have an inflexible judge to appease. They have a work to do which must be done or their souls will be lost. They have a religion to direct them which allows no sin and allows nothing to take the place of God in their affections. It cannot reasonably be expected, that when men do the work of the Savior as faithfully as he did it, they will be treated essentially better. Indeed he has said as much. Let no one therefore go blindly to work, nor be disappointed if he receive not the applause of the world. We all know how the Savior and his apostles were treated, and it is enough "for the disciple that he be as his master."

Let the reader consider in himself what he will do. Whether he will engage in the appropriate work of a Christian and be faithful even unto the end, the Lord helping him, and then receive the Christian's reward; or whether he will labor for himself, seek his own, and run the hazard of being found an unfaithful servant.

ART. II. — [Our last number contained a brief sketch of Christmas Island, furnished by Capt. Edmon, late of the English Whale-Ship Briton, accompanied with a chart of the island. The following communication presents much additional information, and we are happy to give it a place on our pages.]

Remarks on Christmas Island; Read before the Sandwich Island Institute, April, 1838.

By F. H. Tresilian, M. D. Honolulu; late surgeon of the English Whale-Ship Briton.

Gentlemen,

I have been induced to offer to your attention this evening a few brief remarks relative to Christmas Island.

An island so isolated in the great North Pacific, and so dangerous to navigators may perhaps claim some little notice, on the score of humanity, if no other plea may be allowed to exist.

In order to afford a more correct idea of the nature, extent, situation, &c. of the island, I know not that I can do better, by way of preliminary, than give you a description of the state of it, as discovered by Cook sixty years since, and annex my own remarks relative to the island, when we last left it.

"On leaving one of the Society Islands the 8th of December 1777, steering to the northward, we crossed the line, and on the 24th, discovered land, bearing N. E. by E. Upon a nearer approach, it was found to be one of those low islands so common in this ocean; that is, a narrow bank of land, enclosing the sea within.

"The meeting with soundings was an inducement to anchor, with a view of procuring turtle, as the island seemed

a likely place to meet with them;—two boats were sent to search more accurately for a landing place, and at the same time, two others, to fish at a grapling near the shore;—these last returned with upwards of two hundred weight.

"Some of the people having been on shore all night were fortunate enough to turn between forty and fifty turtle on the sand.

"Not a drop of fresh water could be had, for there is none upon the whole island, nor was there a single cocoa nut tree in the neighborhood:—one of the people who had lost his way, in order to allay his thirst, had recourse to the singular expedient of killing turtle and drinking their blood!

"The soil of this island is light and black, evidently composed of decayed vegetables—the dung of birds and sand.—There are other places again where nothing but marine productions, such as broken coral—stones—and shells are to be seen; these are deposited in long narrow ridges, lying in a parallel direction with the sea coast, not unlike a ploughed field, and must have been thrown up by the waves: though at this time they did not reach within a mile of these places. This seems to furnish an incontestible proof that the island has been produced by accessions from the sea, and is in a state of increase:—for not only broken pieces of coral, but many of the shells are too heavy and large to have been brought up by birds from the beach to the places where they now lie."

Again—"not a drop of water was to be found, though frequently dug for.

"There were not the smallest traces of any human being having ever been here. And indeed, should any one be so unfortunate as to be accidentally driven upon the island or left there, it is hard to say that he could be able to prolong existence.

"There is indeed abundance of birds and fish, but no visible means of allaying thirst. Nor any vegetable that could supply the place of bread, or correct the bad effects of an animal diet, which in all probability would soon prove fatal alone.

"On the cocoanut trees upon the island, (the number of

which, did not exceed thirty) very little fruit was found,—and in general, what was found was either not fully grown or had the juice salt or brackish; so that a ship touching there must expect nothing but birds, fish and turtle, and of these, an abundant supply may be depended upon.

"The island is from fifteen to twenty leagues in circumference, and like most others in the Pacific Ocean is bounded by a reef of coral rocks which extend but a little way from the shore.

"Further out than the reef on the west side is a bank of fine sand extending a mile into the sea. On this bank is good anchorage in any depth between eighteen and thirty fathoms; in less than the first mentioned depth the reef would be too near for good holding ground;—and in more than the last, the edge of the bank would not be at a sufficient distance."

Now, gentlemen, having been a resident for nearly eight months on the island, the subsequent observations may be perhaps not altogether intrusive.

In the first place, the island is now very considerably augmented by fresh accessions from the sea; the line of coast more particularly under our observation, the North and N. E. sides, were evidently on the increase—the waves gradually receding, and by their wash continually altering the aspect of the shores.

The reefs bounding the island are frightful and highly dangerous to shipping, running out in long narrow patches, menacing certain destruction to any body approaching their insidious vortex, (if I may be allowed the expression.) I do not recollect seeing any thing to equal them, not excepting the iron bound coast of the Ladrones—the Bonin Islands, which proved so destructive to the Amelia Wilson of London, from the rapidity of their whirling tides and peculiarly rugged coast, may perhaps be an exception.

In the large bay running N. N. W. $\frac{1}{2}$ W. forming the weather side of the island, the tides are sometimes so frightfully rapid round the N. E. point, as to occasion a perfect cauldron of a sea. Captain Benson, in rounding that point

while on a cruise to the westward in a small cutter, had well nigh swamped; and he considered it highly dangerous.

The surf also on this side, runs to an amazing height, particularly during the spring tides; and like that at Guam reaches to the height of twenty feet, being as it were, continually augmenting in power, by the long heavy swell from seaward.

I have particularly remarked that during the whole time of our residence, there had never been any surf on the south side of the island, while on the north or weather side, it was seldom above once or twice in a fortnight that we dared attempt launching a boat, and even then ran a risk of being turned over when coming in again. It was generally observed also that there had been no one instance of the surf having been so moderate on the north side, as it was during the first three days, after the ship struck on the reef. I think the heavy rollers on this part of the island are attributable to the strong N. E. winds to the northward setting the swell down on the north side. The general winds prevalent there are easterly varying from east to E. N. E. and E. S. E.

From the Sand Hills, the highest part of the island, an extensive prospect is to be obtained; the southern shore is very distinctly seen, as also the western group of cocoanut trees, intersected with the lagoons, which are both numerous and extensive. It is to be observed here the lagoons rise and fall with the tide, showing the sandy and perous nature of the soil. It is my firm opinion that fresh water is not by any possibility to be obtained, even by digging in the neighborhood of the cocoanut trees, as they only seem to thrive during the rainy season.

The interior of the island is interspersed with extensive plains of sand and muriate of soda (common table salt.) Some of the small lagoons from having been subjected to intense heat, have become reduced to a state of crystallization: the others from their intricacy and apparently interminable length, are highly dangerous to the explorer; — for should he be unfortunate enough to miss the proper tracks, there is every reason to believe life would be jeopardied.

The rays of light are so powerfully reflected from the sand plains, like those of Arabia, and the heat so truly oppressive

(being nearly situated upon the line) aided too by the most intense thirst, for there is no possibility of procuring water, otherwise, than by each man carrying a sufficient supply for his individual wants; that an excursion under such circumstances and in such a latitude, would be not only any thing but desirable, but really hazardous to a stranger.

Since Cook discovered this island, there have sprung up four large groups of cocoanut trees, one of which alone by a moderate computation may amount to about seven hundred: — they are situated almost on the banks of the great western lagoon, but are not very productive till the rainy season sets in, which is in March and April, when they yield abundantly.

About the centre of the island there is a remarkable plain of coral rock extending for at least a mile perfectly level and resembling Mosaic Pavement, — underneath a strata of black porous earth.

At the foot of the great western lagoon is a group of cocoanut trees, sufficiently handy to the beach for a ship to procure a sufficient quantity of cocoanuts in one day: — and it appears a number of ships have been there for that purpose as many of the trees were cut down, with a variety of English and American ship's names marked upon them, but none dated later than 1834.

The innumerable quantity of fish of various kinds which inhabit this lagoon and the environs of the island is quite astonishing; many of them sufficiently large for the harpoon. It is also much infested by sharks.

Turtle may be said to be numerous; they are of the green kind; weighing one with another from fifty to perhaps near three hundred weight, and probably as good as any in the world. While on the island we frequently caught fish with hook and line as much as we could consume. They consisted principally of cavallies of different sizes — mullet — large and small snappers, with two sorts of rock or parrot beaked fish; one with numerous spots of blue or green, and the other with whitish streaks scattered about. Eels and water snakes of a large size are also abundant, with crawfish and a species of cockle much larger than any I had hitherto seen. Oysters are likewise to be obtained. Shrimps

and barracouta of a superior sort are very numerous; the larger sorts of albacore are frequently to be met with at the edge of the reefs, but it is seldom that even hooks of the largest size will hold them; they require the harpoon.

The land or ground shark is seen also in some of the deeper fissures on the reefs; the bill or sword fish is occasionally to be met with — the conger eel is extremely numerous — lurking under large stones, shewing great resistance if molested; their bite is very keen.

With regard to beche de mer, three or four species are to be found — the black — the red, the white, &c. — not in such great quantities on the weather or N. E. side of the coast as on the southern boundary. But whether a sufficiency is to be obtained to warrant an expedition for that purpose, is a matter of doubt. I should think not; as there is a great quantity of low brushwood to be found principally near the beach, at least sufficient fuel might be obtained for a beche de mer trip. Shells — particularly the triton conch — tridachua squamosa or clam are very abundant — several species of the cyprea — volute — fan shells with some fine specimens of cone are to be met with.

I must now refer to my journal.

Making one in a party or a trip to the westward, and running down the south side of the island in a small cutter, we passed several low flat points of land, crossed some extensive bays, with occasionally a solitary cocoanut tree or two in the distance. At 4, P. M. made Taylor's large group and soon passed his signal flag; here we had some fresh squalls with a high running sea, till we reached the entrance of the lagoon, which we entered passing over several extensive shoals and sunken rocks. In consequence of the tide rapidly falling, we were obliged to bring to about a mile from the shore. It was now sunset, with a thick dense atmosphere, indicating heavy and long continued rains during the night, which rendered it necessary to remain on board the skiff, exposed to the raging elements — for though situated on the equator, the nights and mornings are extremely cold.

The prospect at sunrise was rather imposing; in front of us a large group of lofty cocoanuts towered along an extensive line of coast, bordering considerable plains of sand and interspersed with marine brush wood down to the foot of the lagoon, which extended far and wide — forming a large bay full of shoals and reefs; the entrance to which, is by two passages on each side of the small sand bank at the N. W. and S. E. points.

In our progress over a long continued sand bank, interspersed with small pools of salt water which we had to cross, we found the strand literally buried with sea eggs, of the most beautiful and variegated colors.

At the foot of the lagoon a few hundred yards from the beach lies a small pool of salt water, which rises and falls with the tide, much infested by land crabs and rats. The water, nevertheless, during heavy showers, from its shallowness, becomes brackish and is palatable enough to any one laboring under extreme thirst; indeed, after long continued rains it is sufficiently fresh to drink.

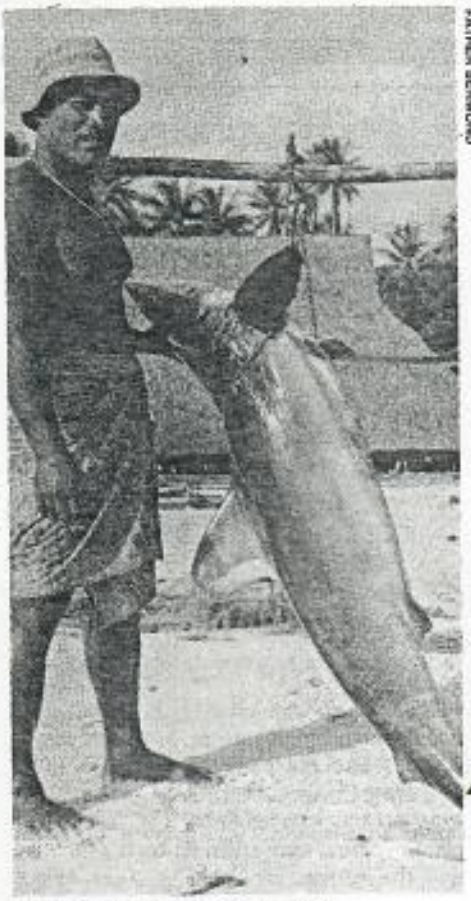
The site of this small lake is rather picturesque, being completely encircled by cocoanut trees, forming a kind of belt. The area is well sheltered by a great deal of marine shrubbery, growing luxuriently in every direction around it. Neither musketoes or land flies were observable, either at this point or elsewhere, during the rainy season, which is rather remarkable.

With regard to the birds inhabiting this island, there are many of them migratory — particularly the man-of-war hawk, and boatswain or tropic bird — several species of gull — with noddies, — mutton birds, much resembling a pigeon — and lark. During certain seasons of the year the eggs are so numerous as literally to cover acres.

Pacific Magazine
March/April 1987

Kiribati Fisherman Nets 12-Foot Shark

A monster shark, 12-foot long that must have weighed three to four times more than a local canoe, was landed by fisherman, Rabaere Tenanorake of Koina village, Abaiang Island in Kiribati, a week before the Christmas and New Year's celebrations. It took more than six hours for Rabaere and two other fishermen to kill the shark, a record considering the manner in which it was caught. Rabaere was on a fishing expedition at Koina lagoon at sunset. He had spread his net to catch bone fish. When it got dark, he inspected his net. Bone fish more than 10 inches long were caught at one end of the net. As he got nearer to the center, he realized that the other half of his net was missing. Rabaere knew that a large fish must have broken it. But the fisherman from Koina did not abandon his net that easily. With the half he had, he continued his fishing. He had to since his family were waiting for his catch. Fish is a daily food of an I-Kiribati family. Rabaere made up his mind that early the next morning he would start searching for the other half. So at break of day, he stood on his nine-foot canoe while making a thorough search. About a 100 yards away, he saw a float from the other half of his missing net.



FATHER BERNIDO

The biggest they ever saw

He paddled his canoe over to it and began to pull it aboard. After six to seven pulls he knew he had something very heavy.

■ **Clumsy:** It moved. A heavy, clumsy move. He pulled harder, and then he saw it. A great shark, the biggest he ever came across during his fishing days. It followed his pull. It was entangled in the broken net. A few yards away two canoes sailed toward him. These new fishermen of the day had seen Rabaere rushing about on his canoe. They sensed danger and raced toward him to give a hand. The trio pulled and pulled. But there was nothing they could do to get it aboard their canoes. It was too heavy. It would have broken their canoes or sunk them. So alternately they dragged it all the way to land.

■ **People:** The people of Koina, more than 200 of them, knew there was something unusual about the three craft. They recognized the canoes and knew that the fishermen would have a story to tell. When the shark was finally landed, most of them said, "Te kara ni bakoa," meaning the biggest shark they ever saw. When its stomach was cut open, there was a medium size turtle, four bone fish, a rock fish and four travilis. Each family at Koina village had a share of the shark meat, a delicacy for some. Those who salted their share had shark meat for the Christmas and New Year's.

Batiri Bataua

Dear Dr. Balazs,

It took me rather long to send you the stamps but two main reasons caused this. Your letter arrived here earlier this month - it probably got stranded on Tarawa for over a month. Since last March our air-link with Tarawa was stopped following the sale of our Boeing 727 and eventhough a link was maintained with Honolulu by a chartered Hawaiian Airlines every week, all overseas incoming mails have been sent first to Tarawa by a diffident way. It was until earlier in July that the first ship call from Tarawa after nearly four years finally brought mails almost for everybody on Christmas.

Secondly the postmaster here had been rather disorganised - when I first saw him about the stamps, he said he did not have it in his collection. Two days ago I went back to the post office and to my anger I noticed the very stamps you requested purchased by Japanese visitors and so I bought 6 straight away for you. I hope you would still like the

Wildlife Conservation Unit,
Christmas Island,
Kiribati
31 July, 1988

Dear Dr. Balazs,

It took me rather long to send you the stamps but two main reasons caused this. Your letter arrived here earlier this month - it probably got stranded on Tarawa for over a month. Since last March our air-link with Tarawa was stopped following the sale of our Boeing 727 and eventhough a link was maintained with Honolulu by a chartered Hawaiian Airlines every week, all overseas incoming mails have been sent first to Tarawa by a different

stamp and I enclose the 6 bought for your herewith. Should you like several more please write me and I'll send them.

Meanwhile I express gratitudes to you for sending me copies of two publications on turtles. They would be extremely useful and would greatly enhance our teaching.

My next report will go out in a week or so time. I'll send you a copy when it is ready.

Sincerely,

Katino Taebáki

Dr. G. H. Balazs
National Marine Fisheries Service
Honolulu Laboratory
P.O. Box 3830
Honolulu, Hawaii, 96812

PS Plse. excuse my haste

WWF WORLD WILDLIFE FUND

INTERNATIONAL UNION
FOR CONSERVATION OF NATURE
AND NATURAL RESOURCES

Telephone : 022/64 71 81
Telegrams : Panda, Gland
Telex : 28 183 wwf ch

Avenue du Mont-Blanc
1196 Gland, Switzerland

Telephone : 022/64 71 81
Telegrams : Iucnature, Gland
Telex : 22 618 iucn ch

Dr. G.H. Balazs
Deputy Chairman of IUCN/SSC
Turtle Specialist Group
Institute of Marine Biology
Box 1346 Coconut Island
Kaneone
Hawaii 96744
USA

Gland, 13 October 1982

Dear Dr. Balazs,

Please find attached copies of correspondence between us and Roger Perry on the question of Marine Turtle Farm on Caroline Atoll.

We would be grateful if you would kindly advise us as to whether the proposed Turtle Farm should be actively discouraged by IUCN.

Yours sincerely,

Anton K.C. Fernhout
WWF/IUCN Project Manager
ASIA, PACIFIC and OCEANIA

Encs.

cc - R. Scott

Roger Perry, Esq.,
The Chestnuts
Orford
SUFFOLK IP12 2NT

Gland, 24 September 1982

Dear Mr. Perry,

I refer to your letter of 16 September addressed to Dr. Chew Wee-Lek who is unfortunately no longer at our office.

I would be happy to take up your request with the IUCN/SSC Specialist Group with regard to a proposal to establish a turtle farm on Caroline Atoll. However, before doing so I would be grateful if you could supply me with more detailed information to be able to fully understand the issue and therefore be in a position to seek advice.

I look forward to hearing from you.

Yours sincerely,

Sue M. Howlett
WWF/IUCN Project Management
ASIA, PACIFIC and OCEANIA

08 OCT. 1982

ROGER PERRY

THE CHESTNUTS
ORFORD
SUFFOLK IP12 2NT

TEL. ORFORD 445

3 October 1982

Dear Miss Howlett,

Thank you for your letter of 24 September concerning the project to establish a marine turtle farm on Caroline Atoll, Line Islands, Republic of Kiribati.

I trust that you have seen, or will be able to see, the report of the Wildlife Conservation Unit on Christmas Island and to which I refer in my letter of 16 September. What is needed is a statement on the IUCN's attitude to, or judgement of, marine turtle farming. As you will doubtless know, a number of projects of this kind have been set up at various times in Latin America and in the Pacific. The reports and commentaries I have read about these all do little to erase my impression that they are little more than thinly disguised ploys to circumvent legislation and to exploit wild populations of turtles. In the case of Caroline, such a project has come forward, and in order for the conservation authority there (represented by Katino Teeb'aki) to present a sound counter-argument to the ministry concerned, who will either sanction or turn down the idea, it is necessary for them to have the latest authoritative views on the subject. That is the reason why I wrote. And I believe it necessary that we take the initiative in such a case, and without undue delay.

If you could let Mr. Katino Teeb'aki know directly this would be best; if not, please let one of us have the names of the present officers of the Marine Turtle Specialist Group so that the necessary advice can be sought.

Yours sincerely,

Roger Perry

Miss Sue M. Howlett,
WWF/IUCN Project Management,
Avenue du Mont-Blanc,
1196 Gland,
SWITZERLAND.

ROGER PERRY

THE CHESTNUTS
ORFORD
SUFFOLK IP12 2NT

TEL. ORFORD 445

16 September 1982

Dear Chew,

I enclose a copy of a letter from Katino Teeb'aki, Wildlife Warden for the Line and Phoenix Islands, Republic of Kiribati, in response to an earlier one from me (of 26 July, copy attached), about a proposal to establish a 'turtle farm' on Caroline Atoll. In his letter Katino requests further information on the whole question of turtle farming and the source I have obviously referred to is IUCN and the Marine Turtle Specialist Group. Could you very kindly take the matter on from here -- or is there anything further I can do? I think the letters themselves, together with the original Wildlife Unit report (a copy of which I am sure would have reached IUCN), will be self-explanatory.

On a rather different matter, I propose visiting the Juan Fernandez Islands at the end of this year. This will be a private visit but do you happen to know of anyone whom I might approach concerning current research on the islands and the status of wildlife protection there? Any help or suggestions would be very much appreciated.

With my kind regards,

Yours sincerely,

Dr. Chew Wee-Lek,
Programme Officer, Asia,
Australasia and Pacific,
I.U.C.N.,
1196 Gland,
SWITZERLAND.

GOVERNMENT OF THE GILBERT ISLANDS

TELEGRAMS: WILDLIFE CHRISTMAS
GILBERT ISLANDS

WILDLIFE CONSERVATION UNIT
CHRISTMAS ISLAND
GILBERT ISLANDS
CENTRAL PACIFIC

WF: 24

Dr. George H. Balazs
Hawaii Institute of Marine Biology
University of Hawaii
P.O. Box 1346
Hawaii 96744.

22nd February, 1983.

Dear Dr. Balazs,

I enclose a copy of the Unit's latest report for your interest and information particularly with regard to turtle farming. Till now, there has been no further progress on the project but I will keep in touch should any come up in the future.

Thanks for sending the SPC turtle evaluation report. Do you have any more of the turtle posters that you sent with your report? We are very keen to get some 4 or 5 of the posters for our teaching programme here. If you could get 5 for us we would be most grateful to have them.

With thanks

Yours sincerely

Katino Teb'aki

enc:

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

October 26, 1982

Dr. Anton K. C. Fernhout
WWF/IUCN Project Manager
Asia, Pacific and Oceania
Avenue du Mont-Blanc
1196 Gland
SWITZERLAND

Dear Dr. Fernhout:

Thank you very much for your letter of 13 October, along with important copied correspondence, which I have just now been able to read upon my return to Honolulu from Samoa. Yes, I certainly would advise that IUCN actively discourage any proposed commercial "turtle farm" at Caroline Atoll. At least until such a time that a full and detailed plan has been received, and that plan conclusively shows just how the various problems of biology and conservation inherent to such farming can be solved. I fully agree with the concerns and comments set forth in Mr. Roger Perry's letters. I recommend that we work with him in any way appropriate. It appears that he is very knowledgeable about this area of the Pacific, and is respected by officials of the Kiribati government.

In 1977 I served as an honorary consultant to the South Pacific Commission to review their experimental turtle farming project in Fiji and the Cook Islands. My report on this work may be useful to you, so under separate cover I am sending a copy by air mail. You may also want to refer to the report by Drs. Carr and Main evaluating the Torres Strait turtle farming project. This effort by the Australian government was terminated several years ago after investing a considerable amount of money without achieving much in the way of success. It was a terrible disappointment to the native people who were promised great things. I would hate to see the same thing happen in Kiribati.

Sincerely,

GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec
Encl.
cc: Archie Carr

GOVERNMENT OF THE GILBERT ISLANDS

TELEGRAMS: WILDLIFE CHRISTMAS
GILBERT ISLANDS

WILDLIFE CONSERVATION UNIT
CHRISTMAS ISLAND
GILBERT ISLANDS
CENTRAL PACIFIC

Mr. Roger Perry
The Chestnuts
Oxford
SUFFOLK IP12 2HT
United Kingdom.

Rec'd 9 Sept/82

12th August 1982

Dear Roger,

Very many thanks for your letter of 26th July 1982 and particularly for your comments about the development proposed on Caroline atoll by Capt. Omer Darr.

The points you make against the suggested 'turtle farm'(which is part of Omer Darr's development proposals on the island) are interesting and I agree that the scheme should be reviewed. I am not certain but I think at this stege, since Government has only given initial approval for the scheme and that there has not been any further progress over the issue, we could possibly do something wisely.

It is indeed a great help that you know Caroline from your visit as well as knowing Omer Darr personally. We will keep you informed about this issue but meanwhile we would be appreciative if you could enquire to the specialised group within IUCN on our behalf. It might be a help and on the other hand we do not know which address we should write to.

Martin has been away for two months now and he should be back on next week's flight. I will bring your letter to his attention when he arrive.

With best wishes

Yours sincerely -

Regards to Shirley and Mandy.

Copy to CEH

The Chestnuts,
Orford,
Suffolk IP12 2HT.

26 July 1982

Dear Katino,

Thank you for the latest (9th) Report of the Wildlife Conservation Unit, which I was both grateful and interested to receive. I take it this will have been distributed to all members of the Advisory Panel on Nature Conservation in the Line and Phoenix Islands.

The few points I make I address in rather general terms as it is difficult to comment at this distance. I hope anyway they will be useful.

1) The proposed development of Caroline (2i) has given me the most thought as I am very possibly the only person connected with Kiribati in recent years to have visited both Omer Darr and Caroline. It is a small atoll, and one of very great charm. I would urge that development proposals are reviewed critically by the government. Whilst I believe Captain Omer Darr to be a man of integrity, and I felt he had a deep feeling for the island and its wildlife, one has to be most wary of diffuse development plans coming from outside the country. The involvement of agencies in French Polynesia - if this is where such a development would be based or from where it would be promoted - is a particular point, for the French colonial administration has not a good record for concern in environmental matters. I am reluctant to believe, for instance, that a suggested 'turtle farm' would be anything in effect other than the disguised exploitation of turtles occurring naturally on the island - which is of course contrary to existing wildlife legislation in Kiribati. As you may know, there is a specialist group within IUCN which is concerned with marine turtle conservation, and I would urge that their advice is sought on the ethics and efficacy of turtle farming before any judgement is given in favour of such an operation on Caroline. If you would like me to make such an enquiry to IUCN on your behalf for this information, please let me know and I will do it.

over/..

2) I was saddened to learn of the disturbance to the sooty tern colony on Cook Islet following the visit of the cruise-ship MS Ivan Franko. Lessons will have been learnt; but remember that firmness in guiding is not out of place and that problems can often be prevented by adequate briefing beforehand. I am sure you could always seek the help of the police for extra personnel in exceptional cases like this. As regards the briefing, one possibility might be to have a written statement prepared (outlining the reserves, precautions needed and the reasons for them), ready to be delivered on board and read over a ship's broadcasting system before disembarkation occurs. This happens elsewhere on visits to island sanctuaries.

Finally, do let me compliment you on the significant progress of the Unit. The present school lessons being undertaken in conjunction with the South Pacific Regional Environmental Programme mark a substantial step forward and can only bring beneficial results. And I think the Order aimed at controlling cats living in the villages a wise and sensibly cautious measure at this time.

With very kind regards,

Yours sincerely,

ROGER PERRY

Mr. Katino Tee'baki,
Wildlife Conservation Unit,
Christmas Island,
Kiribati,
Central Pacific.

October 26, 1982

Mr. Roger Perry
The Chestnuts
Oxford
Suffolk 1P12 2NT
United Kingdom

Dear Mr. Perry:

IUCN/WWF recently sent me an inquiry asking for my views on a proposed turtle farm at Caroline Atoll. I am the current Deputy Chairman of the Marine Turtle Specialist Group. The Chairman is Dr. Archie Carr (Graduate Research Professor, Dept. Zoology, 223 Bartram Hall, Univ. Florida, Gainesville, Florida 32611). As you will note from the enclosed copied letter, I am not in favor of the commercial sea turtle farming. During the past 10 years, I have seen at least 5 proposals for such farming here in the Pacific islands. All of these failed in their understanding of the biological problems that would be involved. None faced up to the question of further stimulating international commerce which in turn would place greater exploitative pressures on wild sea turtles. I haven't seen the Caroline Atoll proposal, so it will be interesting for me to find out exactly what the promoters have in mind this time around. I can't help but recall the old CIMADA project that was planned for the Cook Islands.

If groups of Tahitians have been regularly visiting Flint, Vostok and Caroline to cut copra since at least 1967 (see enclosed PIM), I wonder just how many turtles are actually left there?

Please let me know how I can best help.

Sincerely,

GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec
Encls.
cc: Archie Carr

October 26, 1982

Mr. Martin Garnett
Wildlife Conservation Unit
Christmas Island
Gilbert Islands (Kiribati)

Dear Mr. Garnett:

I am writing to urgently ask if you can provide me with any detailed information on the subject of a "turtle farm" which I have recently heard is being proposed by Mr. Omar Darr for the development of Caroline (or Flint?) Atoll. As you may know, the advisability, and benefits, of farming sea turtles for commercial purposes have been subjects of great concern and debate by sea turtle conservationists. The IUCN/SSC Marine Turtle Specialists Group has always attempted to stay informed about any new ventures in this area. I currently serve as the Deputy Chairman of the Marine Turtle Group under the leadership of Chairman Dr. Archie Carr.

Back in 1977 I worked as an honorary consultant to the South Pacific Commission to evaluate a turtle farming experiment that had been funded as one of their development projects. A copy of my report covering this assignment is being sent to you by air mail under separate cover. Drs. Carr and Main previously carried out a similar evaluation of the ill-conceived turtle farming project that got started, and later collapsed, in Torres Strait. By copy of this letter, I am asking Dr. Carr to send you a copy of his report.

I hope to hear from you at your earliest convenience.

Best regards,

GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec
Encl.
cc: Archie Carr

ROGER PERRY

THE CHESTNUTS
ORFORD
SUFFOLK IP12 2NT

TEL. ORFORD 445

15 November 1982

Dear Dr. Balazs,

I have been grateful to receive your letter of 26th October concerning the proposed project to set up a turtle farming enterprise on Caroline in the Southern Line Islands. It is particularly valuable to have the benefit of your specialist advice and I am communicating the contents of your letter to Katino Teeb'aki, who is now in charge of the Wildlife Conservation Unit on Christmas Island. I am urging him to keep in close contact with both of us. Things take their time in Kiribati and I hope plans will not have been far advanced. You obviously feel, as I do, how much better it is to forestall these projects before they get underway and all the ancillary effects of disturbance take their toll. In fact, when I was on Caroline Atoll in November 1977 I was charmed by its beauty and pleased to see how little disturbed it had been. There were plenty of signs of turtles - but even more I would say at Flint, which I later visited.

I shall be away over the next two months and will review any further correspondence on this matter on my return. Thank you again meanwhile for your support and for the most valuable report that you so kindly sent me.

Yours sincerely,

Roger Perry

Dr. George H. Balazs,
Hawaii Institute of Marine Biology,
University of Hawaii at Manoa,
P.O. Box 1346,
Coconut Island,
Kaneohe, Hawaii 96744,
UNITED STATES OF AMERICA.

GOVERNMENT OF THE GILBERT ISLANDS

TELEGRAMS: WILDLIFE CHRISTMAS
GILBERT ISLANDS

WILDLIFE CONSERVATION UNIT
CHRISTMAS ISLAND
GILBERT ISLANDS
CENTRAL PACIFIC

22nd December, 1980.

Dr G.H.Balazs,
PO Box 1346,
Kaneohe,
HAWAII 96744.

Dear Dr Balazs,

Thank you for your letter of 30th November, which arrived on the last flight here.

I was interested to hear of the latest developments regarding Kaula Island, which I realise has been of great concern to conservationists in Hawaii for many years. I regret that I feel unable to comment in any detail about Dr Schreiber's visit to Christmas Island earlier this year. All I can say is that the Government of Kiribati refused Dr Schreiber's application for a permit to collect a sample of seabirds for scientific purposes.

On the question of sea turtles on Christmas Island, as far as I am aware, Captain Cook was the only early visitor to the island who commented on their abundance. Since its settlement in the latter half of last century, their have been no records of large numbers of turtles on or around the island. Green Turtles (Chelonia mydas) nest sporadically on isolated beaches, and turtles (probably mainly Green Turtles) are quite commonly seen around the reefs and in the lagoon. In my opinion it is unlikely that human predation and disturbance can have had much effect on the numbers of turtles found here. The occasional turtle is killed for food, but this is rare, and the pattern of human settlement on the island (which has over 100 miles of coastline) ensures very large stretches of completely undisturbed habitat. Sandy beaches suitable for beaching turtles are to be found mainly on the southern and western coasts, but the presence of wide, shallow bench reef platforms may inhibit landing on the island. Their are no beds of turtle-grass around the island (which drops off steeply offshore) or in the lagoon.

Quite large concentrations of Green Turtles are reported to nest on Flint Island in the southern Line Islands, but I have no detailed information on this. The island is uninhabited, being visited once every few years by teams of copra cutters from Tahiti.

I hope that this information is of some interest to you,

With best wishes to you in your work,

Martin Garnett

Martin Garnett

UNION INTERNATIONALE POUR LA CONSERVATION DE LA NATURE ET DE SES RESSOURCES
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

Avenue du Mont-Blanc
1196 Gland - Suisse/Switzerland

Télex/Telex: 22618 iucn ch
Tél./Tel. (022) 64 71 81

Télégrammes/Telegrams:
Iucnature, Gland

Référence/Reference:

cc - R. Perry
bc - G.H. Balazs

Mr. Katino Teeb'aki
Wildlife Conservation Unit
Christmas Island
Kiribati
Central Pacific

Gland, 25 November 1982

Re: Marine Turtle Farming on Caroline Atoll

Dear Mr. Teeb'aki,

Your letter addressed to Mr. Roger Perry (dated 12 August 1982) regarding the proposed turtle farming project has been referred to the IUCN/SSC Turtle Specialist Group.

The Turtle Specialist Group recommended that IUCN should not encourage the turtle farming proposal in the absence of a full and detailed plan including considerations as to how various problems of biology and conservation inherent to such farming can be solved. It was also stressed that so far experimental turtle farming programmes in several parts of the world (including in the Pacific) have proven to be very expensive and little effective. To give you an idea of the kind of problems which might be experienced in turtle farming we are sending you a copy of an evaluation report on the South Pacific Commission Turtle projects in Fiji and the Cook Islands, prepared by Dr. G.H. Balazs in April 1977. We would be pleased to provide further assistance to you, should you need any additional information.

Yours sincerely,

R. Scott
Executive Officer
Species Survival Commission

GOVERNMENT OF THE GILBERT ISLANDS

TELEGRAMS: WILDLIFE CHRISTMAS
GILBERT ISLANDS

WILDLIFE CONSERVATION UNIT
CHRISTMAS ISLAND
GILBERT ISLANDS
CENTRAL PACIFIC

Ref. WF 24

Dr. George H Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
University of Hawaii, Hawaii 96744.

8th December 1982.

Dear Mr. Balazs,

I am replying to your letter of October 26, 1982 addressed to Martin Garnett who, unfortunately already left Kiritimati (Christmas) some three weeks before your letter arrived. I apologise for having taken so long before replying but presumably you will understand as you read through.

At the moment there appears to be some doubts regarding the status of Captain Omer Darr over the leasing of Caroline, Vostok and Flint atolls. From records it appears that the terms of the latest lease agreement or licence between him and the Government of Kiribati has already expired and according to records too, he has not renewed his licence. The Secretary to the Ministry here responsible for these islands is enquiring to the Ministry concerned (in Tarawa) for confirmation.

With regard to the development proposed, I understand that Omer Darr has not started on any initial phase of the Turtle Farming project. It is not clear why though the scheme has been approved in principle. I am afraid I can not provide you with any detailled information of the project but indeed I doubt if there is any such information around. Or whether there is a detailled plan of this development, I am not certain either. The Secretary to our Minister here (to whom this letter is copied) may be able to provide such as soon as doubts over the question of the lease are clarified from the other end. I will let you know in due course. Photocopies of your letters to Roger Perry and Dr. Anton K.C. Fernhout (WWF/IUCN Project Manager)have been received from Roger himself, so I am copying this letter to them as well. I shall keep addressees in contact of any further news. Meanwhile, thanks for all the advices and for sending the copy of your SPC Turtle Projectt Report.

Yours sincerely

Teeb'aki

K. Teeb'aki
for Wildlife Warden

cc: Martin Garnett
: Mr. Roger Perry
: Dr. Anton K.C.Fernhout
: The Secretary, LSPC, Kiribati

micro. # 5341

Tyerman, F. (1838) Hawaiian Spectator I

...ise to the westward in a small cutter, had well ...; and he considered it highly dangerous.

...so on this side runs to an amazing height, par... the spring tides; and like that at Guam reach... of twenty feet, being as it were, continually ... power, by the long heavy swell from seaward. ...cularly remarked that during the whole time of ... there had never been any surf on the south ...and, while on the north or weather side, it was ...once or twice in a fortnight that we dared at... a boat, and even then ran a risk of being ...hen coming in again. It was generally obse... had been no one instance of the surf having be... on the north side, as it was during the first three ...e ship struck on the reef. I think the heavy ... part of the island are attributable to the strong ...s to the northward setting the swell down on ... The general winds prevalent there are east... from east to E. N. E. and E. S. E.

...and Hills, the highest part of the island, an ex... is to be obtained; the southern shore is very ..., as also the western group of cocoanut trees, ...th the lagoons, which are both numerous and ... is to be observed here the lagoons rise and ...ide, showing the sandy and perous nature of the ... firm opinion that fresh water is not by any ...be obtained, even by digging in the neighbor... cocoanut trees, as they only seem to thrive dur... season.

... of the island is interspersed with extensive ... and muriate of soda (common table salt) ...mall lagoons from having been subjected to its ...ve become reduced to a state of crystallization ...m their intricacy and apparently interminable ...bly dangerous to the explorer;—for should he ... enough to miss the proper tracks, there is ...o believe life would be jeopardied.

...light are so powerfully reflected from the sand ...se of Arabia, and the heat so truly oppressive

(being nearly situated upon the line) aided too by the most intense thirst, for there is no possibility of procuring water, otherwise, than by each man carrying a sufficient supply for his individual wants; that an excursion under such circumstances and in such a latitude, would be not only any thing but desirable, but really hazardous to a stranger.

Since Cook discovered this island, there have sprung up four large groups of cocoanut trees, one of which alone by a moderate computation may amount to about seven hundred;—they are situated almost on the banks of the great western lagoon, but are not very productive till the rainy season sets in, which is in March and April, when they yield abundantly.

About the centre of the island there is a remarkable plain of coral rock extending for at least a mile perfectly level and resembling Mosaic Pavement,—underneath a strata of black porous earth.

At the foot of the great western lagoon is a group of cocoanut trees, sufficiently handy to the beach for a ship to procure a sufficient quantity of cocoanuts in one day;—and it appears a number of ships have been there for that purpose as many of the trees were cut down, with a variety of English and American ship's names marked upon them, but none dated later than 1834.

The innumerable quantity of fish of various kinds which inhabit this lagoon and the environs of the island is quite astonishing, many of them sufficiently large for the harpoon. It is also much infested by sharks.

Turtle may be said to be numerous; they are of the green kind, weighing one with another from fifty to perhaps near three hundred weight, and probably as good as any in the world. While on the island we frequently caught fish with hook and line as much as we could consume. They consisted principally of cavallies of different sizes—mullet—large and small snappers, with two sorts of rock or parrot beaked fish; one with numerous spots of blue or green, and the other with whitish streaks scattered about. Eels and water snakes of a large size are also abundant, with crawfish and a species of cockle much larger than any I had hitherto seen. Oysters are likewise to be obtained. Shrimps,

clam gardens
trade routes

TRADITIONAL MANAGEMENT AND CONSERVATION OF FISHERIES IN ATOLLS OF KIRIBATI AND TUVALU

Draft: don't cite w/o permission

In Press in Proc. UNESCO Regional Seminar on Tradit. Mgmt. of Coastal Systems. K. Ruddle & R.E. Johannes eds.

Leon P Zann
Institute of Marine Resources
The University of the South Pacific
Box 1168
SUVA, FIJI

AQUACULTURE

On many islands in Kiribati, and on Nui in Tuvalu (a former Gilbertese colony), milkfish are, or were formerly, raised in excavated ponds (te nei) or in natural fresh or brackish pools. Wild fry are collected from beneath frond rafts placed at the lagoon edges or in island passages on days around new and full moon. The fry are caught with a fine net, (now of mosquito gauze) and feed on the natural accumulations of debris and algae in the pools, sometimes supplemented by scraped coconut. The fish grow to edible size in about 12 months. The ponds were formerly considered very valuable possessions and were inherited with land. Catala (1957) described several types of ponds in detail, and commented that many were then falling into disuse. The decline in milkfish culture has been hastened by the introduction of Tilapia which eat the fry. Tilapia are not aquacultured and are eaten on only a few islands such as Butaritari which have large natural ponds for their flesh becomes tainted in confined conditions. Milkfish are currently cultured on a large scale by the Kiribati Fisheries Division for tuna baitfish and for domestic consumption on South Tarawa.

Green turtles (Chelonia mydas) are occasionally ranched in both groups. Hatchlings and juveniles accidentally caught in gill nets are held in natural salt water ponds, while captive adult turtles may be tethered by a flipper to a stake at the lagoon edge until ready to eat (Chambers, 1975). Chambers also reported that any turtle eggs found were generally brought home and allowed to hatch. Hatchlings were sold at the Nanumea store as "pets" for 11c each during her visit. The survival rate was not high as most were kept in basins.

A turtle-raising pond visited by this author on Taratai, North Tarawa, was a mangrove-fringed passage between islets, one end of which had been blocked by a storm bank and the other end by a footpath causeway. At the time the 120m x 20m x 1m tidal pond contained only two turtles but the owner stated that he normally kept 10 to 15, and that he once had 60 turtles. Their diet consisted of naturally growing algae and mangrove "twigs" (probably Rhizophora seedlings). Their growth was said to be rapid, from about 20 or 30 cm to 80 or 100 cm in one year. They were usually sold on Betio, the urban centre of Tarawa, during festive occasions.

The new passenger-cargo ship "Milos".

August for the Australia-West Pacific Line.

Her master, Captain G. Paulsson, told *PIM* in Sydney he hoped the 6,787-ton *Milos* would be calling at New Guinea ports by February to pick up timber for the Australian market.

He said the *Milos* was the last of three ships the Hillerstrom group of companies of Helsingborg, Sweden, ordered in 1965 from a Gothenburg shipyard to replace ships on their Australia-Far East shipping runs.

She is equipped with remote-controlled cranes and cargo space to accommodate 150 ISO containers (8 ft x 8 ft x 20 ft). There are air-conditioned cabins for 12 passengers in four double and four single rooms.

NEW VENTURE FOR CAPTAIN DARR

American master mariner Captain Omer Darr, who has been knocking around French Polynesia for the past 20 years as skipper of *Nordlys*, *Te Vega* and *Wanderer*, and as a property owner at Moorea, is to start a new venture soon.

Captain Darr is to reopen the coconut plantations on Flint, Caroline and Vostok Islands which he has leased from the British Government.

The three islands, which come under the jurisdiction of the High Commissioner for the Western Pacific, are 600 miles or so north-west of Tahiti. They were formerly leased to Mr. M. P. A. Bambridge, of Tahiti, but they have not been worked for some years.

Captain Darr has acquired the *Topaz*, a 30-year-old Danish sailing ship, to transport copra from the islands to Tahiti.

The *Topaz* was built at Ring Andersen's Shipyard, at Svendborg, Denmark. Captain Darr was in Svendborg in July to take delivery of her.

In a note to *PIM* from Svendborg, Captain Darr said the local people were particularly interested in details of the *Topaz's* new career.

He also sent us a clipping from the local paper, *Svendborg Avis*, about his plans.

As far as we can make out from this—our Danish not being too good—some 80,000 coconut palms have been planted on Flint and Caroline Islands, and Captain Darr expects an annual copra production from them of 800 tons.

We also understand from the clipping that Captain Darr plans to call at the Gilbert Islands on his way back to Tahiti from Denmark to hire about 60 labourers for work at Flint, Caroline and Vostok.

NORFOLK FISHING BOAT SWEPT ON ROCKS

The fishing boat *Maitai*, owned by Norfolk Island Processes Ltd., was swept from the Cascade Pier on the night of August 10 and was found on the adjacent rocks next morning.

She was lifted back on to the pier

38(9):103