

SEA TURTLES - COOK IS.

GH BALAZS



OUTER ISLANDS AFFAIRS

Letter No.:-

Prime Ministers Office
Prime Ministers Department
Government of the Cook Islands
Private Bag, Mangaia, Cook Islands.
13 September, 1982.

Mr George H. Balazs
Asst. Marine Biologist
University of Hawaii

Dear sir,

I am in receipt of your letter dated 25th August 1982. In response to your letter and the enquiries that I have made on informations on sea turtle here on Mangaia. I was told that before the year of 1943 turtle used to lay their eggs around the sandy beaches in Oneroa. In the same year a terrible and violent storm had struck the island and washed away a lot of sand where most of the turtle nest were found. It seems there is no one knew the exact month of the year when turtle made their nest. People do eat turtle meat and eggs were not seen around the beaches or otherwise they might have eaten it too. The most turtles caught are as follows:-

1. Kemps Ridley
2. East Pacific Green
3. Flat Back

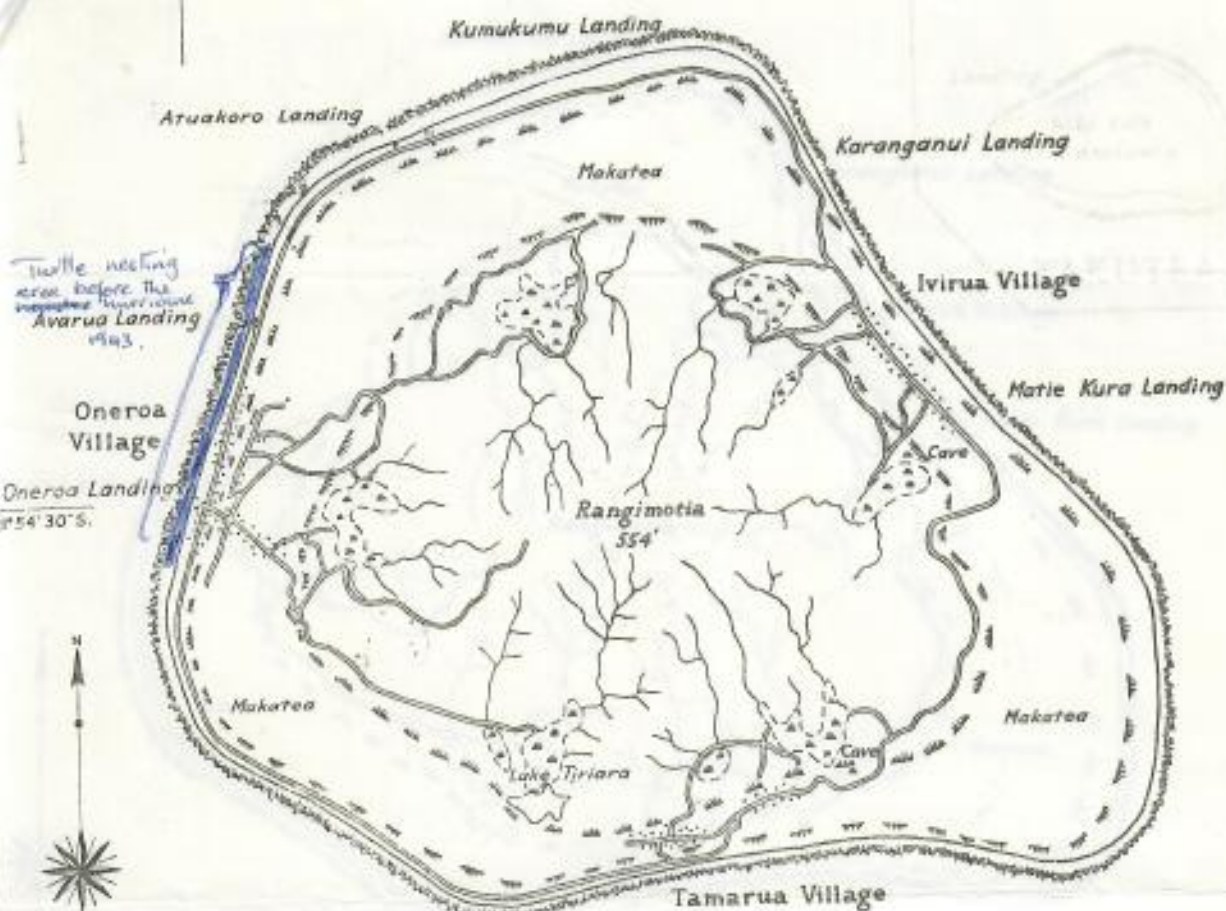
So far there has not been any turtle caught with tags on because I believed the ones that had been caught locally were only small size ones. and the average turtle caught each year were about the average of three

Other information.

- Most turtles caught in Mangaia were from outside the reef and not inside the lagoon
2. Turtle meat are not so popular to the people of Mangaia, although few people ate them
 3. Turtle population are less today as compared in the year 1943 were there is plenty of them. I hope this gives you a fair idea about the turtle population here on Mangaia. And thank you very much for your letter of introduction. Yours faithfully

Tua John
Chief Admin Officer

157° 58' W.



MANGAIA ISLAND

SCALE

Miles 1 3/4 1/2 1/4 0 1 2 Miles

Compiled from Aerial Photographs

SURVEY DEPT. RAROTONGA

R.L.C.

Please Return to:

GEORGE H. BALAZS

UNIVERSITY OF HAWAII

Hawaii Institute of Marine Biology

Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

Tua John
Chief Admin Officer

157° 58' W.

Kumukumu Landing

Atuakoro Landing

Karanganui Landing

Makatea

Ivirua Village

Avarua Landing

Matie Kura Landing

Oneroa Village

Oneroa Landing

21° 54' 30" S.

Rangimotia

554'



Makatea

Makatea

Lake Tiriara

Tamarua Village

MANGAIA ISLAND

SCALE



Compiled from Aerial Photographs

SURVEY DEPT. RAROTONGA

R.L.C.

ours initially

Tua John
Chief Admin Officer



Outer Islands Affairs

PREMIERS OFFICE
PREMIERS DEPARTMENT
GOVERNMENT OF THE COOK ISLANDS
PRIVATE BAG, MAUKE COOK ISLANDS

Letter No.:

15th September 1982.

George H Balazs,
Assistant Marine Biologist,
P.O Box 1346,
Coconut Island,
Kehehe,
HAWAII 96744

Dear Sir,

This is a reply to your letter to me of August 25 1982.

1. Yes. Sea turtles do come ashore to lay eggs on our sandy beaches. The last lot of eggs were discovered about July or August 1976. The mother turtle was killed for meat.
2. Some people on Mauke like turtle meat and eggs. In 1979 someone caught a turtle outside the reef. This was a small one. The man was skin diving with a spear, when he saw the turtle and speared it. The last turtle caught nesting was in 1976.
3. The kind of turtles caught here is the Hawksbill type.
4. The turtles that have been caught here did not have any metal tags attached to them.

Since the last turtle caught in 1976 none have been found laying eggs on our beaches.

Although some has been seen outside the reef but they don't seem to be coming ashore for nesting.

I hope this information will help you.

My sincere regards to you.

Sincerely,

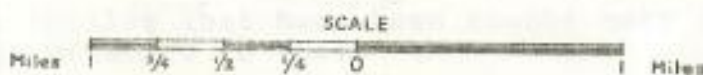
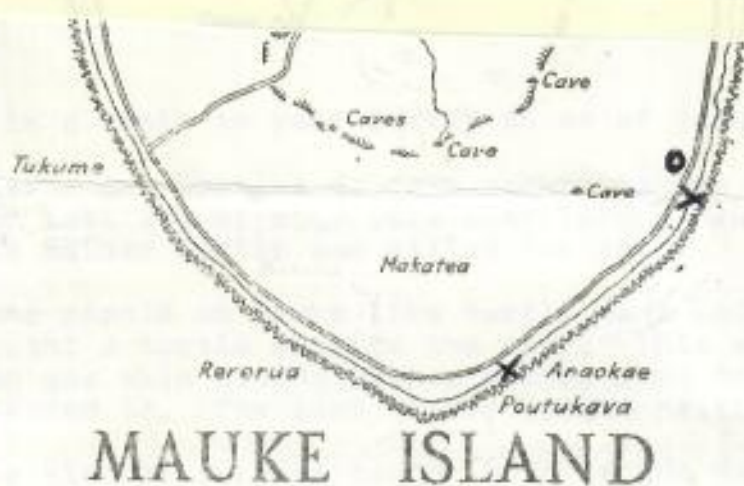
Tupuna Ngaoire

Chief Administration Officer
Mauke.

Where the x are, those are the places where turtles are found nesting. The last turtle found in 1976 was found where I marked
o.

Good luck to you

Agave



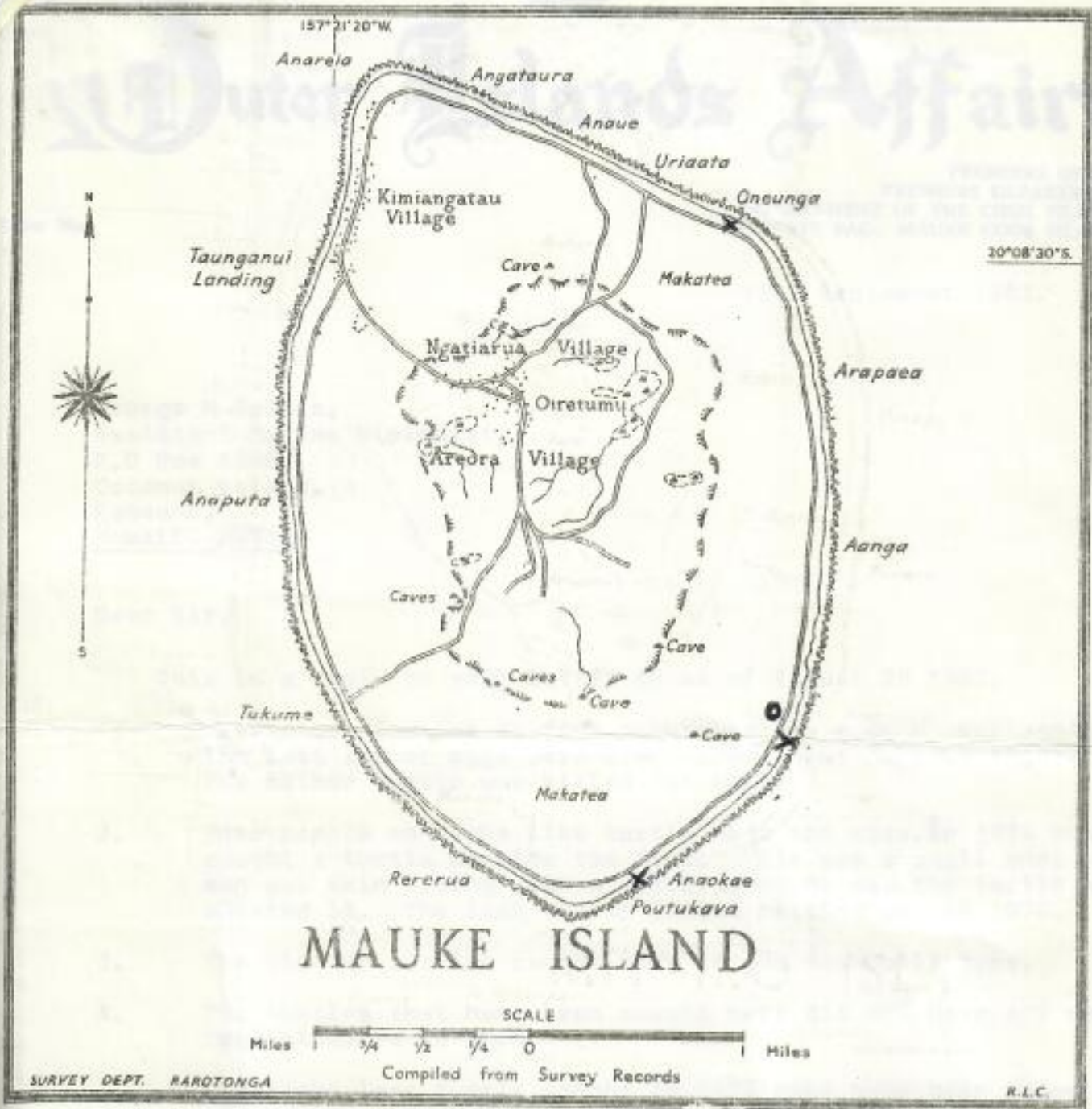
SURVEY DEPT. BAROTONGA

Compiled from Survey Records

R.L.C.

Please return to -

GEORGE H. BALAZS
UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96741



Please return to -
 GEORGE H. BALAZS
 UNIVERSITY OF HAWAII
 Hawaii Institute of Marine Biology
 Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96741

November 18, 1974

Notes for the ICLARM file on the Cook Islands fisheries organization.

Result of visit in Sept-Oct 1974

Mr. Tom Marsters is the Director of Fisheries for the Cook Islands. He is a young Cook Islander with strong political ambitions. Mr. Don Brandon is a project manager on a turtle culture project. Much of this will be centered around turtle nesting areas on Palmerston Island, where in 1967 there were thirty to forty nests, there are now approximately ten nests.

To summarize their fisheries problems, they feel as though they only have a shortage of marine resources in Rarotonga. They think that it is because of overfishing, resulting in a depletion of stocks. They are also unsure about the fluctuations of skipjack tuna offshore, but they feel as though they have declined in recent years. The previous Fisheries Officer, Ron Powell, undertook a program to construct boats and there are three boats that were constructed for the fishery that are presently unused - two approximately 25 feet and one about 50 feet.

In late September 1974 they were considering hiring Mr. Richard Sixbury, who was proposing to bring in a giant freshwater prawn or crayfish from Australia. This appeared to be an extremely ill-founded idea and my estimation of Mr. Sixbury was that he was an itinerant beachcomber-biologist and that the Cook Islands were heading into another "Tap Pryor situation".

P. HELFRICH

10/2/82

Dear Dr. Balazs,

It was a pleasure reading this most interesting and concise paper on turtles in the Tokelau (Union) Is. Your approach to the subject matter as well as the tangential anthropological data is an inspiration to my wife & myself in our planned work in the Solomon Islands. Though we did see some turtles caught and "fanned" in Manihiki, I have only peripheral knowledge & cannot think of anything to add to your excellent study.

Yours sincerely
Stephen R Weinstein
Elisabeth

- 10/21 Visted me again - Said that
- 1.) CAO "Hoku" was just a name - many people had names after name life - no self restrictions on eating turtles - he ate part of the big ♀ caught (just before they left)
 - 2.) ♀ had large egg yolks in tract - but not shelled - caught while nesting
 - 3.) No turtle shell handicraft seen - Only pearl shell
 - 4.) To her memory, Manihiki beaches were mostly fist-size coral rubble - no sand, many water.
 - 5.) She will write to Hoku ^{in NZ} and ask for historical info on turtles.



Ministry of
Agriculture
& Fisheries

Cook Islands Government

P.O. BOX 96, RAROTONGA
Cables: 'DIRAG', Rarotonga

Please address all correspondence to: The Secretary.

20 September, 1982.

George H. Balazs,
Assistant Marine Biologist,
University of Hawaii at Manoa,
Hawaii Institute of Marine Biology,
P.O. Box 1346,
Kaneohe,
HAWAII 96744.

Dear George,

Thank you for the Tokelau Report and letter of September 14.

I thought my good friends Stephen and Elizabeth Weinstein were on the U.S. East Coast since a year back. Please send my regards if you are in contact with them.

I have not been to Penrhyn recently and do not know when I will get there as I am involved with a freezer and pearl project on Rakahanga at present.

As soon as I receive all information on this large turtle I will send them on to you.

It is not likely our department will seek funds for a turtle project within the near future, as all finance goes straight into other areas. However, if you can find a grant we will naturally assist as much as possible during a stay on our Northern Atolls.

We will soon have regular fortnightly flights to Penrhyn and return fare to Rarotonga will be appr. NZ \$700. Quite a lot, but cannot help that. Fuel is expensive. Anyway, a stay in Penrhyn cost almost nothing. We have permanent personnel there who would look after you.

Well, That is all for now ,

Kia Manuia.


C.S. Friberg
Prin. Fisheries Officer N. Group.

UNIVERSITY OF HAWAII AT MANOA
HAWAII INSTITUTE OF MARINE BIOLOGY
P. O. BOX 1346
KANEHOE, HAWAII 96744

September 14, 1982

Mr. Christer Friberg
Ministry of Agriculture & Fisheries
Rarotonga, Cook Islands

Dear Christer:

This morning I had a pleasant and interesting discussion with Elisabeth Weinstein, who is here in Hawaii with her doctor husband Stephen for advanced studies. In her spare time, Elisabeth has been taking care of several sea turtles that are being held at the laboratory of the National Marine Fisheries Service. She seems very much interested in turtles and came to me for information relating to the Solomons, their next destination after Hawaii.

During our visit, Elisabeth mentioned that a very large shell from a green turtle is attached to the wall of a building (or church?) at Penrhyn. If and when your time permits, would you please measure the total length of this shell for me? I would be interested to learn just how big it is. If you know approximately how long ago it was caught, I would also appreciate that information.

Thank you for your help with this request. I hope that you received the report on Tokelau sea turtles that I mailed to you last week. Best regards.

Sincerely,

George H. Balazs
Assistant Marine Biologist

GHB:md

June 2, 1980

Mr. Christer S. Friberg
Principal Fisheries Officer
Northern Group
Ministry of Agriculture & Fisheries
Penrhyn, Cook Islands

Dear Mr. Friberg:

Many thanks for your interesting and informative letter of April 30, which I received during the third week of May. I really appreciate the details you provided on the marae and turtle fishing at Penrhyn. Don Brandon, a New Zealander living on Rarotonga, previously supplied me with some information for Penrhyn, but your details are certainly more up to date.

As requested, I have located a copy of our University brochure for prospective students from other countries. I am also sending you the 1979-1981 General Information Bulletin which provides more detailed information on all aspects of the University. My position with this Institute (see pages 10 and 238) only involves research activities, specifically sea turtles at the present time. I therefore unfortunately cannot be of any great assistance in helping you enter as a student. I would say, however, that you should also investigate the study opportunities available at the University of the South Pacific in Suva. I suspect that the tuition and living costs would be lower in Fiji than they are here in Hawaii. In any event, I wish you success in your efforts and I will help you to whatever extent possible.

If possible, can you send me a picture of yourself, wearing the "turtle badge," taken with some of your Penrhyn employees or friends? I know that this is an unusual request, but the organization that gave me the badges (Chelonia Institute of Washington, D. C.) has asked me to gather such photos of people on Pacific islands. I hope you don't mind. If you need an extra roll of film, please let me know and I will send one down to you.

Someday I hope to be able to visit Penrhyn for a firsthand study of the turtles.

Sincerely,

George H. Balazs
Assistant Marine Biologist
and Deputy Chairman
IUCN/SSC Marine Turtle Group

mk
enclosures



University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1348 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

August 25, 1982

Chief Administrative Officer
Mitiaro Island
Cook Islands

Dear Sir:

I am writing to ask if you can provide me with information on the occurrence of sea turtles at Mitiaro. I would like to know the following.

1. Do sea turtles come ashore to lay eggs on the sand beaches at Mitiaro? If so, would you please mark the places where they usually nest on the enclosed map. During what months of the year do the turtles nest?
2. Do the people of Mitiaro eat the sea turtles or their eggs? How many turtles are taken each year?
3. What kinds of turtles occur at Mitiaro? To help you answer this question, I have enclosed (as a gift) a color identification poster which shows the different kinds of sea turtles.
4. Has a metal tag with a number and address stamped on it ever been found attached to a sea turtle at Mitiaro? If so, would you please tell me the details of this discovery.

I am a marine biologist here at the University of Hawaii that studies sea turtles in the Pacific Ocean. Any information that you can write to me about sea turtles at Mitiaro will be greatly appreciated. Thank you very much for your kind help.

Sincerely,

GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec
Encls.

SAME LETTER TO: 1) Manihiki Atoll; Rakahanga Atoll; Pukapuka Atoll; Mauke Island; Atiu Island; Mangaia Island.

AN EQUAL OPPORTUNITY EMPLOYER

The Honolulu Advertiser

Established July 2, 1856

THURSTON TWIGG-SMITH *President & Publisher*
GEORGE CHAPLIN *Editor-in-Chief*
BUCK BUCHWACH *Executive Editor*
JOHN GRIFFIN *Editorial Page Editor*
MIKE MIDDLESWORTH *Managing Editor*

Tuesday, October 28, 1980

Cook Islands to Hawaii

Pacific exchanges

The abstract notion of the Pacific Community takes concrete shape in various ways. Among the most beneficial and entertaining to many people are cultural exchanges such as Hawaii has enjoyed for the past two weeks.

The Tupapa-Maraerenga Cultural Arts Company from the Cook Islands has been visiting under the sponsorship of the Kamehameha Schools.

Their songs and dances were seen in more than 15 schools and at public performances like Kanikapila 1980. At Andrews Amphitheatre they literally brought the house up — off the grass for a standing ovation.

IN ALL, more than 30,000 people in Hawaii saw and (it can safely be said) enjoyed their infectious enthusiasm. That easily outnumbers the total population of their home islands, named for Captain James Cook.

Those 15 islands, lying between New Zealand and Tahiti some 3,000 miles south of Hawaii, are now self-governing but dependent on New Zealand for foreign affairs. As in Hawaii, the Polynesian people of the Cooks were heavily influenced by the arrival of Christian missionaries in the 1820s.

The Cook Islands and its people "are comparatively untouched by the heavy hand of our century," as one guide book puts it. Their dance style reflects this, but the subject matter is at times quite modern.

In one dance a comely matron representing the sea rejects any attempts to be used as a nuclear waste dumping ground. With her hips she knocks to the ground male dancers representing intruders. More practically, the Cook Islands has been a leader in protests by the South Pacific Forum against "further exploitation of the Pacific for nuclear purposes."

One of the best received dances was an unusual rendition of the famous song of respect for Hawaiian heritage, "Na ali'i." The words, "Memories come of the famous chiefs. They are gone, they have passed and their flowers (or descendants) survive," were especially poignant in the voices and motions of the young Cook Islanders.

EXCHANGE MUST go both ways, of course. Most recently Hawaii sent, under the auspices of the state Commission on Hawaiian Heritage, a delegation of performers and artisans to the Third South Pacific Festival of the Arts in Papua New Guinea.

Apparently Hawaii's participation made an impression because the next South Pacific Arts Festival Council meeting next year in New Caledonia will take up Hawaii's elevation to full membership. At present Hawaii is an invited guest. Also on the agenda will be recognition that many festival participants, like Hawaii, come from the north Pacific.

Honolulu Star-Bulletin

Published by Gannett Pacific Corporation

CHINN HO, CHAIRMAN

ALEXANDER ATHERTON, PRESIDENT

PHILIP T. GIALANELLA, PUBLISHER

PAUL T. MILLER II, ASSOCIATE PUBLISHER

A. A. SMYSER

Editor, Editorial Page

JOHN E. SIMONDS

Managing Editor

Edwin S. Edwards, Adm. Assistant to the Publisher; Claude Burgess, Deputy Managing Editor; Barbara Morgan, Today Editor; Cynthia S. Oi, News Editor; Bill Kwan, Sports Editor; Charles S. Frankel and Carl Zimmerman, Assistant Editors, Editorial Page

Published at 605 Kapolei Boulevard | Honolulu, Hawaii 96813

A-10

Saturday, December 22, 1979

Back from Oblivion

The premier of the Cook Islands, Sir Albert Henry, lost his job last year when he got caught using government funds to fly voters in from New Zealand for the elections.

Sir Albert lost the premiership as a result, but that wasn't all. He was ordered to pay fines and court costs, and was barred from seeking political office for three years.

But Sir Albert, who had run the Cooks since independence for 13 years, wasn't through. He appealed the political ban, and won. Three New Zealand judges, sitting as the court of appeals for the Cooks, accepted his claim that the ban was inappropriate, unreasonable and oppressive.

Now Sir Albert is very much available to serve the electorate again if it still wants him.

The next time he stands for office Sir Albert won't be able to dip into government funds to finance a voter airlift. But it would be foolish to presume that the electorate will be unwilling to forgive such a resourceful fellow.

South Pacific by tramp

By JERRY HULSE

Los Angeles Times Service

If you're allergic to sun, sand and seafood, well, turn to the sports section or the comic pages.

This is for the traveler with a penchant for the unusual. Dick Goodman's kind of companion.

Goodman showed up here the last time in 1977, beating the drum for trips to the South Seas. Now he's back, putting together something that sounds like a page out of "Robinson Crusoe." Or the "Swiss Family Robinson."

It's a trip by tramp freighter among obscure islands in the Cook chain.

Ever feel like rolling off the world? Well, that's exactly how it will be with Goodman's Goodtravel group.

It will be a first, this tramp steamer fling among the Cooks. Goodman's group will step foot on islands no other tourist has ever visited.

They'll sleep in thatched huts or under the stars and slurp kava with the locals.

If you're used to the Sheratons and the Hiltons, then forget it. The nearest thing to electricity that's available on most of these islands is a kerosene lantern. Hot showers? Dreamer. Well, a waterfall maybe. Or a bath in one of the tepid lagoons that surround these islands.

Goodman's group will visit an island where only one man ever lived, the eccentric longer, Tom Neale, and now he's gone too.

It's a trip that begins in the Cooks and ends in the Samoas. On July 5 Goodman's comrades will board an Air New Zealand jet in Los Angeles for a non-stop flight to Rarotonga, capital of the Cooks. To recover from the jet lag they'll spend a couple of nights at the Hotel Rarotonga.

After that the adventure begins.

From Rarotonga the group will take off by propeller airplane for the island of Aitutaki (don't be distressed if you've never heard of it, no one else has either). It's a pit stop before joining up with the tramp freighter.

On Aitutaki, Goodman and the others will put up at what is facetiously referred to as the Rapae Motel. Imagine a motel on an island with only five cars?

What distinguishes Aitutaki is that it's off the beaten path. And because it is, says Goodman, the locals are abnormally friendly.

"They see someone walking down a path and they call out. 'Hey, Brudda, come visit and have something to eat with us.'"

Ten miles long and up to eight miles wide, Aitutaki is an atoll with

what Goodman describes as a superb lagoon.

It is into these waters that the freighter Manuvai will sail on or about July 10 to pick up Dick Goodman's gadabouts. She's an aging rust bucket, one of the last of the still-functioning old-time tramp freighters.

Goodman chartered the Manuvai exclusively for this island-hopping adventure of his. Still other passengers will be aboard. Many islanders will be returning home to visit friends and relatives.

On board the crew will carry shipments of beer, onions and other provisions.

Even kitchen sinks, for the Manuvai — and freighters like it — are the lifeline of these remote South Seas isles, mere dots in an immense sea that spreads to the distant horizon, clouds scudding overhead, rains blowing like some lacy curtain.

Goodman describes the Manuvai as cramped and even a trifle uncomfortable. "The plumbing is temperamental but we're using the ship to get us where we're going because it's the Manuvai or stay home. Besides, the experience of sailing on this old dinosaur is part of the adventure."

Goodman's flock will hole up in five somewhat tacky cabins — a place to sleep. Nothing else. He says quite frankly the Love Boat it isn't. ("I've heard rumors, though, that the showers work!")

What counts, of course, is that the Manuvai has a new engine and there's all the world out there to discover. A peaceful world of rainbow-colored lagoons, rain-fresh skies and an emptiness that reaches to eternity, to infinity.

From Aitutaki the Manuvai will set a heading for Palmerston Island, an atoll in the most westerly waters of the Southern Cooks.

When the Manuvai arrives in July, its passengers will be the first tourists ever to overnight on Palmerston Island, where they'll be the guests of local families, bedding down in makeshift huts with the Milky Way and a million other stars pressing overhead.

After Palmerston the Manuvai will put to sea for nearly 36 hours, its destination Suvarrow, the island of the eccentric Tom Neale, who lived a life more lonely even than that of Robinson Crusoe, for on Suvarrow there was no Friday, only Neale himself.

Married to a woman on Rarotonga, he would visit her on occasion, always returning to Suvarrow and his self-imposed exile after she be-

came pregnant again. Nice guy.

On Suvarrow he wrote the book, "An Island and Myself," and afterward he went home to die in the arms of his wife on Rarotonga.

Goodman and Co. will swim and fish and snorkel on Suvarrow and afterward they'll sail for Rakahanga, another atoll where Goodman admits, "I haven't the slightest idea how they'll house us."

Well, it shouldn't be bad, what with no telephones, no TV, no newspapers and plenty of beer. With lots of suds and no interruptions, who can fault that kind of life?

Next on the itinerary is Manihiki, that Goodman describes as the most beautiful atoll in all the Cook Islands.

And while Lars Eric Lindblad has delivered visitors to Manihiki, Goodman's troupe will be the first outsiders ever to overnight on this remote and romantic atoll. In all they'll spend three nights, with days filled with fishing, snorkeling and swimming.

After that it's off to Pukapuka and finally Apia in Western Samoa, where the adventure ends with a short hop to American Samoa and a connecting flight to the land of hot showers, 27 days in all for under \$3,000.

If such escape seems appealing, Goodman awaits your message at Goodtravel Tours, 5332 College Ave.,

freighter

Oakland, Calif. 94618. Should the mail seem too slow, he may be reached by telephone at (415) 658-2060.

A second and similar trip is scheduled for July 27 when Goodtravel's people fly with Continental to the Samoas to pick up the same old rust bucket for a reverse voyage of the one we've described.

If punctuality is a personality trait, don't go. The sort of person who goes on his trips are, in Goodman's words, "relaxed, laid back."

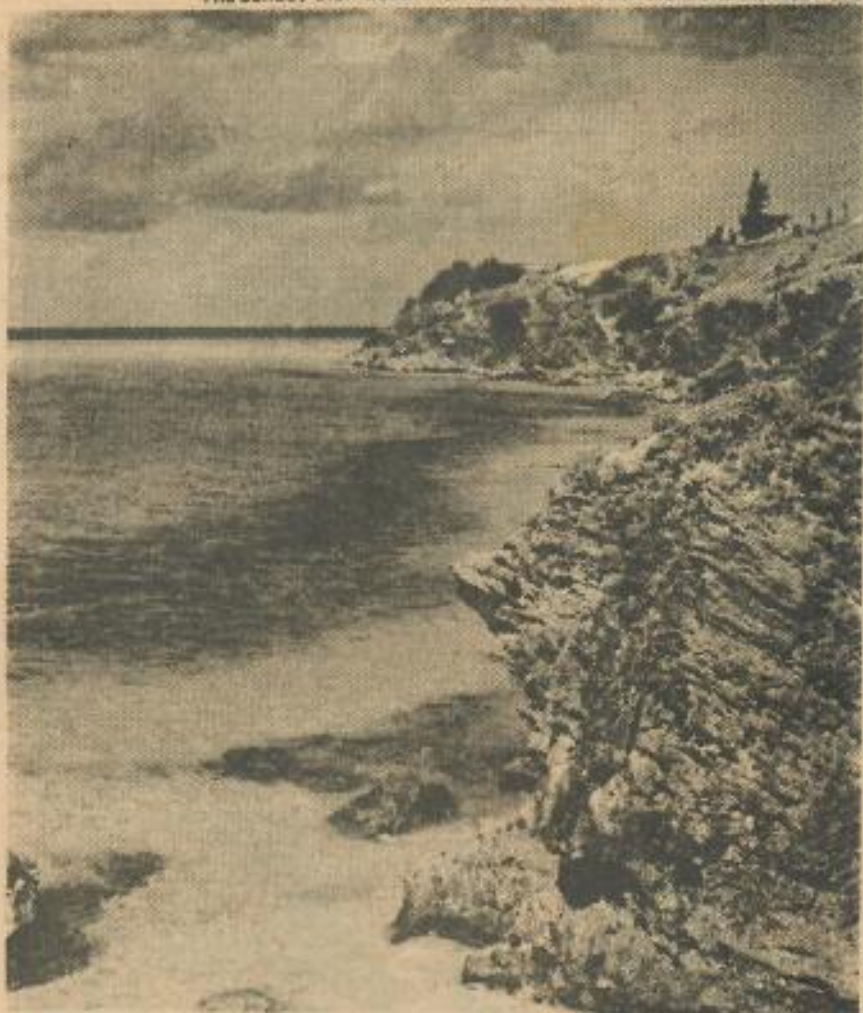
"They don't give a damn when the boat leaves," says Goodman, "and they're intensely interested in other people and their way of life."

Goodman puts together other trips to the South Seas. Fiji is one of his big winners, particularly the 22-day yachting adventure to outlying islands that's tagged at \$2,277, including the round-trip jet hop from Los Angeles.

Goodman describes the food in the villages he visits as the best in the entire South Seas, such items as freshwater shrimp, lobster, mahi mahi, chicken and pork.

Goodman adds: "I'd rather spend a month in a village in Fiji than any deluxe hotel you can name."

Goodman puts up vacationers in thatched-roof shacks. Right alongside the locals. In some cases, with them. "You eat, sleep and commiserate with them."



A trip that's not for luxury lovers

Dept. Fisheries,
Box 96,
Rarotonga.
14th June 1977.

G. Balazs,
Hawaii Institute Marine Biology,
KANEHOE, Hawaii 96744.

Dear George,

Well I have finally received S.F.C.'s recommendation to the govt. and no doubt you received a copy of the same letter addressed to Hon. W. Estall. Unfortunately both Tom and the Minister are away on a fact finding mission to S.E. Asia for a few more weeks so, no further action is expected for some time yet. No doubt there will be a final rush to do everything before the end of my contract.

I notice that an excerpt from your recommendations was included in the letter to Estall. I guess that once again no copy will come to me from S.F.C. leaving me in the dark as per usual.

If the remaining 40 turtles are to be released, have you any suggestions for obtaining tags. I know that you are reluctant to relinquish those that you have so is it possible to get 40-50 tags of suitable size, immediately? Preferably Incenel tags but Monel would be better than none.

Carol from the PEACESAT at your end visited Rarotonga recently, but I'm afraid I did not manage to meet her. Would you please extend my apologies to Carol the next time you see her?

There are a number of turtles in the mortuary here at Fisheries, which have not been autopsied but have died for no real obvious reason. Although the turtles have been in the freezer for some time I think it may be useful in my report if some autopsy reports were included. ~~Of course~~ You will be aware that there is now a direct Raro. * - Honolulu service by Air N.Z. which will facilitate transportation of the specimens. If you can arrange the Autopsies please let me know when you have the appropriate agricultural clearances, and I shall proceed to freight the turtles up to you, immediately.

This week the Publisher of "The American Pacific" is visiting Rarotonga and I notice from his magazine that there is a three part article on turtles, Trust Territories. His name is A. Bruce Jensen Jr. and I have told him that he should get in touch with you when he returns to Honolulu. The magazine is basically about various aspects of the marine resources in the Pacific, and maybe a useful medium for promoting the ~~same~~ cause of turtle conservation.

Would you please send copies of the following if they are available and let me have the bill ;

P.T.O.

South Pacific Commission
Turtle Project

1. Balazs G.H. Hawaii's seabirds, turtles etc.
2. Christensen, R.M. 1976. Special Report : Green Sea Turtle Farming. Chelonis, 3(2), 2-6.
3. Witham, P.R. 1976. Evidence for ocean-current mediated dispersal in young green turtles. M.Sc Thesis, University Oklahoma, Norman, Oklahoma.
4. From the Marine Turtle Newsletter there is a listing of Papers presented at the Florida interregional Conference on Sea Turtles. If you have copies, please send, P. Ross Witham's, H.G. Haines and G. Rebell's, P.C.H. Pritchards and J.I. Richardson's.

No 2

Looking forward to hearing from you again. Maybe one day I shall make personal use of the new direct airlink to Honolulu.

Regards,

D.J. Brandon

D.J. Brandon
S.P.C. Turtle Project

103, 135, 142 - 146, 147 - 148
 180, 182, 185, 192 - 200, 208, 215
 225, 225 - 357, 408, 425, 450, 472 - 478
 487, 490, 514, 511

book 177

once again I shall reimburse any
 expense involved in locating these papers
 for me. I hope your staff don't
 object too much. Hope to hear from
 you soon. Regards
D.J. Brandon

South Pacific Commission
Turtle Project

23/6/77

Dear George,

Another quick note to ask another favour from you. I would like to have photocopies of some papers ~~is~~ listed in Uday Raj's Bibliography of Marine Turtle literature. To save time writing them out, I shall list them by number as in the book:

PAPERS
103, 135, ~~142~~ 142 - 147, 149 - 152
160, 162, 166, 192 - 203, 208, 215
225, 355 - 357, 408, 437, 450, 472 - 478
482, 484, 514, 711

BOOK 277

Once again I shall reimburse any expense involved in locating these papers for me. I hope your staff don't object too much. Hope to hear from you soon. Regards
Don

SOUTH PACIFIC COMMISSION

TENTH REGIONAL TECHNICAL MEETING ON FISHERIES
(Noumea, New Caledonia, 13 - 17 March 1978)

SPC ACTIVITIES IN FISHERIES OTHER THAN SKIPJACK

by

R. Grandperrin
Fisheries Adviser
South Pacific Commission

PROGRESS REPORT

1. Fisheries Adviser

The role of the Fisheries Adviser may be defined as follows: to advise Governments on certain technical problems, seek funds from development agencies and other specialised bodies, organize and supervise training courses, define and control operations directly financed by the SPC, engage consultants for certain investigations and surveys, organize and conduct meetings, workshops etc., edit the SPC Fisheries Newsletter, prepare and disseminate any data of regional interest and meet any request for information.

Since presenting the last progress report to the 1977 Planning and Evaluation Committee, the Fisheries Adviser has visited the following countries and territories:

Solomon Islands: (15/4 - 23/4/77) - Setting up of Outer-Reef Artisanal Fisheries Project at Gizo.

Gilbert Islands: (23/4 - 3/5/77) - Evaluation of resources and fisheries with the co-operation of the SPC Lobster Project Officer. Visit to Fisheries Department and FAO/UNDP project on Milk fish.

Tonga: (14/6 - 16/6/77) - Visit to Fisheries Department. Feasibility study of assistance by SPC.

Niue: (15/6 - 17/6/77) - Visit to Fisheries Project. Feasibility study of assistance by SPC.

Western Samoa: (17/6 - 21/6 and 23/6 - 25/6/77) - Visit to Fisheries Department.

American Samoa: (21/6 - 23/6/77) - Visit to Fisheries Department and "Mollies" farming project. Feasibility study of assistance by SPC.

Fiji: (25/6 - 29/6/77) - Visit to Fisheries Department and SPC Marine Turtle Farming Project. Contact made with USP.

Fiji: (25/7 - 29/7/77) - Participation in the SPEC meeting concerning the establishment of a Fisheries Agency.

New Hebrides: (22/8/77) - Think-tank session on possible aquaculture projects in collaboration with CNEOX.

Solomon Islands: (20/9 - 30/9/77) - Visit to SPC Outer Reef Artisanal Fisheries Project at Gizo. Discussions with the Fisheries Department and the SPC Lobster Project Officer.

Western Samoa: (2/11 - 5/11/77) - Advisory mission on national aquaculture projects with CNEOX.

American Samoa: (6/11 - 8/11/77) - Visit to the "Mollies" Farming Project with CNEOX. Development of an SPC aid programme for deep sea fishing.

French Polynesia: (8/11 - 11/11/77) - Setting up of a data processing project on Fish Poisoning. Visit to CNEOX plant. Feasibility study of co-operation with CNEOX for development of aquaculture in the Pacific.

Fiji: (17/11 - 26/11/77) - Participation in the SPEC meeting concerning the establishment of a Fisheries Agency in the South Pacific.

2. Outer Reef Artisanal Fisheries Project

This project began in 1974 and was terminated on 31 December 1977, in accordance with Recommendation No.15 of the SPC Ninth Regional Technical Meeting on Fisheries (held in Noumea, 24-28 January, 1977).

"The Meeting recommended that the SPC Outer Reef Artisanal Fisheries Project be terminated at an appropriate time as determined by the SPC Fisheries Adviser."

The project was based successively in the New Hebrides, Western Samoa, the Cook Islands, Tuvalu and the Solomon Islands. The aims of the Outer Reef Artisanal Fisheries Project were to survey local resources of fish; to determine the fishing techniques most suited to the exploitation of these resources; to provide adequate training in fishing techniques and in the use of fishing equipment to local fishermen; to assess the economic feasibility of fishing commercially; lastly, to advise Governments on fisheries development.

During 1977 the project was supervised by Mr R. Eginton, the Master Fisherman and Project Leader. In Tuvalu he was assisted by two Boat Skippers/Fishermen, Mr P. Mead and Mr C. Scott, and in the Solomon Islands by Mr P. Mead alone. Apart from fishing gear (lines, nets and reels) the bulk of the equipment was made up of three fishing boats, an ice-making machine, and a cold storage plant set up only in Gizo in the Solomon Islands.

Funafuti (Tuvalu)

Since the Funafuti population fishes mainly for Skipjack and Yellow-fin tuna, emphasis was placed on investigating sea bottom resources at night in waters between 100 and 400 metres in depth on the outer slope of the reef.

The average weight of fish landed after each expedition was 52.5 kg, excluding sharks. This corresponds to 1.7 kg per fisherman/fishing hour or to 2.5 kg per reel/fishing hour (on the basis of three crew members, two electric reels and an average of 10½ actual fishing hours). Allowing for a 21% bad catch of highly toxic and thus non-saleable fish, these results represent an average marketable catch of 42.3 kg per expedition, or 1.3 kg per fisherman/fishing hour.

In the light of these results, an economic appraisal was conducted on the basis of two different types of boats. Under present conditions (high price of petrol, market price of fish at 70 francs per kilo, no safe anchorage, etc.) further development of deep water fishing on the outer slope of the reef hardly seems expedient. On the other hand, it would appear that more extensive operations could be conducted in the lagoon without any imminent danger of overfishing.

Gizo (Solomon Islands)

The people of the Western Solomons fish mostly with nets, spears, and light handlines. All of these methods are carried out along the shore or reefs usually in depths of less than 20 metres. There are some villages which do pole skipjack from canoes using the traditional pearl-shell lure but catches by this method according to villagers have declined rapidly in the last five years.

Emphasis of the SPC Outer Reef Project in the Western Solomons was on bottom fishing using electric reels fishing in depths of 40 to 300 metres. The most productive fishing depths were from 180 to 220 metres. The most productive fishing time was from 1800 to 0600 hours on nights with a light current and winds below ten knots. The most productive type of bottom was of mixed sand and coral.

When this short report was written, the data available showed that 106 fishing voyages were made by the project's boats catching a total of 12,005 kilograms of fish for an average of 113.3 kilograms per voyage. The boats are usually crewed by three fishermen using two electric reels. This gives a catch of 56.65 kilos per reel per voyage or 37.77 kilograms per fisherman per voyage. Carrying calculations even further, there are three hooks per reel producing a catch of 18.88 kilos per hook per night. Each fisherman's effort would yield 3.14 kilos per trip hour (12 total hours per trip). Each reels effort would yield 4.73 kilos per trip hour.

At the present market price in Gizo of \$A.25¢ per pound (.55¢ A. per kilo) a fishing boat with two reels would have \$A62.25 total income per trip. With the large areas of sheltered fishing grounds in the Western Solomons 2.5 fishing trips per week or 130 fishing trips per year would not be unrealistic. This would give a total yearly income of \$A8,092.50. At the present time in the Gizo area there are:

- (a) large sheltered fishing grounds within a short steaming distance
- (b) a dependable supply of fuel at not unreasonable prices
- (c) fairly good engineering and slipping facilities
- (d) excellent sheltered anchorages for small boats
- (e) a growing market for bottom fish
- (f) low wages and a large number of unemployed young men who on the average quickly become keen fishermen.

Given the above results and conditions in the Gizo area it would seem that bottom fishing would be a viable project for further development.

The final report is in preparation.

3. In-shore fisheries development project

This project includes 3 sub-projects: lobsters, marine turtles and bêche-de-mer. The first two were terminated in 1977, in accordance with Recommendations 8 and 5 of the Ninth Regional Technical Meeting on Fisheries convened by the South Pacific Commission in Noumea, 24 - 28 January, 1977.

3.1 Lobster sub-project

The Lobster Project began in the Solomon Islands on June 11, 1975 with the arrival of the Project Officer, Mr Prescott, in Honiara. The first exercise was to survey possible sites where the project could be based. The project was finally based on the island of Loun in the Russell group.

The project was run by Mr. Prescott with help from one assistant, sometimes two. Altogether six government (Fisheries Department) trainees were trained in lobster live storage and transport by the project. Ten local fishermen worked in close cooperation with the project and received a good background in live storage and transport methods. Furthermore, four live storage projects were initiated in other places in the Russells involving thirty fishermen. One project was also started on Guadalcanal Island.

The equipment used was chosen as being available in the Solomons. It was essentially a 25 foot fibreglass canoe run by a 25 h.p. engine, a Seagull spare engine and some diving equipment. A house and a shed were also built.

Experimental live storage of tropical rock lobsters, principally the double-spine rock lobster, Panulirus penicillatus, has shown it feasible and profitable for village fishermen to store their catch of rock lobsters for periods of up to 6 weeks. The mortality rate was variable, but generally low, averaging 23.5%. The mortality rate in most cases was related to the way the rock lobsters were handled during capture and prior to being put into storage. There was a significantly lower mortality rate among rock lobsters which lost only a few limbs during handling than those which lost many. Feeding the rock lobsters during live storage for periods of up to 6 weeks was unnecessary and uneconomical. Weight loss determined by wet weight measurements was 3.3% and 3.7% for fed and non-fed lobsters respectively, although there was a statistically significant difference in weight loss between fed and non-fed lobsters when dry weight analyses were made.

Live transportation of rock lobsters for periods of less than 12 hours was also shown to be feasible using simple methods and easily accessible materials. For the transportation of rock lobsters over longer periods of time with low mortalities, it was necessary to reduce their temperature by using ice.

The economics of the fishery were ultimately dependent upon the size of the sustainable yield. To provide data from which estimates of the resource could be made, a mark-and-recapture study was undertaken. Seven hundred and five P. penicillatus were tagged and released; there were 133 recaptures which provided usable data. The growth rate for males was expressed by the von Bertalanffy growth equation as $L_{\infty} = 143.87$ and the slope of the line as $K = .2940$. For females, the growth was best expressed by the von Bertalanffy growth curve fitted to Mauchline growth estimate where $L_{\infty} = 113.37$ and $K = .49880$. The population density of two reefs in the Russell Islands was 53.8 Panulirus penicillatus per hectare for one study - 149 mm. area and 56.7 for the other, with a range of carapace lengths from 40mm. The mean carapace length of 920 lobsters from the two reefs was 96.0 mm. Tagged rock lobsters moved only short distances along the study reefs. There was no evidence of migrations. Because of a low population density, a restricted habitat, and a growth rate which is low relative to the other tropical species on which fisheries are based (Panulirus ornatus in the Gulf of Papua, and Panulirus argus in the Caribbean area) the sustainable yield for P. penicillatus appears to be low.

A final report to the Solomon Islands on the results of the live storage and transport experiments and population study is in preparation, as well as a handbook for lobster fishermen and a scientific paper.

When the S.P.C. was asked by the Gilbert Islands to make an assessment of the stocks of rock lobsters and comment on the economic viability of establishing a commercial fishery for rock lobsters,

the Lobster Project Officer accompanied the Fisheries Adviser to the Gilberts. The Project Officer carried out a survey of the rock lobster stocks on three atolls and prepared a report for the Gilbert Islands government.

3.2 Turtle sub-project

This project started in 1974 and was divided into two sub-projects, one at the USP run by Dr U. Raj, and the other in Rarotonga run by Mr D. Brandon. The former was terminated at the end of 1976 and the latter ended in August 1977.

The purpose of this project was to investigate the economic feasibility of raising hatchling turtles, in captivity, from the egg to a size suitable for the market, as an alternative source of protein for Pacific Island Countries.

It was shown that careful handling of the eggs leads to a higher hatching rate than in nature. The maximum stocking density depends on the quality of the pond water, the size of the turtles and the quantity of food available. Too high a stocking density leads to constant biting. Also, continual renewal of pond water or treatment of stagnant water is essential to avoid fungal infections, particularly in hatchlings up to a year in age. Another common problem encountered is bacterial disease, particularly when pond salinity drops. But the main problem appears to be the diet. In this regard, various foods were tested and it was shown that the lack of suitable food available locally at low cost makes small-scale turtle farming unfeasible under Island conditions.

A final report is in preparation.

3.3 Bêche-de-Mer sub-project

Three training courses in bêche-de-mer processing were financed by the SPC during 1977 from the 1977 budget: two under Item 3003 and one under Item 7400, "Inter-territorial study visits and travel grants". In addition, approximately one thousand booklets on bêche-de-mer in the islands of the South Pacific were reprinted for the benefit of fishermen.

The courses were organized by the Department of Fisheries of the Solomon Islands for the trainees from Tuvalu and the Gilberts and by the Department of Fisheries of Fiji for the trainee from Tonga. The SPC wishes to express its deepest gratitude for the valuable assistance given by these two countries in the field of regional co-operation.

These courses, lasting from two to three months, dealt with the collection, processing, storing and marketing of "trepang". They also enabled students to become familiar with certain fishing techniques such as livebait skipjack fishing and to recognize and solve

problems encountered in other countries in the field of development. Keen interest in bêche-de-mer production has been shown by several countries and territories, in view of the growing demand for this luxury item on international markets, and the Commission has received several applications for training in 1978.

4. Ciguatera Toxins (ref. WP.4)

5. Various other specific operations

5.1 Sea mounts in the New Hebrides

Sea mounts are of increasing economic importance. Some hitherto unexploited resources have, in fact, recently been discovered in the Hawaii Islands. Mapping and prospection of these zones are vital in the New Hebrides, the Solomon Islands, Samoa etc. Following the discovery of sea mounts in the New Hebrides during the geophysical campaigns conducted by ORSTOM, an agreement was concluded between the SPC and ORSTOM for the latter to carry out an exploratory campaign with the oceanographic ship, "VAUBAN". For various reasons, the prospected areas appeared to be not proper sea mounts but slopes on the outer reef. However, results of bottom line and trap-net fishing operations were encouraging in certain areas. A similar campaign is planned for 1978.

5.2 Evaluation of lobster resources in the Gilbert Islands

At the request of the Gilbert Islands, a two-week mission was conducted by the lobster project officer, M.J. Prescott, who was accompanied for one week by the Fisheries Adviser. Following this mission, a report was sent to the Gilbert Islands.

5.3 Aquaculture

The SPC received a request for assistance and advice on farming techniques of fresh and seawater and of different types of bait-fish for skipjack fishing (the New Hebrides, American Samoa, Western Samoa). M.A. Michel from CNEOX in Tahiti acted as consultant.

5.4 Marine Turtles

Dr. Balazs from the University of Hawaii conducted a mission to decide the future of the SPC Turtle Project. His conclusions substantiated those drawn by the last Fisheries Meeting. As a result of his recommendations, the SPC took out a subscription in favour of all the Fisheries Departments in the area to the "Marine Turtle Newsletter" published by the International Union for Conservation of Nature (IUCN).

5.5 Fisheries Development in the New Hebrides

The Fisheries Adviser received a request from the Condominium to take part in discussions concerning the establishment of a Fisheries Development Plan in the New Hebrides and a report was drawn up accordingly.

6. Review of recommendations adopted by the Ninth Regional Technical Meeting of Fisheries (convened in Noumea, 24-28 January, 1977)

B. WORK PROGRAMME (1978)

As discussed by the Planning and Evaluation Committee in May, 1977, and approved by the South Pacific Conference (convened in Pago Pago, 24-30 September, 1977), the Work Programme stands as follows:

* Deep Sea Fisheries Development Project	5,034,300 CFP
* Training course on Bêche-de-mer Processing	436,500 "
* Awards for In-shore Fisheries Training	(no award)
* Short-term Consultants	780,800 CFP
* Regional Technical Meeting on Fisheries	465,600 "
* Research on Fish Poisoning	3,540,500 "
* Workshop on the Implications of the 200-mile Exclusive Economic Zone (EEZ) for South Pacific Countries	2 134 000 "

1. Deep Sea Fisheries Development Project

For 3 years the SPC Work Programme included an Outer Reef Artisanal Fisheries Project which was based successively in the New Hebrides, Western Samoa, the Cook Islands, Tuvalu and finally in Gizo in the western region of the Solomon Islands. The development of this project revealed difficulties within its own intended objectives, with the result that the following recommendation was adopted by the Ninth Regional Technical Meeting on Fisheries (convened in Noumea, 24th-28th January, 1977):

Recommendation No.15: "The Meeting recommended that the SPC Outer Reef Artisanal Fisheries Project be terminated at an appropriate time as determined by the SPC Fisheries Adviser".

All operations concerning this project were discontinued at the beginning of February, 1978.

There is however a need for future deep sea fisheries trials and the Planning and Evaluation Committee (convened in Noumea, 23rd-27th May, 1977) therefore recommended that the efforts of the SPC be redirected accordingly. In accordance with this recommendation, the Seventeenth South Pacific Conference (held in Pago Pago, 24th-30th September, 1977) adopted the Deep Sea Fisheries Development Project. (DSFDP).

The South Pacific Commission will use boats belonging to fishermen or the local Administration rather than its own for this new project in order to be able to offer appropriate advice and practical training by demonstrating deep sea fishing gear and techniques adapted to local conditions. Fishing on the outer slope of the reef will be a particular point of issue.

This project will require less financial assistance and the Project Team will consist of a Master Fisherman and a Fisherman. These Officers

will conduct missions lasting from one to three months, as the case may be, at no expense to the host country except for running costs of the boats operated by local skippers and salaries for trainees.

The team from the Commission will provide basic equipment and fishing gear. The SPC Master Fisherman and Fisherman will not necessarily work together at the same time nor in the same place.

Several official and unofficial requests have already been received at Headquarters, from American Samoa, Tonga, Niue, the New Hebrides and the Trust Territory of the Pacific Islands.

2. Training course on Bêche-de-Mer processing

In addition to funds from the ordinary SPC budget, an award of CFP. 450.000 has been granted by the CFTC. This award can obviously only be used for the training of Commonwealth nationals.

Six official requests have been submitted to date, by Tonga, Western Samoa, the Gilbert Islands, French Polynesia, the Cook Islands and New Caledonia, making up a total of eight trainees.

These courses will be hosted by the Solomon Islands and Fiji, thanks to the extreme generosity of the Fisheries Departments in these two countries. Although the SPC covers travel costs and per diem for the trainees, it should not be forgotten that these courses place an additional onus on the host countries and their spirit of regional cooperation is to be highly commended.

3. Awards for In-shore Fisheries Training

No financial provision was made by the Conference for grants to enable students to spend one or two years in applied research on certain species of marine life (green mussels, oysters, marine turtles, trochus and mainly bêche-de-mer). Such research is essential, especially as far as bêche-de-mer is concerned, for virtually nothing is known at present of the fundamental biological data vital for the exploitation of these resources (fertility, lifespan, growth, stock repletion, ecology etc.)

On the other hand, the aquaculture project will probably be financed under Item 7401 "Inter-territorial Study Visits", which concerns all SPC activities. In addition, the CFTC has awarded approximately CFP 1.100.000 to cover training courses in aquaculture for students from Commonwealth countries.

4. Short-term consultants (ref. Seminar on albacore)

A great deal of long line tuna fishing is occurs within the area of the South Pacific Commission. Since this type of fishing is carried on by foreign fleets (from Japan, Korea, Taiwan) statistical data are not available, and keeping abreast of the development of catches from one year to the next proves difficult. In view of the establishment of the 200-mile Exclusive Economic Zone, it is vital to have as accurate an idea as possible of the quantity of fish landed within the 200 miles of each country and territory. This is the purpose of the mission conducted by Mr Klawe, results of which will be discussed during the Seminar on albacore.

5. Regional Technical Meeting on Fisheries
6. Research on Fish Poisoning (ref. WP.4)
7. Workshop on the Implications of the 200-mile Exclusive Economic Zone (EEZ) for South Pacific Countries. (ref. Seminar on the Law of the Sea and the creation of the Regional Fisheries Agency).
8. Other Business

This item covers various activities which the SPC intends to undertake in 1978 (some of these arise from recommendations made by the Ninth Regional Technical Meeting on Fisheries which had hitherto been shelved through lack of time).

- Regional Technical Fisheries Directory;
- Fisheries Newsletter;
- Handbook on the live storage and transport of lobsters for the benefit of fishermen;
- Directory of Fisheries regulations;
- Funds for aquaculture consultants;
- Exploratory studies of sea mounts in the New Hebrides.

C. PROPOSED THREE YEAR WORK PROGRAMME (1979 - 1981)

Each year the Secretariat of the South Pacific Commission is required to submit proposals for a three year Work Programme to the Planning and Evaluation Committee (held in May) and also to the South Pacific Conference (held in September). The fact that the working documents for the Planning and Evaluation Committee must be circulated throughout the region by mid-March, prevents the Fisheries Meeting from examining these proposals. It is therefore intended to hold future Fisheries Meetings in October so that their recommendations may be taken into account when the Work Programme is being drawn up.

The following table is a summary of proposals to be discussed by the Planning and Evaluation Committee in May and which were recently sent out to the various administrations of the countries and territories in the area. They include certain actions considered necessary for regional Fisheries development. If any of these seem inappropriate or others, that have been omitted, appear necessary, the Secretariat would welcome suggestions from Fisheries officers and do its utmost to communicate them to the Planning and Evaluation Committee or, if it is too late, to the South Pacific Conference.

THE SPC THREE-YEAR (1979-1981)
WORK PROGRAMME PROPOSALS IN MARINE RESOURCES

	<u>1979</u>	<u>1980</u>	<u>1981</u>
1. <u>Assessment of the resources and fishing techniques</u>			
- Skipjack Survey and Assessment Programme (1) (2)	+	+	
- Deep Sea Fisheries Development Project (DSFDP) (1)	+	+	+
2. <u>Management and/or conservation</u>			
- Regional Training Course on Skipjack (1) (2)	+		
- Workshop on Outer Reef Resources Management (1)	+	+	
- Workshop on Marine Turtles (1)			+
- Workshop on Tropical Lobsters			+
- Short-term Consultants (molluscs, aquaculture etc.) (1)	+	+	+
- Expert on Fisheries data collecting processing and analysing	+	+	+
3. <u>Processing</u>			
- Training course on bêche-de-mer processing	+	+	+
- Expert on fish processing	+	+	+
4. <u>Awards and grants for applied research and training</u>			
- Awards for research studies (Bêche-de-mer biology, oyster and mussel farming, aquaculture of lobster biology of deep bottom fish etc.)	+	+	+
- Awards for training in fisheries and aquaculture	+	+	+
- Research on fish poisoning	+	+	+
5. <u>Collection and dissemination of information</u>			
- Regional Technical Meeting on Fisheries	+	+	+
- Expert Committee on tropical skipjack (2)	+	+	+
- Fisheries Newsletter	+	+	+
- Regional Directory on Fisheries	+	+	+
- Regional Directory on regulations	+	+	+
- Handbooks (fishing gear, processing, lobster, turtle etc.)	+	+	+

(1) Already approved by the Seventeenth South Pacific Conference (Pago Pago, 24 - 30 September 1977) for 1979 and/or 1980.

(2) Oceanic Fisheries Programme.



WHEN AITUTAKI WAS WHALING

As early as 1776 British whalers hunted the sperm whales off the coasts of Chile and Peru and down into the Tasman Sea. Later, large numbers of American whalers left the Atlantic for the Pacific Ocean where already the French and British were active. Thus, hundreds of whalers cruised the southern seas, calling at Pacific islands to take on provisions and to render down the oil which they transferred to barrels to be shipped to other countries.

The beautiful tropical islands were like paradise for the hard-worked crews after months of rugged life at sea. The prospect of fresh fruit, vegetables, pork and chicken was something to dream of, and they'd heard of the beauty of the Island girls. They were prepared to pursue the girls along the coral sands and into the coconut groves, but tales are told that soon after dark when the ships anchored, lithe young brown skinned girls would clamber up the sides of the vessels. With their long

black hair glinting in the moonlight, and their wide smiles revealing perfect teeth, they would welcome the sailors to their island and when they swam back to the beach with the trinkets they'd been given and told of the friendly men, they had status indeed. To this day on some of the Pacific islands the native girls prefer to marry Caucasians and there are many happy couples of this mixed alliance.

In the Cook Islands hundreds of whaling ships called at the island of Aitutaki, as it has the biggest and most sheltered harbour in the group, but when steel replaced whalebone, known as baleen, and Pennsylvanian oil took the place of sperm oil, during the middle of the last century, whaling began to decline.

Rarotonga had a large number of whale boats for the islanders to use for harpooning whales for their own people. The men harpooned the whales by hand, puncturing the lungs with their long killing irons. They risked attack from sharks as they jumped into the water to quickly stitch up the mouth before the lungs could fill with water and cause the mammal to sink. The sight of blood issuing from the blow hole indicated a kill, but was also an attraction for sharks.

Days were very busy for the

family when word was passed that a whale had been killed. Fruit and vegetables were quickly gathered as everyone hurried excitedly to the beach to stay a few days.

Slabs of meat hacked from the carcass were cooked with the vegetables, and so they feasted, laughed, sang, danced and played music on their handcrafted instruments, and drank their own brewed "bush beer." The celebrations ended when the last of the whale meat had been eaten.

Many tales are told of the days when time was more precious than money. When folk grew and gathered and shared the food among their families. They were hard workers but they were richly rewarded by the harvests from the land and the sea.

One of the most fearless of the Rarotongan men used to leap upon the whale's back to harpoon it. Sometimes when things didn't go quite as well as planned a harpooned whale would tow the boat around amid laughter and shouts from the crew.

It is recorded that the last whale to be killed in Rarotonga was during the early part of this century.

These days it is a rare sight to see a school of whales cruising along outside the reef, although they are now safe from harpoons. ☺

Beaufort force 2 3 4 5 6 7 8 9

OCEAN AREA EAST OF THE PHILIPPINES

January	5	23	31	21	13	5	0
February	13	21	37	17	7	2	0
March	13	29	26	19	12	1	0
April	18	37	22	8	3	0	0
May	29	36	22	3	1	0	0
June	27	31	25	3	2	2	0
July	26	30	17	9	4	2	1
August	20	27	21	14	3	2	0
September	27	26	14	7	4	5	1
October	23	27	26	10	2	2	1
November	11	21	33	19	8	4	0
December	9	17	31	17	14	5	2

RAINFALL RECORDS

ISLANDS	AVERAGE ANNUAL RAINFALL, INCHES	YEARS OF RECORD	SOURCE
Marshall Islands:			
Eniwetok	53	5	1
Ujelang	77	16	1
Wotje	78.2	4	2
Kwajalein	107	8	1
Arno	120(?)		3
Jaluit	157	25	2
Caroline Islands:			
Mokil	100(?)		4
Kapingamarangi	80-100(?)		5
Lamotrek	104		6
Kayangel	150(?)		7
Ulithi	114.31	2	8
Line Islands:			
Palmyra	149.72	1	8
Johnston	32.90	2	8
Washington	122.00	7	9
Fanning	81.00	41	9
Christmas	58.00	12	9
Malden	28.00	33	9
Flint	(56.00)	8	9
Penryhn	70.98	14	10
Northern Cook Islands:			
Manihiki	94.74	14	10
Pukapuka (Danger)	109.42	14	10
Palmerston	82.82	11	9
Tokelau Islands:			
Atafu	114.70	24	11
Phoenix Islands:			
Canton	17.32	14	8
Sydney	41.41	3	12
Gardner	46.06	4	12
Hull	32.68	3	12
Raised a toll:			
Ocean	82.34	2	12
	471		

Gray book

- COOK ISLANDS -

from Steve Karikana -

"Palmerston probably has most number of nesting turtles (~80 people); he lived Perryhn for some time (*toxic fish on reefs) - Perhaps this island is second. Turtle called "onu" - hawkbill also known. He knows of three methods to catch turtles (1) A Perryhn smooth sand extends out into lagoon, then drops off abruptly to blue water. Three to five days after full moon, incoming tide, water is knee deep to waste deep over sand area. Natives space themselves out from shore to blue (at 30 intervals) and quietly, with no lights, walk along until turtle is sighted. This is made easy because turtle is frightened and takes off like a "submarine" for deeper water. Position of turtle is told to people (in or out) and chase is given. Caught by hand - all sizes. It is said that turtles come up to feed - seaweed found in stomach (2) Group of people swim in water ~ 50' deep and encircle a turtle, keep it in circle and try to keep it from surfacing for as long as possible - When it does surface it takes one breath and goes straight to the bottom and lies still - it is then grabbed by hand, or gaffed behind the neck. (3) A waiting

pair of turtles has as many as 10 males around waiting for their turn. The female is captured and a rope noosed around her front wing - subsequent males that mount are then captured.

at Northern Islands - "famine is considered absence of tobacco"

^{Don}
from Brandon -

At Palmerston - 15 turtles are raised from eggs by each family, held 1-3 months and released (or preserved). 4-5 turtles each year are brought to Rarotonga market.

from Nane - Brandon's girlfriend -

In 1976 six turtles were brought to Raro from the north - meat sold for 20\$1b - just a few weeks ago meat bought 40\$1b - shell of big ones bought \$50.00.

In 1976 40-50 turtles were taken at Penryhn for shells alone - few got to Raro - apparently sold to ships.

from Desmond Clark's wife - one of islets at Pukapuka has nesting - turtles taken here must be shared.

Japanese - Korean - Taiwan ships stop (large lagoon) since 1950's.

from Tom Wickman - Manihiki - turtles nest there but people kill them and take eggs and hatchlings. Turtles are raised to a small

STORING
fish pond

Wickham
continued

- COOK ISLANDS -
PAGE 3

Size, gutted and injected with formalin -
sent to NZ for gifts (or trade).

Palmerston - Also inject partially reared turtles
with formalin. Estimated that within
last five years people have seen a decline
in the number of turtles - Island council
has passed a law prohibiting use of spearguns -
turtles can only be taken by hand. On both
islands, they apparently let them rest a few
times - can't predict when they will return
to lay. People at Palmerston have many
turtle shells - used for covering ovens. However,
when not cured properly they rot.

Hawksbills also said to be found in
north islands, but not known to what
extent, or if they nest. Last time
Tom's store had turtle meat they experienced
difficult time selling it at 30¢ lb. People not
familiar - didn't want it. ^{Free} Floating cages made
of bamboo used to hold turtles in Palmerston lagoon.

Australian carpenter (Gerry's husband) - he saw a
hawksbill shell from Pukapuka. Two-three
months ago turtles were brought from Palmerston -
2 were kept at Rarotongan Hotel - tethered into
ocean for tourists to see. eventually killed.

Matafo Matafo's house - He spent 4-5 days
on Perryhan, brought back a few hatchlings
on plane. held in bathtub by house.
lets.

At Namihiki - stone wall fish pond used to
hold ²⁻³ turtles.

- COOK ISLANDS -

from Weins -

? see Bryan 1941

"Gill said that several species of turtle - loggerhead, hawksbill, green turtle, etc. were very plentiful on Rakahanga in the breeding season."



WORLD WILDLIFE...

the New Zealand scene

by Arthur Feslier

Every time I meet Sir Henry Wigley I get the feeling he would prefer to be somewhere else.

The reason is no reflection on either of us; it is simply that our meeting places are always confined: we are enclosed in an office, in an aircraft passenger cabin, a crowded conference hall. And despite his outstanding and recognised accomplishments in business and administration it is soon apparent in any conversation that the Chairman of the Mount Cook and Southern Lakes Tourist Company Ltd would rather be outside, in air which is conditioned by nature, not by machines.

His natural habitat is the environment in which he was nurtured: among our lakes, rivers, mountains, rocks, bush — and in earshot of the wild life which inhabits these lovely solitary places.

It is Sir Henry's affection for our country's open spaces and his sensitivity towards our imperilled environment which brought him a hand-written letter from the Governor-General requesting him to accept an additional task in his energetic life as National Chairman of the World Wildlife Fund of New Zealand.

Sir Denis Blundell was obviously aware that if you want a job well done you should find a busy man to do it. But he knew, too that the heritage of the Wigley family went deep into the recesses of New Zealand's most remote areas. Sir Henry is personally aware of the awesome hazards facing New Zealand's native fauna, especially the birds which have become in recent times the target for destruction by predators of many types — both animal and human. From his earliest boyhood when his father, Rodolph, encouraged the then "Harry" Wigley and his five brothers and sisters to observe and study the wildlife in the Mount Cook area, Sir Henry has never lost his enthusiasm. In a recent conversation, he said, "Every day I drive into town from my home in Redcliff's past the estuary. It's an area full of wildlife and on those flats I've counted 17 different species of bird from godwits in season to herons.

"However," he explained, "these days, sadly, there is less to observe. We have been cruel to our wildlife." Sir Henry points out that many of New Zealand's unique birds developed over the centuries in an environment where fear was unknown. Except for an occasional falcon there was nothing to prey upon them and many, as we know, lived on the ground rather than in trees.

"But when man came, bringing with him rats and cats and weasels and stoats, and the large game animals he inflicted irreparable damage on the original natural New Zealanders."

"For this reason our family for four generations has been concerned. Beginning with my father and his six children, my own five, and now my 13 grandchildren, we are all enthusiasts to preserve the heritage of our wildlife. We cannot bring back the dead ones, but we can set out to preserve and hopefully increase those others which remain."

Sir Henry has hard things to say about lakes with man-made fluctuating levels. "This can be disastrous because — taking only one aspect — it kills off shoreline growth which likes to get its feet wet. For example, when manuka dries out, it dies; so do the insects which can live nowhere else and hence the insect-feeding birds starve. It brings an imbalance to nature, ruining the cycle of life and regeneration."

Questions: In his new role as National Chairman of the WWF in New Zealand Sir Henry answered questions posed by NAC's *New Zealand* about the World Wildlife Fund.

Question: What are the origins of the Fund?

Sir Henry: It's an international organisation whose task is to conserve nature in all forms.

Q: When was it formed and by whom?

A: In 1961 by a group of IUCNRR scientists, but soon came under the leadership of Prince Bernhard of the



World Wildlife Fund symbol

Netherlands. (IUCN — International Union for the Conservation of Nature and Natural Resources)

- Q:** You say it is international in scope. Has it achieved anything on the world scene?
- A:** Certainly. It has worked closely with its associate organisation the IUCN-NR, and has devoted over \$20 million to help 1,200 projects in more than 70 countries.
- Q:** What are its purposes for New Zealand?
- A:** We aim to complement and assist the work of our many environmental organisations. Let me make it clear that our role is that of a funding body, and educational too, so that we can bring money and attention to the work of those well qualified to handle projects in the field.
- Q:** Are only New Zealand "natives" covered by your efforts or are "imported" species also included?
- A:** Only native species are in danger. Therefore, imported fauna are not directly involved. Indeed, to preserve indigenous species, we would financially support and aid in the eradication of others such as cats, rats, thar, weasels and stoats. These prey directly on our birds or destroy places where they live.
- Q:** Will money collected in New Zealand be spent only in New Zealand?
- A:** That's a yes-no answer, in a way. We plan to raise \$50,000 in the next year or so from New Zealand people. You can tell them that New Zealand projects have priority but we could be called upon to assist overseas. WWF has a type of ebb-and-flow system right across the world and we in New Zealand have already had generous aid from contributors abroad. For example, overseas funding has helped

research for the preservation of the kakapo.

- Q:** This raises the point of what species in New Zealand are in "immediate danger?"
- A:** The takahe, kakapo, Chatham Island robin are three living examples. But, additionally, certain ground areas ranging from the mangrove swamps in the north to places adjacent to hydro projects and others in the high mountains all need assistance. And out there in the Pacific, the coral reefs, so popular with the tourists, are in grave danger, as are tropical rain forests in Asia. And, of course, whales.
- Q:** Does WWF go out into the field?
- A:** Not directly, because this type of work is left to experts. But WWF funds them by aiding, for example, Wildlife Service, Forest & Bird Protection Society and other meritorious and useful people. I stress again that WWF is a co-ordinator, bringing a balance, a fusing of all conservation efforts. We will provide some pretty strong muscles to help carry out these projects.
- Q:** Do you receive support from the Government?
- A:** Yes. Our small staff of officers in Wellington share space with the Nature Conservation Council and the secretary of the NCC is now also secretary of WWF. It's a generous thing to do — sharing facilities and people through the cooperation of the Lands Department.
- Q:** Are workers paid?
- A:** The secretary is paid by Internal Affairs. Our Executive Director is not. The people who work in the field for the organisations supported by WWF monies are sometimes salaried; others are often volunteers

for their causes. They are not our employees. We've only been going for 18 months or so in New Zealand, but one day, hopefully, we'll have a fully paid executive.

- Q:** Do you see inconsistencies between the efforts of WWF and other areas of work in which you personally have done so much? Tourism, for example?
- A:** Not at all. There's no inconsistency. The efforts are entirely complementary. There's no conflict at all. People concerned about wildlife can only benefit tourism because their work will enhance or preserve the very attractions people come to see. All New Zealanders must have a direct interest in what our country can show them as residents, and show visitors from other places.
- Q:** Any final comment?
- A:** I like to think I'm planning something which will be recognised 500 years from now.
- Q:** Five hundred years. That's a long time. Would you explain?
- A:** Well, we've done so much to imperil wild life in the past one hundred years that it will take us a long, long time to help nature readjust its balance. If we can drum up support from the ordinary human Kiwi in the 1970s, we'll see some improvement by the 1980s. If we keep the thing moving it's not too much to hope that generation after generation of New Zealand families will live in a country which will grow noticeably more lovely by the year.
- Q:** And you see the Wigley family continuing in this role for five hundred years?
- A:** Yes, why not? We've begun; and we'll continue. ●

2. The ariki priests. Three allotments were made. The Inland High Priest took precedence, the Shore High Priest came next, and the Ruler of Food came last.

3. The Temporal Lord came next to the ariki priests, with one allotment. The district chiefs (*para*) each had an allotment. The subdistrict chiefs (*kairanga nuku*) of each district were grouped together as the *'ai rangatira*, and each group had an allotment. Each allotment was so arranged that subdistricts (*tapere*) would have an even share of the food provided. After the allotments were called, the subdistrict chiefs of each district divided the allotment into shares corresponding with the number of subdistricts. Each subdistrict chief then divided up his share between himself and the lesser chiefs in his subdistrict.

4. The people. A long, single spread was laid for those without any title or distinction. After the allotment was called, persons of both sexes sat down on either side and ate as at a long table.

Sometimes a district held a feast in which the subdistrict chiefs were given individual allotments, and their titles were called. The share of food was awarded to the title (*tao'anga*) and the *kairanga nuku* had to eat the food himself. It was tapu to him and he could not give any to his wife.

Once a *kairanga nuku* of Veitaei named Ouro took a portion of food home to his wife from a district feast. The district chief was informed of this lapse in custom. At a later feast of a similar nature, Ouro was not awarded a share. Ouro, not knowing of the punishment that awaited him, attended the feast. The Ruler of Food, on seeing him, called out, "Ei miri koe, e Ouro." (Take your place behind, Ouro.) Ouro was thus publicly relegated to the common lot with the mass of the people. The punishment of being publicly shamed was acutely felt and acted as a safeguard to established custom. The act was promulgated in song:

Te ua o te rangi ei miri au e.

I karanga Mauria mei kai koe i anga'uru.

E Ouro 'oki te tu'itu'i i kai rava,

Kua rarerare tapiri koe koi'o.

The-rain-from-heaven is placed behind.

Mauria called, "You may eat with the many."

Ouro should have eaten all even to repletion,

But he took food away and now shrinks against the wall in shame.

Note: The-rain-from-heaven referred to Ouro's title as a subdistrict chief; while Mauria was the Ruler of Food.

The allotments having been satisfactorily set out, the official Ruler of Food took charge and called the feast (*nana e tuoro te takurua*). The first call (*tuoro*) was a general one and took the following set form:

Putunga a kai

Na Ruanuku, na Tangaroa,

Na te anau Atea—

E tini—e mano.

Allotments of food

For Ruanuku, for Tangaroa,

For the descendants of Vatea—

(They are) numerous—(they are) myriad.

Note. Ruanuku is a mythological character who had something to do with food from the sea, and the primogeniture of Tangaroa is recognized by calling his name instead of that of Rongo.

The distributor then placated the tribal gods by giving them a small portion such as a single taro, saying,

To taro e Mоторо—a kai,

To taro e Tane—a kai,

To taro e te pupu kai ai,

Ara—a kai.

Your taro, O Mоторо—eat,

Your taro, O Tane—eat,

Your taro, O host of gods,

There you are—eat.

- Island farthest South in Cook Archipelago -
110 miles SE of Rarotonga

The Ruler of Food proceeded to call the allotments in the order given. He held a piece of banana leaf (*rauaka*) in his hand and touched the allotment with it as he called the title of the person to whom it was allotted.

The personal name followed by the title might be called. On coming to the district chiefs, the order commenced with the districts on the right from east (head) to west (tail) and then, similarly, with the districts on the left. The chief was referred to as head, body, or tail of the fish of Rongo. Thus, commencing with Parima, chief of Tamarua, the call was, "Na Parima teia, no tetā'i pauru o Rongo in Mangaia nei." (This is for Parima, one of the heads [of the fish] of Rongo in Mangaia here.) The call could be varied by saying, "Na Parima teia, no te pauru o Rongo i katau." (This is for Parima, the head [of the fish] of Rongo on the right.) The allotment of the subdistrict chiefs of Tamarua was called thus, "Na te 'ui rangatira teia, no te pauru o Rongo i katau." (This is for the assembly of chiefs from the head [of the fish] of Rongo on the right.) The other districts were similarly called by designating the part of the fish to which they belonged. The common people, when called, were referred to as the *papa mau tane* (males) and the *papa mau wa'ine* (females).

When the allotments had all been allocated, the food was collected in baskets by the various recipients and removed to some convenient place where they could eat. Except under the special rules governing the district feasts, the people, after regaling themselves, took the remainder home.

PROTECTION OF FOOD SUPPLIES

Undue depletion of various foods was corrected by declaring a closed season (*ra'ui*). In ancient times the initiation of this economic safeguard rested with the Ruler of Food (*ariki i te tapora kai*). Since the definite division of the island into six districts, each district has acted independently. The district distributor of food is one of the subdistrict chiefs who has been agreed upon by the district and subdistrict chiefs. The person selected is thus entrusted with the *rauaka* (banana leaf) at feasts and is referred to as the *kairanga nuku tei a ia te rauaka* (subdistrict chief who has the banana leaf). For brevity he is termed the *rauaka*. It is the duty of the *rauaka* to inspect the cultivations within the district and take note of all vegetable food supplies. He also inspects the lagoon within the district boundaries to note whether the catches of fish are getting smaller. Should he think it necessary, he calls the district chief and subdistrict chiefs (*'ui rangatira*) together in council. The matter is discussed, and if a closed season is decided upon the *ra'ui* is promulgated through the district, each *kairanga nuku* taking the word to his own subdistrict. The news spreads from mouth to mouth and the closed season commences on the date given out. The closed season affects the land food supplies (*'enua*) or the sea (*tai*); the two forms of closure are termed *ra'ui 'enua* and *ra'ui tai* respectively.

1. Inland closed season (*ra'ui 'enua*). The closed season on the products of the land, as taro, breadfruit, coconuts, and bananas, was promulgated by two special criers. Each crier was distinguished by a plaited coconut leaf suspended over the back and a leaflet



University of Hawaii at Manoa

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

October 27, 1977

Mr. Peter R. Wallbridge
c/o General Delivery
Rarotonga, Cook Islands

Dear Mr. Wallbridge:

Your recent letter to our University concerning the possibilities of obtaining sea turtle eggs in Hawaii for farming in Rarotonga was referred to me for reply. You will be interested to learn that some research has already been conducted in this field in the Cook Islands under a joint project with your Fisheries Department and the South Pacific Commission. Unfortunately, the results of these experiments were not very encouraging. The major problems encountered were disease and a scarcity of good, inexpensive food to feed the turtles. If you would like further information on this work, I suggest that you contact Mr. Tom Marsters of the Fisheries Department in Avarua. I am sure that Mr. Marsters would be glad to speak with you on this subject.

I should also tell you that it would not be possible in any event to get turtle eggs, either hawksbill or green, from Hawaii. All such eggs are legally protected and their taking and exporting banned.

Please feel free to contact me if I can be of any further assistance. Also, if you should have the opportunity to visit Hawaii, I would be pleased to speak with you in person here at our laboratory.

Sincerely,

George H. Balazs
Jr. Marine Biologist

GHB:md

cc: Mr. Tom Marsters

November 18, 1974

Mr. D. J. Brandon
South Pacific Commission
Post Box D-5
Noumea Cedex
New Caledonia

Dear Mr. Brandon:

Please excuse my long delay in acknowledging your most interesting letter of September 4th. You certainly appear to have a good deal of work ahead of you and I will be most happy to assist in whatever way possible.

In reviewing some of the past material which Mr. Baird has been kind enough to forward to me, two points come to mind. First, I wonder what sort of data has been or will be collected on the distribution and abundance of marine spermatophytes or algae in the Cook Islands. With reference to the green turtle, it would be advantageous to feed prepared diets during the first 6 - 8 months after hatching and thereafter utilize the animals herbivorous habits. This would consist of a "ranching" operation where grazing could take place under near natural conditions. Of course, densities and suitable bays with good flushing action would have to be given careful consideration. I believe that this may be the only intelligent direction of experimentation in view of the Torres Strait failures and the self-destructive course of the farm on Grand Canyon Island. Secondly, from a commercial standpoint, your emphasis on the hawksbill should be given further evaluation. Present laws now make it near impossible to legally import such products into many countries. As a tourist item, it would be unrealistic to market this animal knowing full well that it would be confiscated when the person returned to his or her home. It is truly unfortunate that funds are only available for research that has a commercial endpoint: as distribution and population dynamics studies are sorely needed on the hawksbill in the Pacific Islands.

Next week, I will be attending a special IUCN meeting in Miami on the exploitation of marine turtles with special reference to the implications of turtle farming. A major portion of the time will be devoted to making a formal evaluation of the conservation claims and pronouncements of Mariculture, Ltd. (Grand Canyon Island).

Mr. D. J. Brandon
South Pacific Commission

November 18, 1974
Page -2-

Please continue to stay in contact with me as your schedule permits.

With best wishes and aloha.

Sincerely,

GEORGE H. BALAZS
Jr. Marine Biologist

GHB:ec

NEW ZEALAND'S
COOK ISLANDS

Paradise in Search of a Future

By MAURICE SHADBOLT

*Illustrations by National Geographic
photographer WILLIAM ALBERT ALLARD*

TAKE A MAP and jab a pin into the heart of the Pacific south of the Equator, and with very good luck your pinprick might demolish one of the 15 tiny islands of the Cook group. Scattered thinly over 13 degrees of latitude, between the Samoa Islands and Tahiti, they're easy to lose.

Europeans began this lottery in 1595, discovering islands and losing them, and taking 228 years to find them all (map, page 208). Centuries earlier, Polynesian voyagers found new islands by losing others, eventually settling them all like wind-sown seed.

"You can sail past one in the night and never know," the skipper told me. We stood on the bridge of a tiny trading vessel, peering into a moonless night, almost a week from last sight of an island. "It's done often."

Charts told us we were near Manihiki, in the Northern Cook Islands, but we drew a blank from the dark ocean.

"Here," he said, and handed me binoculars. "You try. First focus on a faint star. Then look at the horizon for a shape, something that might be land."

He signaled half speed to the engine room, while my eyes grew used to the feeble starlight and then searched the murk of the sea.

Something seemed to be out there. A black cloud—or could it be Manihiki?

"We'll see," said the skipper, and reduced speed still further. He took his turn with the binoculars, squinting into space and then concentrating upon an ocean which seemed almost as vast and empty.

"That's it," he said. "That's Manihiki. You know how to find a Cook island now."

But I had to wait upon morning for sight of one of Polynesia's

Splintered gold of sunset silhouettes young anglers on a wave-lashed reef of Rarotonga in the Cook Islands. Their sea-scattered homeland—once a stranger to time, an idyll in the dreams of Western man—now experiments with self-government. New Zealand, which extends citizenship to the islanders, supports the brave new venture of its long-time territory.

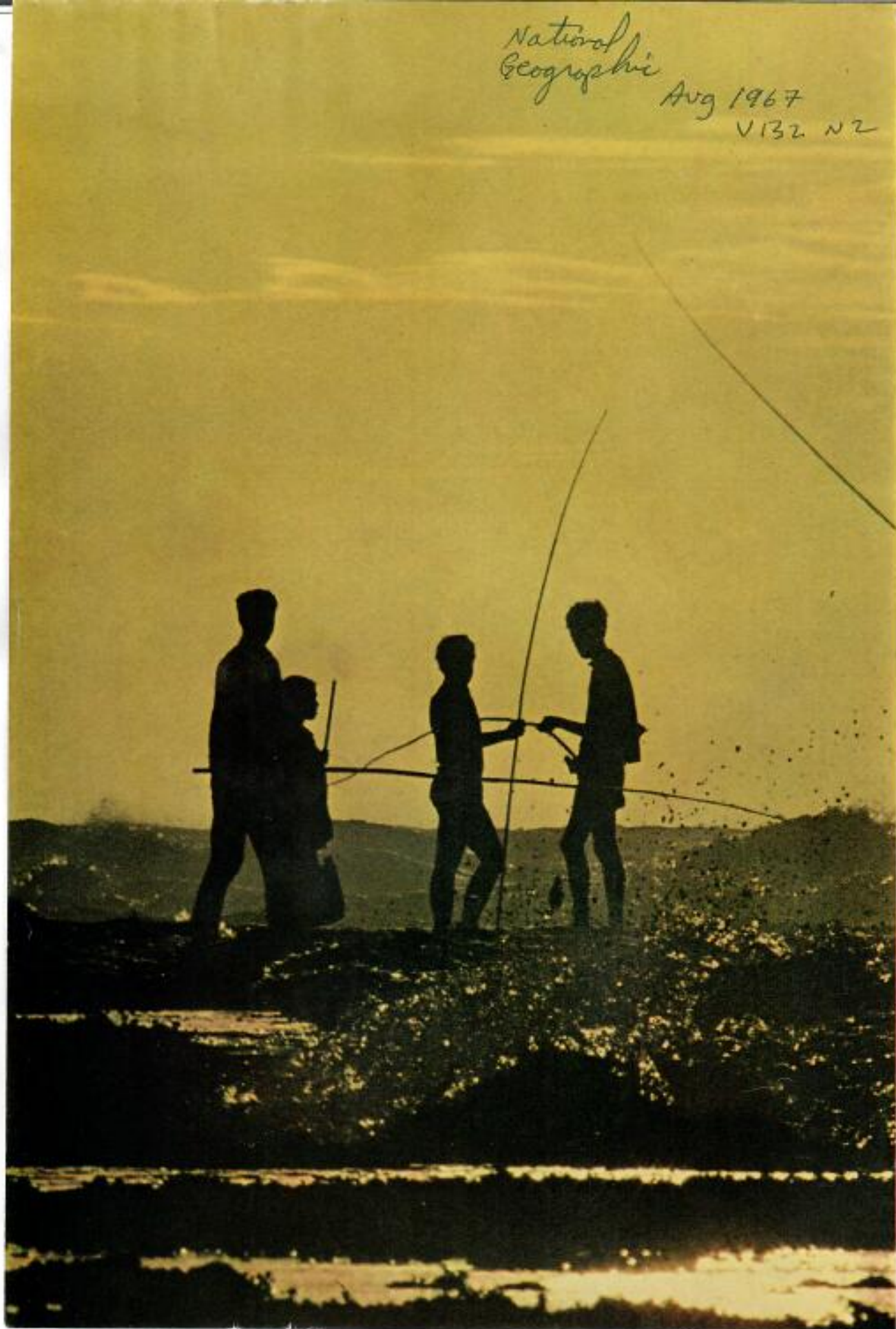
EDMUNDSON © N.G.S.

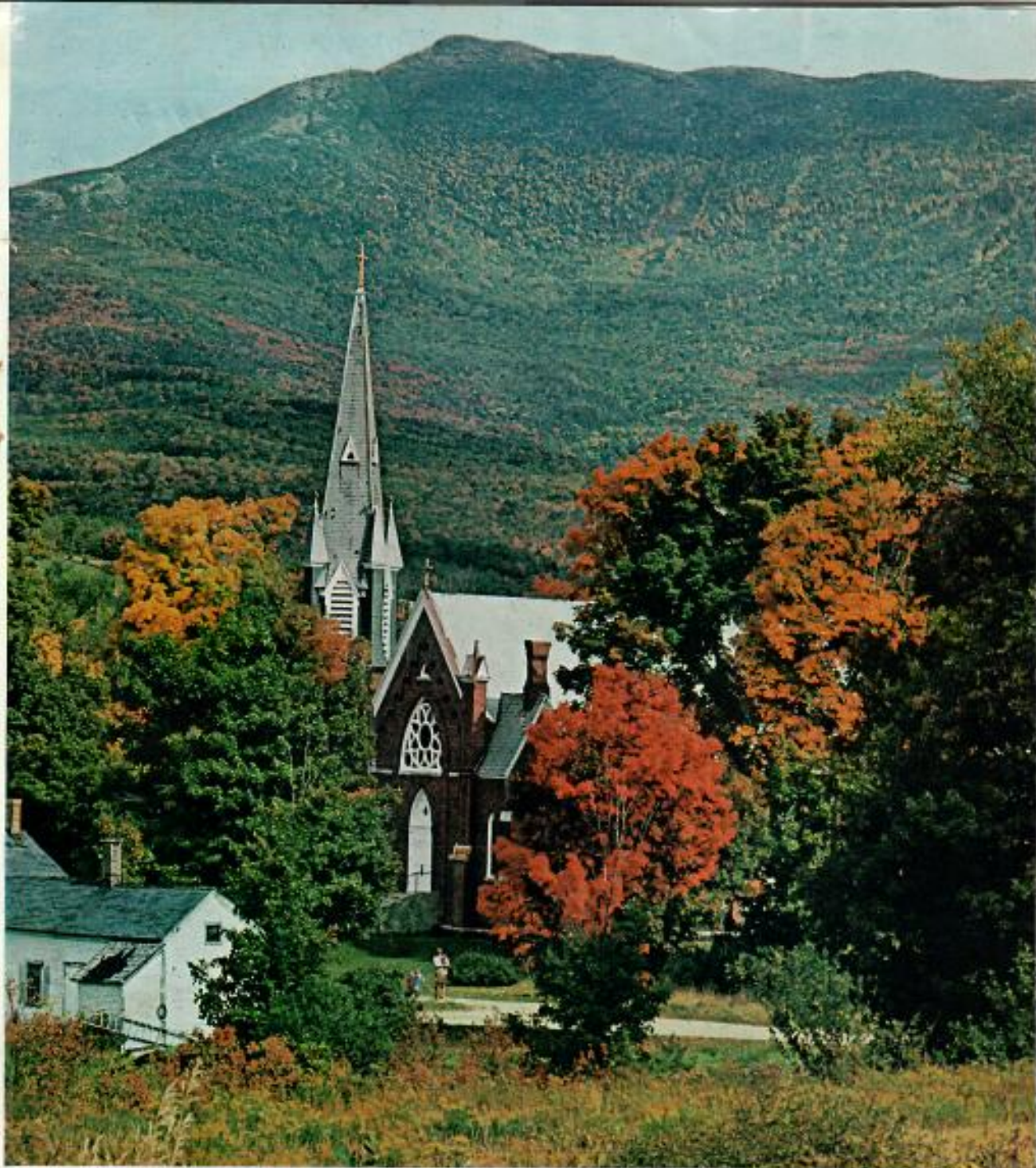


National
Geographic

Aug 1967

V132 N2





EXTERIORS (ABOVE) BY S. ANTHONY STEWART; ROOMS (THIS PAGE) BY EMBRY KRISTOF © S.A.S.

day, picking the mainstays of her prize-winning pickles and preserves. Albert faithfully turned his squashes, hoping to add enough color and girth to bring home a blue ribbon. He dropped by with some cookies from a batch Lillian would enter in the bakery division. Today he was working as town lister, reappraising property for tax purposes.

We discussed the mounting costs of country living and the difficulties of his job.

"You should have heard one taxpayer holler," he said, "when I put a fair price on a

piece of her property. Claimed it wasn't worth near what I decided."

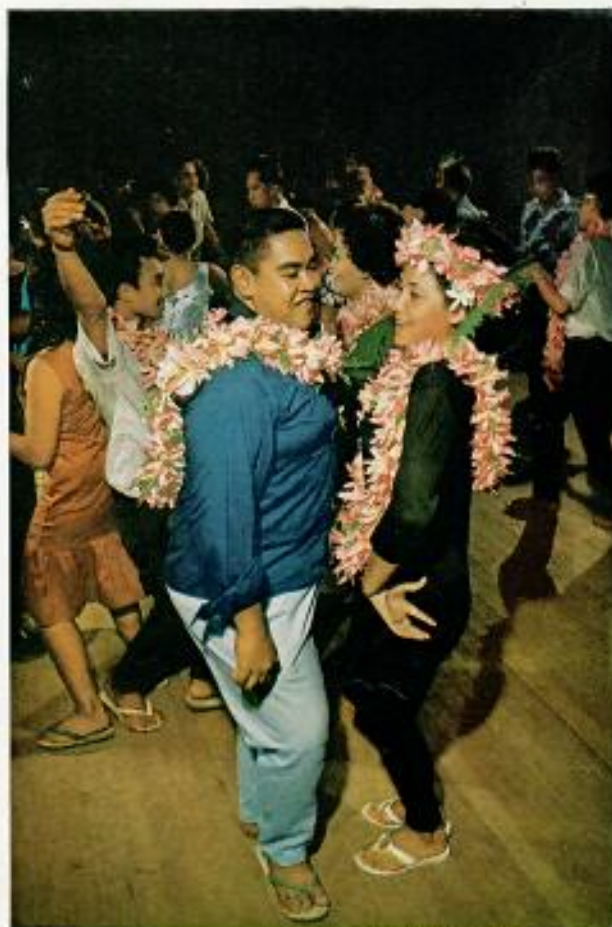
Albert took a long pull on his pipe and went on: "I admitted it was kind of brushy for cattle and maybe a mite too rocky for a homesite. But I told her she should look at it this way—it was holding the world together."

No one will ever put a better value on a plot of ground. I am obliged to Albert for saying so well what everyone knows who owns a share of Champlain country.

It's holding the world together. THE END



Sign of changing times, a scooter proclaims the affluence of a Rarotonga family. But few in the Cooks could afford such a luxury without the aid of New Zealand, which provides more than half the islands' income.



Past churns with present as partners throw a bit of twist and frug into the traditional *tamure* at a Rarotonga dance hall. Garlands of frangipani, called *eia* by the islanders, jiggle in rhythm.

KOSCHIRMED © N.C.S.

loneliest outposts. Sunrise gave color and texture to that anonymous shadow in the night.

Surf flickered along a reef where flying fish skipped. Sinewy coconut palms rose in dense green tangle above a long, low shore of pink sand and pale coral. Here and there, where palms thinned, a calm lagoon glimmered.

In a clearing stood village homes. Dark figures were shouldering boats to the surf, calling across the water.

For a moment I might have been back in

The Author: Gifted young New Zealand writer Maurice Shadbolt has contributed to the GEOGRAPHIC: "In Storied Lands of Malaysia," November, 1963; "Western Samoa, the Pacific's Newest Nation," October, 1962; and "New Zealand: Gift of the Sea," April, 1962. He and another New Zealander, Olaf Ruhen, are now at work on a new GEOGRAPHIC book, *Isles of the South Pacific*, to be published in February, 1968.

204

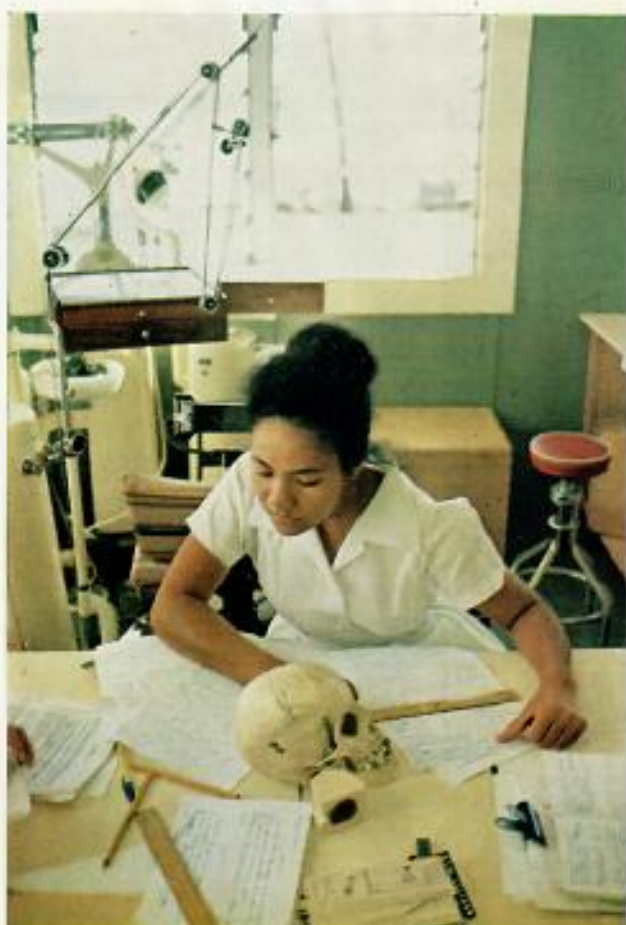
the oldest Polynesia, where virgin islands could still surprise the voyager. The haunting Polynesia of Western dreams, of the writer Melville and the painter Gauguin; the Polynesia of Rousseau's "noble savage," heaven-sent for philosopher, poet, and adventurer.

I had been under no such delusion, a week or two earlier, when radar-guided aircraft—swift jet and lumbering DC-3—winged me by stages across the Pacific to Rarotonga, major island of the Cook group.

I had, besides, some modern, down-to-earth questions on my mind: Can these out-of-the-way islands—around the corner from nowhere—survive? Can their meager resources provide a livelihood for a people bent on tackling the problems of the 20th century? If the questions themselves should surprise, then it is a measure of the tenacity of Western dreams—dreams of sunny islands garlanded



With warlike chop, a cricketer furiously swipes at a ball. Tensions that build up in insular life—once vented in almost continual strife—find release in hotly contested games of cricket, rugby, and tennis.



BLACK AND WHITE (LEFT) AND REDUCED © N.G.S.

Skull session gives a student firsthand knowledge of tooth and jaw formation in Rarotonga's dental clinic. In less enlightened times, jawbones hung from canoes, battle trophies of cannibal islanders.

with the fantasies of writer and film-maker.

For the fact is, the Cook Islands—now crossing the threshold of self-government—face hard political and economic problems for which there are no easy answers.

Yankee Lies at Avarua's Doorstep

The questions slipped from my mind when Moana-nui-o-kiva, the "Great Ocean of the Blue Sky" that Polynesians made their own in times remote, tossed green, surf-edged Rarotonga like a gift upon the horizon.

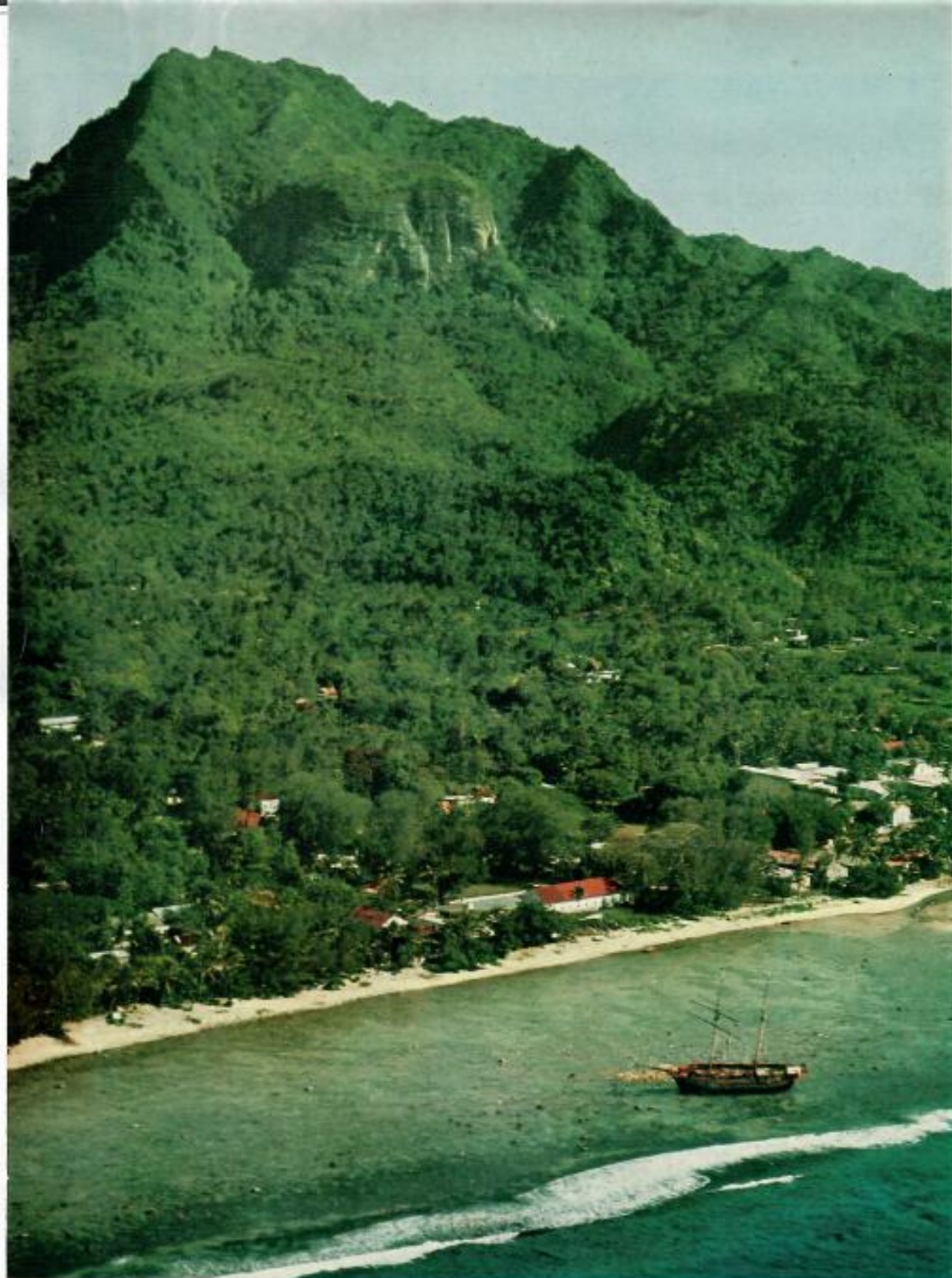
Pale transparent lagoon and long bright beach soon slid below (pages 206-7 and 219). Next came neat coastal villages and plantations and beyond them high dusky-green slopes, densely forested ridges climbing to sky-needling volcanic peaks long cooled. There was a silvery flash of falling water. The old navigators might have traded half their

precious rigging for my view. Then I had to come to ground, as they to shore.

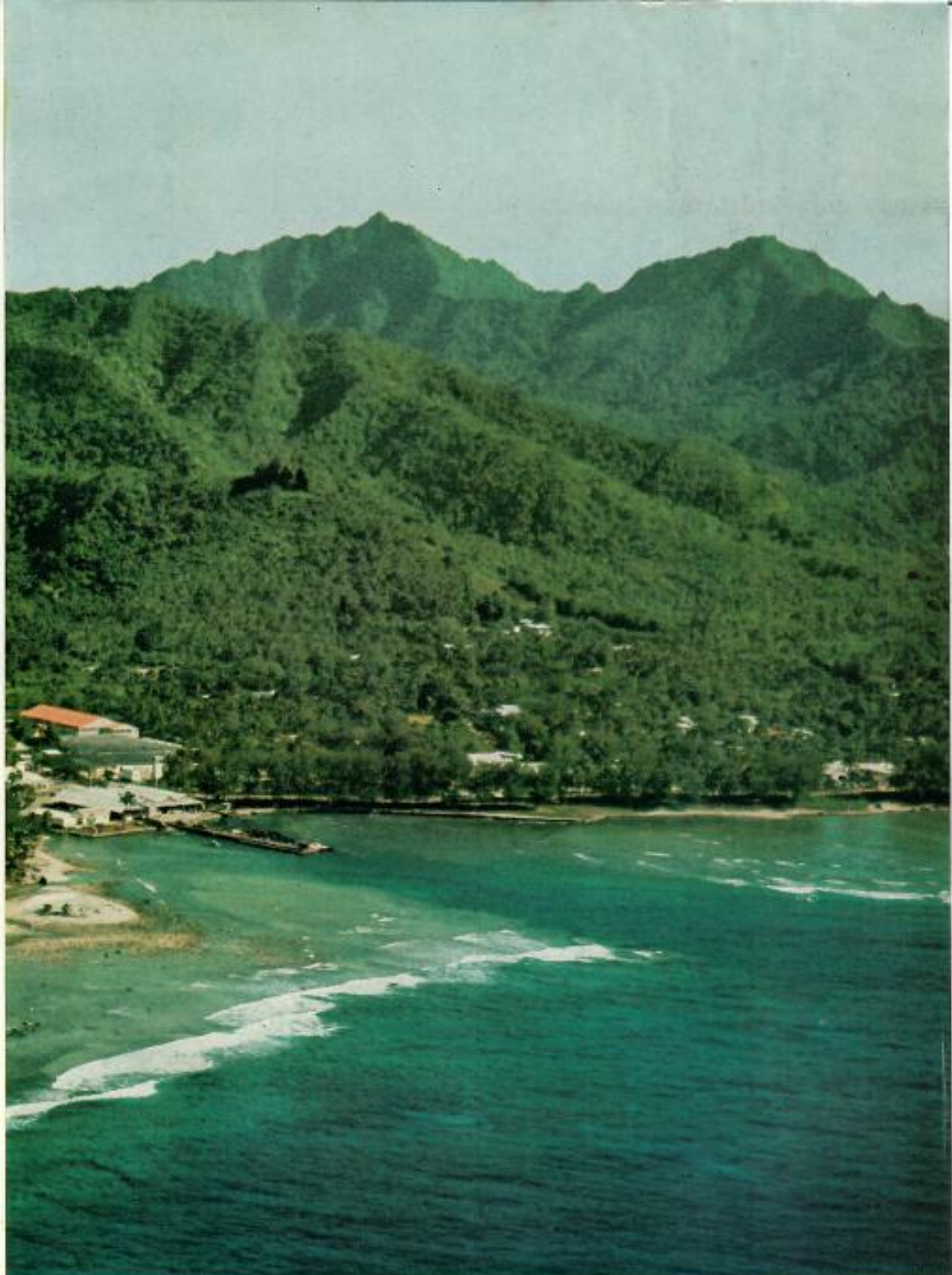
Lying off the main shipping lanes, the Cooks are only fitfully served by sea. And new international rules, which forbid the flying of DC-3's more than 90 minutes from base, have ensured that now even my engine-straining, seven-hour flight from Samoa is no more.

One of the southern volcanic islands, Rarotonga receives a monthly trading ship from New Zealand, a few cargo boats, and brief-calling tourist vessels. The rest of the group's 13 inhabited islands, especially the Northern Cooks, exist in seldom-disturbed isolation.

From the airport I traveled a smooth black-top highway into the overgrown village of Avarua, administrative center for the Cook Islands (inset map, page 208). The route cracked and snarled with motor scooters. Beyond the coconut palms lining the road,



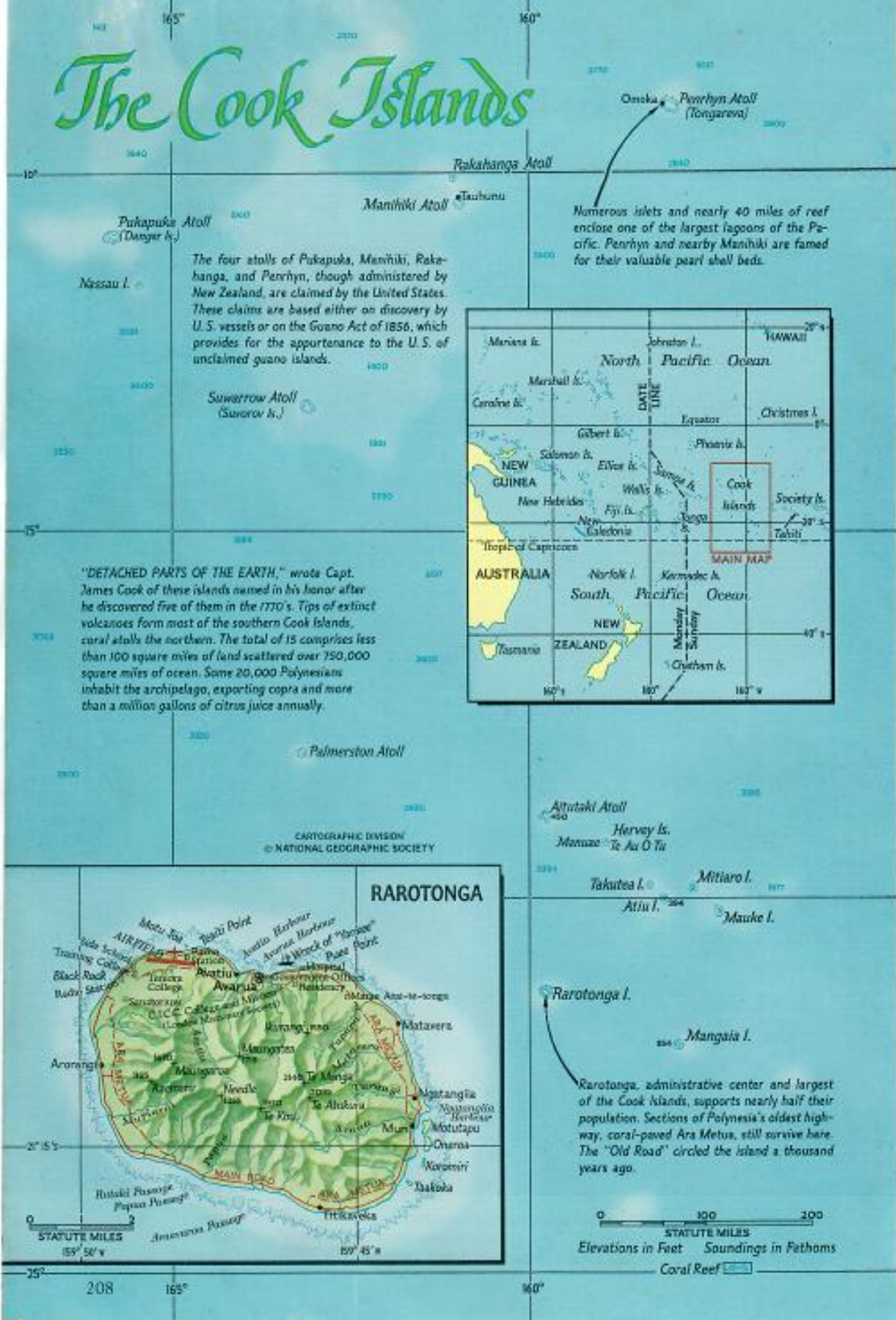
Proud peaks mantled in green and a strand of pearly surf beckon the seafarer to Rarotonga. According to island tradition, mutineer Fletcher Christian and his commandeered *Bounty* stopped briefly here in 1789 to trade, perhaps leaving Rarotonga's first



DUCHROME BY ROBERT E. JOHNSON © A.S.S.

orange seeds. Like a ghost from the golden age of sail, the brigantine *Yankee* lies in the clutch of coral off Avarua, the islands' seat of government. Former sailing home of GEOGRAPHIC author Irving Johnson, *Yankee* under new owners swept to disaster in a 1964 gale.

The Cook Islands



The four atolls of Pakapuka, Manihiki, Rakahanga, and Penrhyn, though administered by New Zealand, are claimed by the United States. These claims are based either on discovery by U.S. vessels or on the Guano Act of 1856, which provides for the appurtenance to the U.S. of unclaimed guano islands.

"DETACHED PARTS OF THE EARTH," wrote Capt. James Cook of these islands named in his honor after he discovered five of them in the 1770's. Tips of extinct volcanoes form most of the southern Cook Islands, coral atolls the northern. The total of 15 comprises less than 100 square miles of land scattered over 750,000 square miles of ocean. Some 20,000 Polynesians inhabit the archipelago, exporting copra and more than a million gallons of citrus juice annually.

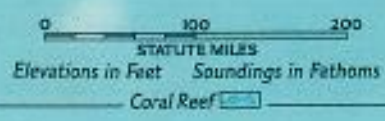


CARTOGRAPHIC DIVISION
© NATIONAL GEOGRAPHIC SOCIETY

RAROTONGA



Rarotonga, administrative center and largest of the Cook Islands, supports nearly half their population. Sections of Polynesia's oldest highway, coral-paved Ara Metua, still survive here. The "Old Road" circled the island a thousand years ago.



though, I glimpsed fishermen in outrigger canoes bobbing near the reef.

Outrigger and motor scooter, Polynesia old and new, the contrast was immediate and everywhere. Palm-thatched, log-framed huts rose beside concrete-block cottages roofed with corrugated iron; sometimes a shiny tractor stood idle in the back yard. And the slanting late-afternoon light made golden the masts of the wrecked brigantine *Yankee*, which once took crews of young sailors to adventures in paradise.* It lay hurricane-tumbled on the Avarua reef (page 206).

Maoris Embark on New Adventure

Avarua, with the untidy wood-and-iron atmosphere of a South Sea trading post, illustrates Western impact. Beached canoes may still be strewn among seafront ironwood trees, but across the road are a department store and coffee bar. A large old church tells of London Protestants who made a missionary kingdom of the Cooks in the 19th century. The collapsing palace beside it was once the home of tribal chiefs.

The heyday of the Western beachcomber may be over, but adventures are not. The Cook Island Maoris have embarked together on the greatest of them all, that of taking their destiny back into their own hands.

For in 1965 the 20,500 people of the Cooks, after 65 years of missionary lawmakers, then another 77 of paternalistic British and New Zealand rule, took over the business of governing themselves again. They elect their own legislative assembly, their own premier. Though they retain New Zealand citizenship, military protection, and financial help, their internal economic and political problems are now their own to solve—if they can.

*After many adventurous voyages around the world—and through the pages of the *GEOGRAPHIC*—the *Yankee* was sold by Irving and Electa Johnson in 1959. Sailing with new owners, she was wrecked in the Cooks in 1964. The Johnsons have since purchased a new, smaller *Yankee* for cruising the Nile and Europe's inland waters.

Hand-shaped section of a 55-foot fishing boat bears the hallmark of Rarotonga shipwright Uapa Marsters, descendant of an English sailor who settled on Palmerston Atoll a century ago. Built for the Cook Islands Government, the boat will explore deep-sea fish resources. By going beyond lagoon and reef—overfished in recent years— Islanders hope to fill the home demand for seafood, chief source of protein in the Polynesian diet. Fish now must be imported from New Zealand to supplement local catches.

Thus began a dramatic race against time, for islands are emptying all over the Pacific, and the Cook Islands are no exception. An estimated 8,000 younger Maoris, more than a third of the total population, have already left for New Zealand's urban lights.

They leave behind them the question which began again to puzzle me as I walked in Avarua: Can island communities so tiny, scattered, and loosely linked survive in the 20th century?

To move, as I did, among Rarotonga's exploding population of 10,000 is to know people of the entire Cook group, for outer islanders come here in ever greater numbers from their ancestral homes. But seldom to prosper. I found immigrants from remote Pukapuka, 820 miles away, still practicing fast-vanishing island crafts. Others from Manihiki Atoll, 760 miles north, work as factory hands, fish an overfished reef, and grow a little taro on land they can lease but never own.

"Don't you want to go home?" I asked.



STYLING BY WILLIAM ALBERT ELLARD © N.S.S.





BOATCRAFT BY ROBERT G. JOHNSON (BELOW) AND WILLIAM ALBERT ALLARD © R.S.S.



Naked to the waist, the muscular fisherman from Manihiki unshouldered the paddles of his canoe. "Of course," he said. "And one day I might, for a visit. Up there I have family land, but good only for growing coconuts. And there is no high school—not enough people. So I brought my children here. Now we're used to Raro. Some of my children have gone to New Zealand and send back money. We get along."

A typical story, yet cheerfully told.

"Promise me one thing, though," he said as we parted. "Promise you see Manihiki, the most beautiful of the Cooks. Ride out across the lagoon—and taste the Manihiki coconut crab."

His eyes were wistful as I promised. It is that faint wistful gleam which distinguishes outer islanders from the Rarotongan: a yearning for lost islands their children may never see.

Politics Cloaked in Flowers and Hymns

Yet this is still Polynesia, and unhappy faces are few. Anything can be a joke; everything can become a festival.

There was the political meeting to which I went as observer. Serious? Of course; this time most ukuleles were left at home. But the thousand-odd Maoris who trooped in from the villages were tangled brightly with fresh blooms. Flowers and passionate hymns transformed Western-style politics into something peculiarly Polynesian.

Though grievances can kindle local problems to the boiling point, internal self-government came quietly to the Cooks. There were no street demonstrations, no riots.

"I don't think we could manage a real riot," a young Rarotongan said with a smile. "Someone would be bound to start playing a ukulele, and that would be the end of it."

I took to a motor scooter to see Rarotonga.

Kiting over a spun-silver sea, tuna fishermen from Penrhyn Atoll sail to the strum of wind filling patchwork canvas. Superb sailors, Polynesians of old threaded vast Pacific reaches in outriggers and double canoes, guided by stars, prevailing winds, and charts made of shells laced to grids of pandanus. Such intrepid adventurers settled the Cook Islands, which later sent out Maori colonizers to New Zealand.

Lost in an infinity of sea, a star glows in the Pacific firmament—Manuae Atoll, or Hervey's Island, as discoverer James Cook called it. Surf breaking over the coral reef frames copra plantations. To harvest the crop, some twenty men sponsored by the Cook Islands Cooperative Bank sign up for one- or two-year stays on the otherwise uninhabited atoll.

A 20-mile road circles the island; inland lies a curious and narrow coral-paved route named Ara Metua (Old Road), built a thousand years ago. Once tribesmen lived on the inland side of this road, but missionaries insisted they move to church settlements along the coast.

Today only eroding stones along this route tell of a vanished and complex Rarotongan civilization. When missionaries directed destruction of all graven images of ancient belief, Polynesian gods were vanquished forever.

Or were they?

Old Gods Await a Change of Faith

At affluent Arorangi village, home of the island's best agriculturalists, I paused astride my scooter. Beyond the neat Protestant church and bell tower rose the flat summit of bulky 1,165-foot Mount Raemaru.

"Up there," a Rarotongan friend explained, "is where the old gods went when the Christians came. They said they would wait there until people tired of Christianity. And they would always be there for whoever needed them. You will find a track worn to the summit by feet, human feet."

The plateau on top of Raemaru seemed an entirely proper place for gods to wait, and the tradition had echo in a conversation later with Pastor Bill Marsters of the London Missionary Society. Mr. Marsters is a member of a clan famous in the Pacific. It descends from an English sailor who settled on tiny and lonely Palmerston Atoll in the Cooks a century ago. Members of the family today number more than a thousand.

He told me, "I'm afraid Christianity no longer has so strong a hold. The example of the *papaa*—the white man—has not always been good. After all, the *papaa* brought Christianity; yet the Maoris see many white men whose behavior is far from Christian. And then, of course, the original fervor for Christianity has almost gone, and often there is a reversion to old belief, old superstition."

Though nominally one hundred percent Christian like the rest of the Cook Islands, Rarotonga is also typical in its superstitions. *Tupapaku*—ghosts—can roam the night under the star-studded Pacific sky.

At Ngatangia village, still on my scooter, I met one of Rarotonga's *papaa* characters. The lean and crisp-spoken English author Ronald Syme fell in love with the island and what he calls its "wild and lovely" people at the age of 17. He returned later in life to make a home near the pale water and palm-fringed islands of Muri lagoon.

"Legends?" he said. "This place is thick with them, old boy. Take this village, Ngatangia. It means 'the people of Tangia,' a Tahitian who went out exploring and ran across a Samoan named Karika in mid-ocean.

"They would have fought there and then, except there were no spectators to applaud a victory. So they voyaged together, discovered Rarotonga, conquered earlier arrivals, and divided the island between them. Tangia lived here, and his descendants still do."

Syme's village, on the east side of Rarotonga, is historic on another account. It was here the first Europeans made recorded contact with the island's Maoris.

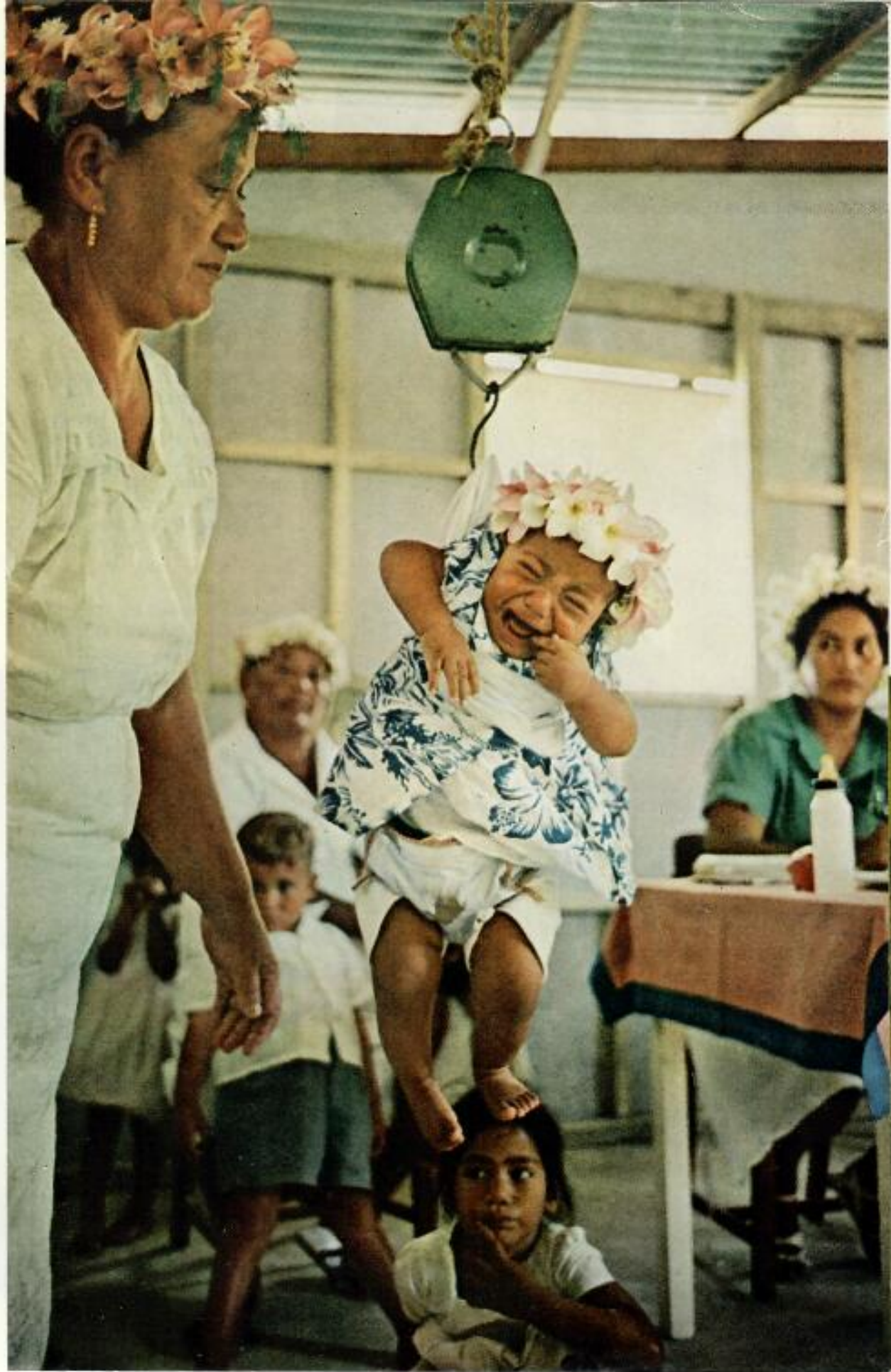
Oddly, despite its size and beckoning peaks, Rarotonga was one of the last islands to be fished from the Pacific by Europeans. Capt. James Cook, for whom the group was named, missed it. Tradition has *Bounty* mutineers trading here in 1789. Then a tantalizing glimpse from a passing vessel in 1813 led speculators in Sydney, Australia, to dispatch a ship to the island. They were searching—in vain, as it turned out—for sandalwood.

Islanders Surprised by Visitors' Garb

Under a captain named Goodenough, the *Cumberland* glided gently up to Ngatangia in 1814. From this encounter probably came the Maori word for European, "*papaa*," which means "four layers." It records the Rarotongans' surprise when they learned that the strangers wore several layers of clothing.

The *Cumberland* expedition was a complete disaster. Not only was there no sandalwood, but five of the ship's complement were slain and eaten by Rarotongans. One was Captain Goodenough's mistress, the only known European woman to fall victim to cannibals in the Polynesian Pacific. Today a dense-branching tree overgrows the spot

Dignity outraged, a pint-size patient dangles from scales at a children's clinic on Rarotonga. All citizens receive free medical and surgical treatment from the islands' Public Health Services, financed by New Zealand. A medical officer resides on each inhabited island and specialists make periodic visits. A sanatorium on Rarotonga cares for patients with tuberculosis, the Cooks' most prevalent disease. ENCLICHROME BY WILLIAM ALBERT ALLARD © 1967





EXTACHROME © R.G.S.

Left alone without a middle generation, the very young and the very old cope with problems of life on Penrhyn. Many young adults forsake their homes for better jobs on other islands or in New Zealand, leaving offspring with older relatives.

where she perished, and there, on nights of full moon, Rarotongans say her restless spirit still cries for help.

Late one afternoon I set out to visit a relic of pagan Rarotonga. Following Syme's lovingly precise directions ("Very few people go there, old boy"), I skidded my way along a rain-slippery stretch of the inland Ara Metua, gloomily overhung with huge old trees. I came to a grove of tall coconut palms, exactly as he had described, their tops still lit with vagrant gleams of sunlight.

Before me lay Marae Arai-te-tonga—a square paved with volcanic rock, with an altar and coronation stone. This open-air temple, the most sacred on the island, was reserved for investing and anointing Rarotonga's high chiefs by the *ta'unga*, or priest.

For a long moment, in my imagination, it

didn't matter that weeds now sprouted in the courtyard, that the stone seats reserved for the noblemen were tumbled and spotted with lichen. All might have been fresh again, waiting for the sacred rites that would herald a new ruler. The silent valley might still have rung with the sound and song of Polynesian civilization. In quiet and seclusion the marae had survived missionaries and vandals. I moved slowly over the courtyard in the leafy green light.

Then a voice. I froze.

But it was only a middle-aged villager. He stood stripped to the waist, a little distance away, machete in hand and probably fresh from his banana plantation. All the same, I felt uneasy. Was I transgressing some ancient law, some still unlifted *tapu*?

Then he struck his machete into a tree and smiled. "*Kia orana*—may you live long," he said. "You are interested, I think, in our old ways. As you can see, this place of our forefathers is still tended, or it would have been long overgrown."

Who tended it? He shrugged. "It is done by those who still have respect. These young people today, with movies and motor scooters and money in their pockets, despise the old things.

They turn away from their proud past into emptiness. In my heart I cannot ignore the old greatness. A people with no past is nothing."

He led me along a muddy track to ground densely overgrown. More stones, clearly foundations. "Here," he said, "was the home of the *ta'unga*. And there the house where the young people grew up. And this"—he halted before a large rock—"was the stone of execution, where offenders against the law had their brains dashed out."

In fast-dimming light, I bent to examine the stone grained with the blood of centuries. But I was careful not to touch it; I have lived too long in the Polynesian Pacific not to respect *tapu* when it stares me in the face. Then the villager, approving my interest, steered me back to my scooter, where we shook hands. He vanished quickly into the dusk, for no

Maori remains near the temple after nightfall.

My scooter, when I kicked the engine into life, sounded painfully loud. My headlight flickered over orange groves, ripening fruit strung like lanterns in the trees, and I was abruptly back in the Cook Islands' present.

For the citrus tree is increasingly the money crop of the volcanic southern islands of the Cook group. It is alien to Polynesia; possibly the first orange trees grew in Rarotonga from seeds left by *Bounty* mutineers.

New Crops Transform Island Economy

Next day I traveled out among the citrus plantations, which now green most of the island's 5,500 arable acres. Pickers were harvesting tangerines and oranges—the best for shipment fresh to New Zealand, the rest destined for Avarua's expanding fruit-juice cannery. Started in 1961, Cook Islands' fruit-juice exports now approach a million gallons annually. Agricultural experts, looking be-

yond the time when the New Zealand market is saturated, foresee possible markets in Europe. Pineapple growing, too, has been boosted by the cannery's presence.

"You can tell the money that's coming into the islands by the number of motor scooters," a young and alert grower named Motu told me. We sat in a sunny and fruit-bright orchard sampling the finest tangerines I have ever tasted. "My wife's a nurse, gone off to New Zealand to study, and she wants me to join her down there. But I reckon we can do better for ourselves here now. There's good money, if you're prepared to work."

Elsewhere I found villagers punching tomato plants into rich black soil. The tomato thrives in the relatively cool winters, when temperatures drop as low as 48° F. from a warm annual mean of 74°. Improved shipping in recent years makes the perishable tomato another profitable export.

In the evenings, with work done, villagers

Hungry for knowledge of the outside world, a Rarotonga teen-ager bikes home from the public library with treasured books. New Zealand provides free primary and secondary schooling for all Cook Islands youngsters. Bright students may pursue higher education in New Zealand under government sponsorship.

PETERBORNE © N.G.S.





like sitting outdoors, as they have for centuries, to sing old love songs and watch old drum dances. At Ngatangia I dropped in on rehearsals of the village dance team.

Turepu, young schoolteacher and guitarist-coach of the team, was forthright about the difficulty of being an educated Rarotongan. He wanted to study anthropology as a career. "But how can I give my whole mind to study," he asked, "when all around me are young people who only want to be happy?"

I left Rarotongan problems behind when I boarded the midget 200-ton trading ship *Akatere*. I had a promise to keep, to a man from Manihiki. Ahead was a 1,600-mile round trip

through northern atolls of the Cook group to pick up copra and deliver mail and supplies.

"We go up when the copra makes it worthwhile," Archie Pickering, the Fijian skipper, told me. "They don't see us often—maybe three or four times a year. Our top speed is seven knots. That makes it a long haul."

We stood together on the bridge as the *Akatere* made ready to depart Rarotonga. Ashore the crowd was thick and noisy. People flung or exchanged garlands. Deck passengers were northern islanders, often elderly, returning perhaps forever to their native atolls. Younger people who had chosen life in Rarotonga or New Zealand said farewell.



DETACHMENTS (ABOVE) AND KOOCHROME BY WILLIAM KURTZ ALLARD © N.Y.S.

Late for church, a young girl peers anxiously inside. She missed the parade and band concert that preceded the service. Churchgoing has long played an important role in island life. As early as 1823, the London Missionary Society sent its first evangelist, the Reverend John Williams, to Rarotonga. Until the southern islands became a British protectorate in 1888, missionaries virtually governed the entire area. Today the religious community also includes Roman Catholics, Seventh-day Adventists, Congregationalists, and Latter-day Saints.

Catholic mission-school student (right) awaits a race on an interschool sports day.

Brothers and sisters, parents and children—many were unlikely ever to see each other again. The first tears seeped, the last line dropped.

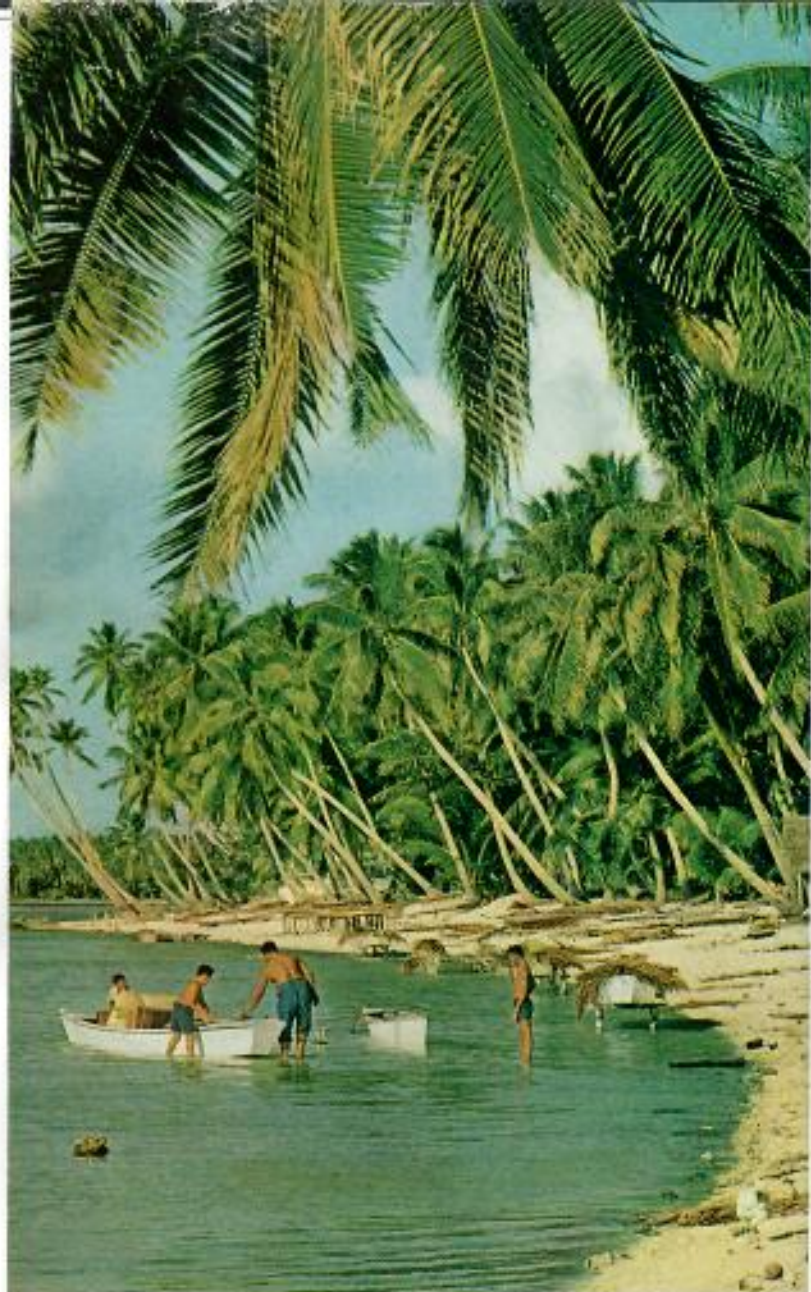
Then it came, a rumble rising to a roar—what I can only call the grief of the Pacific. The grief it has known since the first Polynesians crisscrossed their way, canoe after canoe, through its far-scattered islands, leaving friends and families behind.

With soul-shaking cries, face after face crumpled in despair and dismay; now the tears gushed as the churning *Akatere* pointed its nose toward the Equator. A wake of flowers, falling garlands, marked our way through the gap in the reef.

We were out on the loneliest of oceans. The first day we sighted a yellow Japanese fishing float, the second day a piece of driftwood. On the third day, rolling through fine weather at six knots, *Akatere* was joined by the first sea bird since Rarotonga.

Sea birds supposedly guided the old Polynesians to their islands, so I consulted my map and found that over the horizon lay Russian-named Suwarrow Atoll, uninhabited but storied nonetheless. Piracy, buried treasure, strange European ruins, flintlocks in the sand, hurricanes, and hermits constitute its





legend. Some 15,000 gold U. S. dollars were supposedly lifted from its sands in 1872.

The fourth and fifth days were empty of all but brilliant sunsets. Tiny trading ships which ply these unpredictable, hurricane-haunted waters are hundreds of miles from help. Without radar, ships depend on their skippers' instinct, and reefs grow rich in wreckage.

Over the Reef to Manihiki

On the sixth morning the thud of the engine was muted, the ship drifting. I scrambled to the rail to see the sun rising beyond the palms of Manihiki Atoll, which I had helped find the night before. Tiny flares of red and yellow sunlight exploded through the trees, lighting whitewashed homes. Ashore there was noisy

excitement: We were the first visitors in two months. Boats swarmed to the *Akatere*.

I found myself in a slender and delicately balanced longboat, shooting the seething water of the reef. My first shoot, the first of many. "*Ariana*—Wait a moment," called the steersman, watching for the right wave. Then "*Oe!*—Pull!" when he saw our moment. Oars flashed as we hurtled forward on a high breaking wave, over perilous coral, to the safety of a pale and lovely shore.

Most of the atoll's 650 population seemed on hand to greet us. A village girl danced forward to drop an *ei*—equivalent of the Hawaiian lei—about my neck. But this one was different. It told the story of the people who, over generations, have adapted to the



ETAAPORU LAGOON AND KOBACHORU (CENTER) BY ROBERT S. JOHNSON;
KOBACHORU BY WILLIAM ALBERT ALLARD © N.S.S.

demands of life on these infertile coral isles.

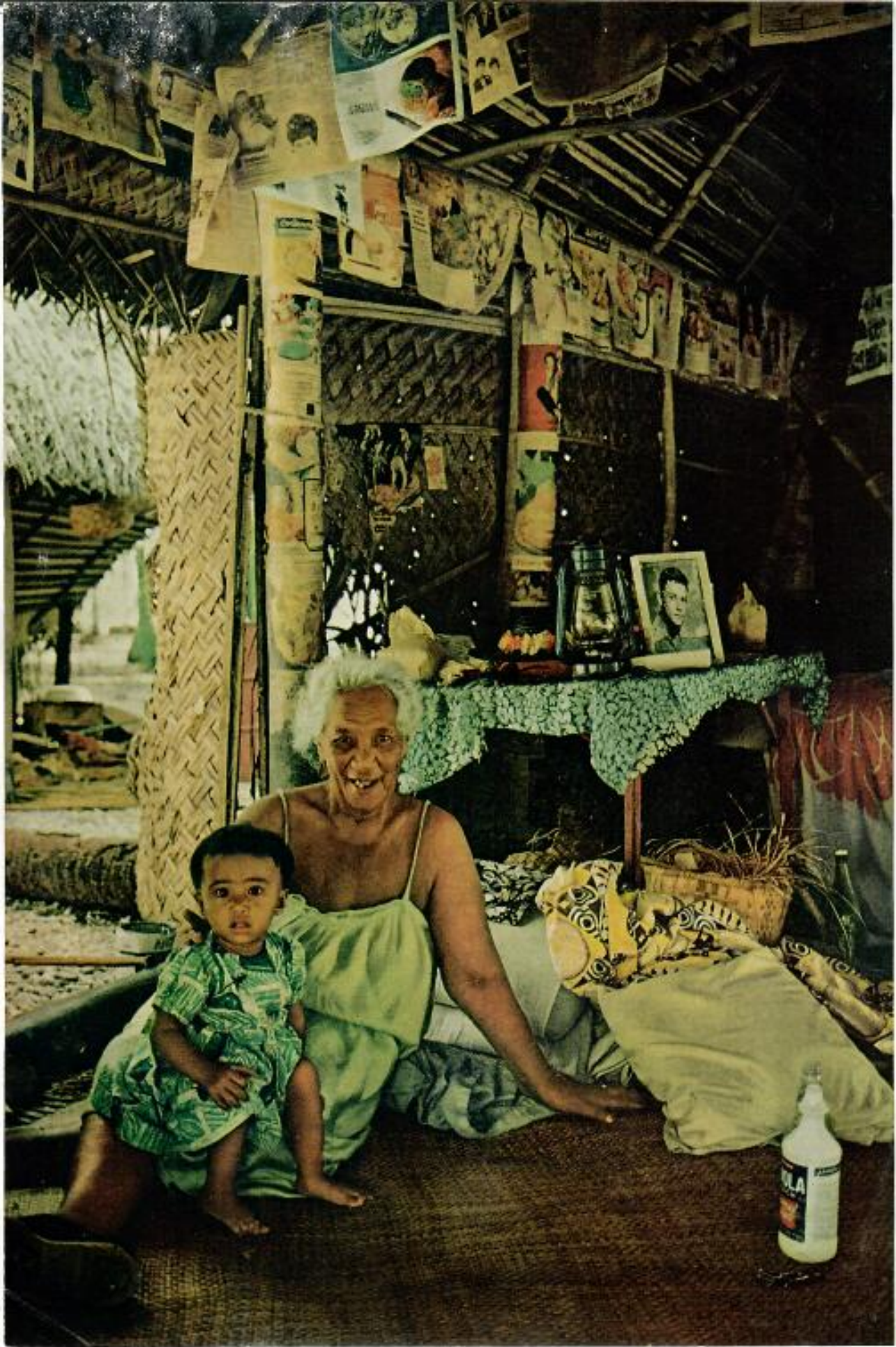
Inhabitants of this 1,350-acre atoll have learned to live without the flowers and fragrance of the green volcanic islands to the south. But imagination and patient hands had conspired with ancestral memory to create the Manihiki ei I was wearing; tiny shells of the shore were shaped into a marvelous and perfect illusion of blossoms.

I barely had time to get my breath before I was in another longboat on the other side of the land, this time with an outboard motor cutting a wake across Manihiki's wide lagoon, peaceful and luminous in the early light. Manihiki, like most atolls, is in fact many islands: a necklace of 39, most small, strung about a deep, reef-protected (and thus

Feathery fronds of coconut palms bend over a white-sand beach on Rakahanga, where men wade the shallows to load a boat.

Coral heads that can tear open a boat's hull pepper Aitutaki's reef. Rapidly multiplying colonies of polyps extract lime from sea water to build rock-hard skeletons. Each generation of tiny animals adds a layer to the growing domes.

"Deepest and most treacherous of all channels," Irving Johnson called Avaavaroa Passage (above). It slices the reef beneath the knitted brows of Rarotonga's loftiest peaks: 2,140-foot Te Manga, background, left, and 2,095-foot Te Atukura, center.



shark-safe) lagoon. I was in distinguished company, for Manihiki's pearl-shell divers are famous. The local record is 180 feet—without scuba equipment. Eighty to 120 feet is considered nothing spectacular.

In mask and flippers I could hope only to accompany them a few feet of the way down. With goggles distorting their faces, the divers shot past me, down, down, among pinnacle and crevice of bright coral, among disintegrating rainbows of tropical fish. In this shimmering world my companions grew small as they glided with incredible leisure over the lagoon floor far below. They paused and plucked and then, fast soaring, surfaced with handfuls of pearl shell to gasp precious air.

Though the market fluctuates, and the lagoon is occasionally closed for shell regeneration, mother-of-pearl has for years been a major money-maker for Manihiki; the other is copra. But where shell diving is a matter of individual skill, coconut gathering for copra is strictly a family business. So I discovered next day, when I was again escorted across the lagoon by a group of genial islanders. Each family knows its traditional land, despite lack of markers, down to the individual palm tree. Men gathered and husked the nuts, and bagged them for return to the village for sun-drying; women gathered fronds and wove baskets. Even the children helped.

After work came the best part of the day. I joined the laughing hunt for coconut crabs which hide under

coral rubble. The fugitives, often lobster-size, were prodded from their holes, claws clashing. Cooked on fire-heated stones (below), they were delicious. *Paua*, large clams from the lagoon, spiced the feast. I was keeping my promise to the man from Manihiki.

All Hope Goes With Islands' Young

Back at the neat, clean village of Tauhunu on the main island, I saw the longboats bounce across the reef to *Akatere*, loading some 30 tons of copra to boost the island's income by about \$4,200. We were also taking aboard another major Manihiki export: young men and women, people in the 20-40 age group.

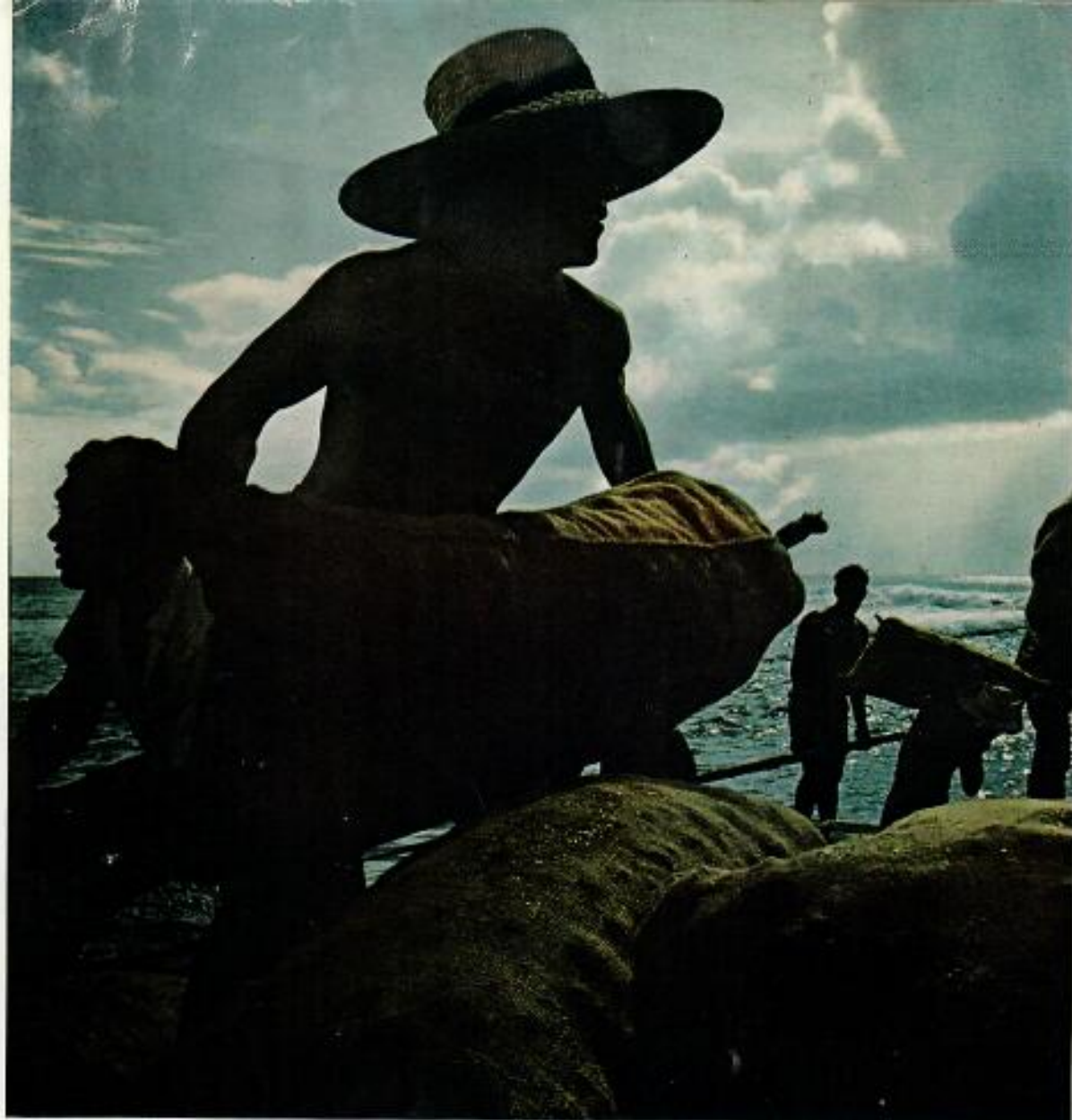
Trader George Ellis lamented the fact to me as we sat on his stilted veranda above the lagoon: "If the young people go, everything will go. For who will there be to learn to weave the coconut frond in Manihiki style?"

SCENES BY WILLIAM ALBERT ALLARD © N.S.S.



Old-style living in a thatch-roofed *whare* affords many comforts for this woman and child on Manihiki, a northern atoll. Walls woven of palm fronds and supported by coconut trunks let in cooling breezes. All the floor's a couch with wall-to-wall straw mats. Rafters make handy hangers for decorative newspaper and magazine pages. Convenient but separate, a cookhouse lies beyond the door.

Succulent coconut crabs roast on a bed of hot stones at a feast in the Manihiki manner. Hunted by night, the creatures defend themselves with massive claws that can easily sever a finger. Diners prize the fat of the tail, which they eat with baked breadfruit.



Who will learn to fish the Manihiki way? All custom, all tradition, will die."

I learned about Manihiki fishing that evening, on the ocean side of the island. Our quarry was *koperu*, silver mackerel-like fish that abound at dusk—but deep. The divers, their mouths crammed with shredded coconut, went fathoms down to feed the fish, tempting them nearer the surface. Soon the *koperu* started to spiral up, climbing the coconut trail.

Then the fishing began. The men dived, carrying rods, and literally fed coconut-baited hooks to the eager *koperu*. The hunt, a fathom or two down, assumed a weird, balletlike quality, men swirling amid silver swarms of fish. Then they surfaced and flipped their catch into the boats.

Was George Ellis right—would this grace-

ful skill perish too? Surely the human race would be poorer if Manihiki, plucked from the Pacific by Spanish explorers in 1606, became one more empty name, one more uninhabited island.

Next morning we were at Rakahanga, 25 miles from Manihiki, taking aboard more copra (above). Legend has it that the two atolls were once one, together part of a great fish hauled from the sea by the mighty Polynesian folk hero Maui. It was Maui who, when the world was still young, brought fire to earth and snared the sun—and fished up islands in the great Polynesian triangle, from Hawaii in the north to New Zealand in the south and lonely Easter Island in the east.

Once the people of the two atolls were certainly one, sojourning in each alternately, but



KOSACHINAK © S. S. S.

missionaries halted the annual migration, arguing that sea travel was too costly in life.

It still is. A few years ago a boatload of Manihiki men, returning from a visit to Rakahanga, was blown 2,100 miles to the New Hebrides. Only three of seven survived the two-month ordeal. I asked one what he remembered. "Hunger and terrible thirst," he said. "And seeing land we were always too weak to reach." And what kept him alive? "Faith," he answered. "Only faith."

Today fewer than 400 people inhabit Rakahanga's one village. Without pearl shell, they rely on copra for cash. But there is some compensation in other crops from the island's thin soil. I walked past flourishing taro patches and banana plants on my way to the village school, but was stopped short by Rakahanga's

Hefting sacks of copra, islanders load lighters beached on the shore of Rakahanga. Coconut plantations cover more than half the Cooks' arable acreage, but the crop yields small returns. A ton of dried coconut brings only about \$140. In the southern Cooks, farmers are finding a better living growing citrus fruits, pineapples, and tomatoes.

strange cemetery. Again I faced an obdurate and ancient custom of the islands.

Each grave was roofed, like a dwelling. And many, I soon saw, were dwellings, with blankets, water jugs, and lanterns; dwellings for the living as well as the dead.

"We believe," explained a Rakahangan, "that the dead must always be appeased by the company of the ones closest to them. Otherwise they might return in anger as ghosts. So mothers sleep out at night with dead children, husbands with wives." For how long? "Perhaps five years. It depends." But I saw older graves where the living still slept.

The living are healthy enough. In an empty dispensary the visiting doctor from Manihiki told me cheerfully, "Not much business here." And at the school I watched sturdy children at study and play. They studied English arduously, sometimes by radio from Rarotonga, for a future still obscure. The brightest would go south to Aitutaki Atoll and then to Rarotonga for further education, perhaps eventually to New Zealand universities. But how many would ever return?

Ghostly Flames Light Penrhyn Lagoon

Now *Akatere* was on the last leg of its northward journey. A night and a day after Rakahanga we came to Penrhyn, northernmost of the Cook group, nine degrees short of the Equator. An urgent message had come through even before we'd left Rarotonga. Without a ship for four months, Penrhyn islanders were out of canned meat, sugar, rice, flour, tobacco, and soap.

So we weren't surprised, when we stood off the entrance to the lagoon after nightfall, to see lights of island sailboats bobbing out toward us. "Avaava—cigarettes" was the call as their occupants scrambled aboard.

But there was a sobering note. The night before, the inexplicable "ghost fire" of Penrhyn had been seen burning in the middle of the 108-square-mile lagoon. Fluttering unpredictably several times a year, the fire is firmly believed to herald death—and that night a year-old sick child had died on the island.

Archie Pickering told me that U. S. Navy



men, during World War II, crashed a PT boat on a submerged reef while seeking the source of the fire. It remains unexplained.

In the morning we were piloted into the great lagoon. To sail into remote Penrhyn, up to the crowded wharf at Omoka village, is still like sailing into a collection of Gauguin portraits. There were the stolid Polynesian women, squatting heavily or standing flat-footed, exactly as the artist painted them in Tahiti 70 years before.

Life on this most barren of atolls has given the Penrhyn Islander a reputation for toughness, and he looks his reputation. Today some 700 people occupy an atoll almost depopulated a century ago by Peruvian slavers. Next major contact with the outside world was during World War II, with hundreds of U. S. servicemen, when the island served as a Pacific base. Women still wear aluminum combs made from the wreckage of a Liberator bomber which gathers foliage beside a seldom-used airstrip.

Pearl Diving No Longer Pays

I looked over the faces in the crowd. There was the now-familiar selection: the very old, the very young, and few between. Children, many of them sent back to grandparents by migrant parents, swarmed over bags of copra, now the island's only substantial export.

Once it was different. Once the island was fantastically prosperous in the pearl business. There was a faint, pathetic echo of that prosperity in the islanders who shuffled up to me as soon as I stepped ashore. "Pearls," they offered, "beautiful pearls."

The market for Penrhyn pearls—high-quality natural gems—slumped before World War II, and was finished by the Japanese cultured-pearl industry afterward.

"They were great days," recalled 83-year-old Philip Woonton, onetime "Pearl King of Penrhyn," when he invited me to a cool drink on his veranda. "I remember checks for thousands of pounds passing through my hands."

Now, he told me, families hoard pearls, in the hope that the market may revive. But the

hope grows ever fainter, ever sadder. Diving gear rots in Philip Woonton's back yard, and the best divers have long since migrated.

A few still skin dive for mother-of-pearl shell rather than pearls. Manihiki divers are known for depth, Penrhyn divers for courage. A diver exchanges fear for faith in a lagoon seething with sharks.

Young schoolteacher Terepai Tutai took me out on a shell-fetching expedition with some friends. After long prayer, he observed: "Here we believe sharks only attack men of poor faith. Or those who have not paid proper attention to their prayers before diving. Now let us go over and see." He produced rubber slingshot and spear. "I will kill a few small fish to bring the sharks around."

Serenity Reigns Amid Circling Sharks

To me it seemed like an invitation to Russian roulette, but I followed him over the side. While his friends dived for shell, Terepai speared enough small fish to leave visible streaks of blood in the clear water. In moments the sharks began to gather, with flicking tails and questing noses.

I had surfaced in a wild explosion of water and climbed back into the boat by the time Terepai came up again. "Nothing to worry about," he reassured me. "They're just black-tipped sharks [left]. They very seldom attack. It is the *papera*, the black shark, you must watch. Come down again."

I dived beside him and made a rough estimate of about 40 circling sharks. Terepai's friends continued fetching shell, apparently serene in their charmed circle of faith. Terepai grabbed my shoulder and pointed.

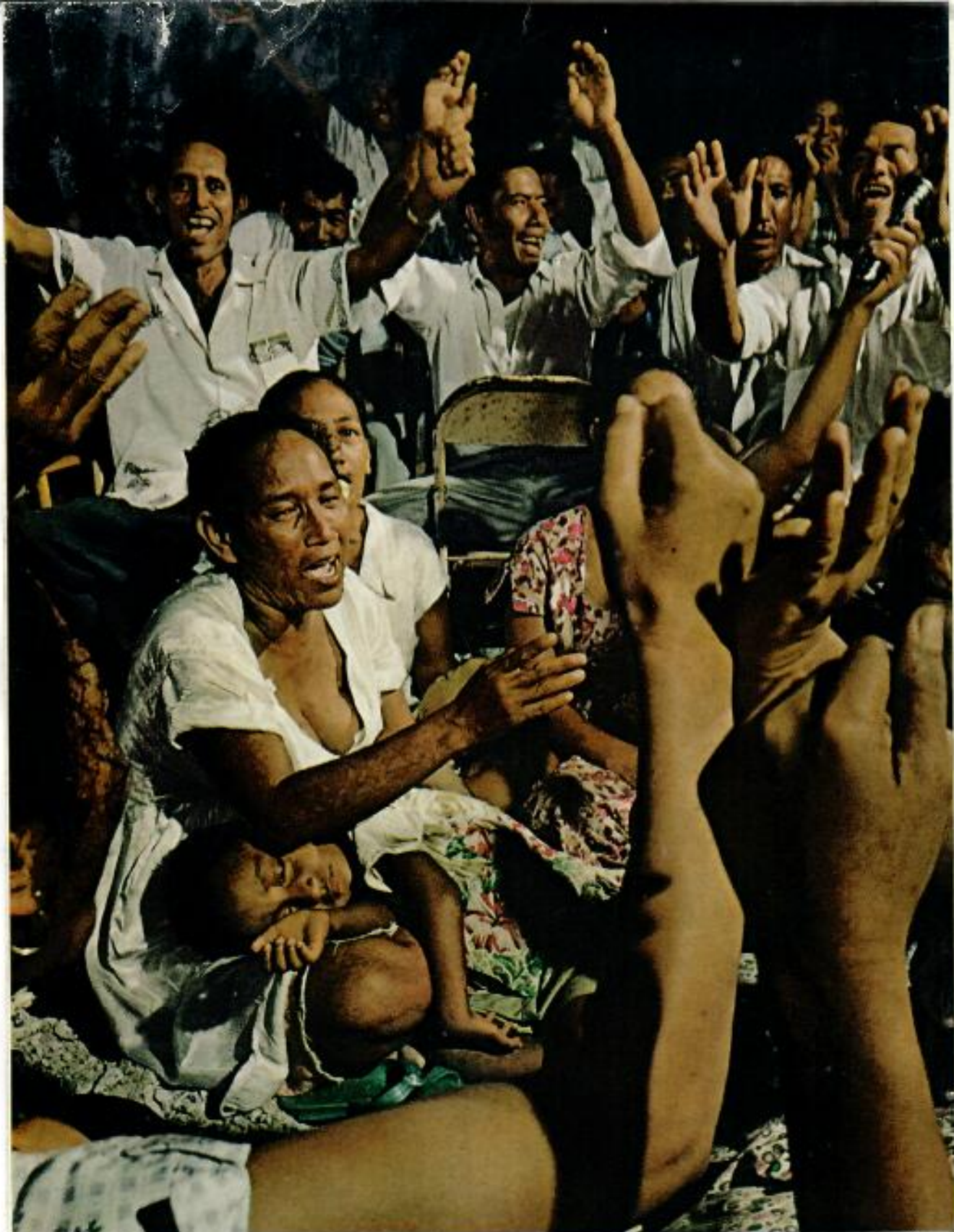
There, beyond the black-tipped sharks, were the *papera*, more gray than black, looking efficient killers from snout to tail. Thereafter Terepai himself stayed close to our boat.

"If they attack," he gasped, when we surfaced to talk, "kick them in the nose. Not in the teeth. You can lose a leg that way."

The divers went on with their work, with an occasional glance over their shoulders. A

Diving to danger in 60 feet of water off Penrhyn, a mother-of-pearl fisherman grabs a prize oyster shell within striking range of a black-tipped shark. While the author watched from a boat, NATIONAL GEOGRAPHIC photographer Bill Allard worked amid a growing number of sharks that "seemed to be snicking and snapping all around," Mr. Shadbolt recalls. "Suddenly a deadly *papera*—a black shark—took an unnerving interest in Bill. I saw it break surface, swerve, and dive a few yards from him." Spotting the killer, Allard swam furiously back to the boat and clambered aboard just as the shark broke water behind him.

ENTRANCE BY WILLIAM ALBERT ALLARD © N.G.S.



Hallelujah! Hallelujah! With unbounded enthusiasm, Penrhyn Islanders shout the night away at a *uapo*, or religious songfest. Villagers, divided into two teams, vie with each other at hymn singing, a favorite pastime since the 1830's. The people became "devotedly fond of singing," observed missionary Aaron Buzacott in 1831, "and seemed to



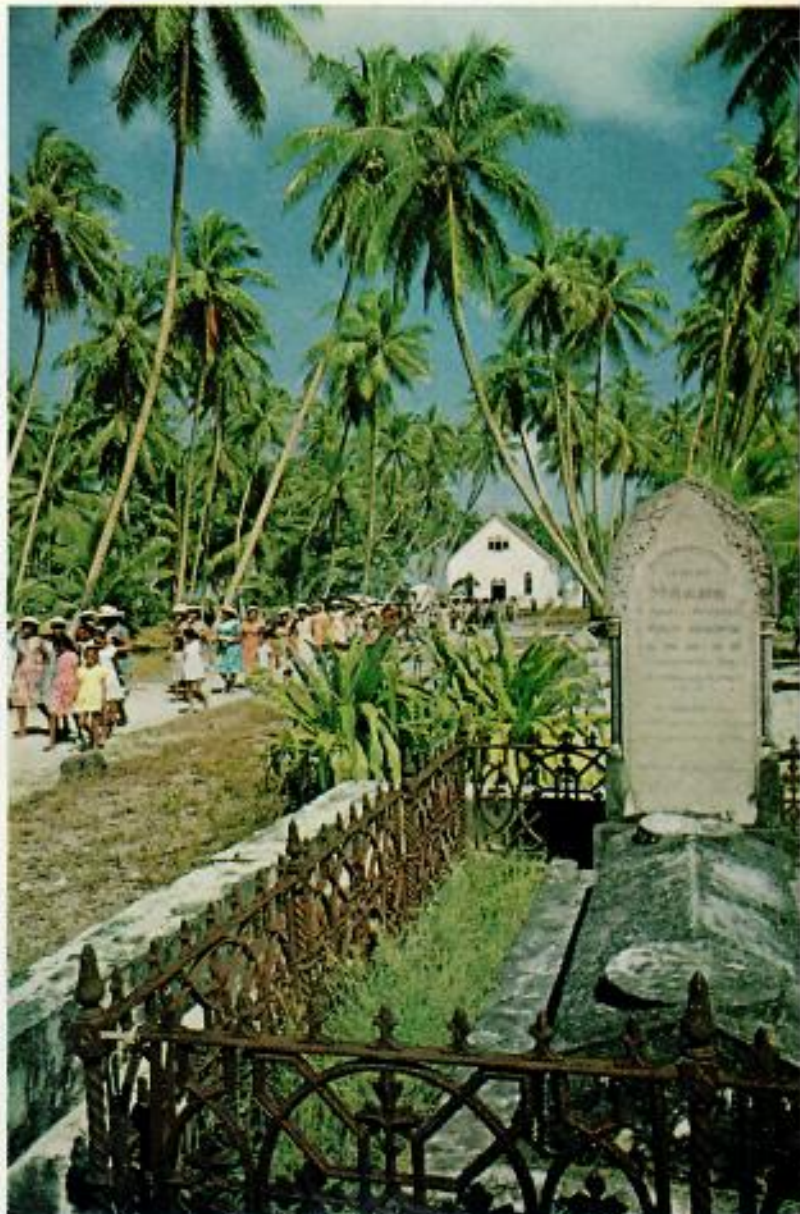
have no sense of fatigue. Their urgent requests to be taught new tunes often deprived our brethren of their rest. . . ."

Overcome with emotion, a hymn singer holds her head during a Penrhyn uapo.



EDSCHROMER © S. S. S.

Trooping from church, Penrhyn islanders pass the grave of Maara Woonton. Her husband, now 83, reigned as "Pearl King of Penrhyn" before Japanese cultured gems depressed the market for natural ones. Graves on Rakahanga Island often lie beneath a roof that shelters a living relative, who sleeps there to appease the spirit of the departed.



sleek papera, perhaps bored, moved close.

Then I saw the Penrhyn instinct at work, the instinct of islanders who have lived long with sea and shark. They seemed to surface as one and climbed, unhurried, back into the boat. With a snap and crack of sail we glided to another part of the lagoon.

On Penrhyn, faith goes hand in hand with healthy respect. Though many islanders are savaged by sharks, few ever perish; five were attacked in the year before my visit, with no fatality. It takes a lot to kill a man of Penrhyn.

But life offers other pains than sharks. "We go hungry when ships don't call and the sea is too rough to fish," a young, well-educated islander complained to me. "I live with my family and earn about \$5.50 a month from copra. Just enough for tobacco. If I really worked hard, I might be able to earn \$10 a month. It's hopeless. I'd clear out on

your ship if I could, but there isn't room. There's never enough room for Penrhyn people wanting to leave."

The *Akatere* had taken its maximum of deck passengers, and I found Archie Pickering checking for stowaways. But one eluded him. She revealed herself in triumph when we were well out to sea. The woman wanted to accompany her son to Rarotonga.

Islanders Protest French Nuclear Tests

Now the Pacific turned violent. The *Akatere* grew tiny under the tremendous waves that burst over the bridge. It lifted, heeled, and crashed backbreakingly into troughs.

"One thing about this ship," said Archie Pickering dryly at the wheel, "it's hard to sink, being so small."

After six battering days we lay up in the lee of Aitutaki, one of the southern volcanic



islands and second most populous in the Cooks. Little more than a 4,461-acre hill, with an island-dotted lagoon, it is a hybrid of volcanic outcrop and atoll (pages 218-19).

Aitutaki supports 2,900 Cook Islanders, principally through citrus-growing and copra-making. But its fame is as home of the Pacific's best dancers. Year after year, at Tahiti's Bastille Day celebrations, Aitutaki dance teams have taken first prize. In 1966, however, international politics interfered.

"No," said an adamant resident of the island. "We're not sending our team to Tahiti this year. It's the only protest we can make against French nuclear testing in the Pacific. It's costing us a lot of prize money to make that protest—and people here often neglect agriculture for their dancing."

With Archie Pickering as companion and guide, I voyaged out to other southern islands.

To 4,552-acre Mauke, where poor soil limits orange production and wild growth tangles over abandoned groves. To womanless Manuae (pages 210-11), first of the islands to be glimpsed by Captain Cook, where annually handfuls of men from Rarotonga and Aitutaki isolate themselves to harvest copra, striving to earn enough to let them stake out new lives in New Zealand.

Farther south lay rugged Mangaia, "the haunted island," second largest in the Cooks, with its ancient coral burial caves. It has now barely enough able-bodied men in the critical 20-40 age group to pick and load pineapple harvests from its 12,800 acres.

But Atiu, at the very heart of the southern islands and once home of their fiercest warriors, stood apart from all the others. Here were tidy villages, cool concrete-block homes in bright flower gardens, trim and fruitful



Highlight of out-island life, the arrival of the 200-ton *Akatere* draws a crowd to the beach at Mauke. Small boats set out with crates of island-grown oranges, bound for Rarotonga's juice factory; they return with new possessions ordered months ago from New Zealand. At Manihiki, the boat yields a bonnet-shaded baby; emigrant parents often send children home to live with older relatives. Only *Akatere* and two other small craft ply this long and lonely passage to the out-islands.

©1968 CHROMES BY WILLIAM ALBERT ALLARD © N.S.S.



plantations of citrus and coffee. Together with intense communal pride, it had a surprising abundance of young people.

"Few ever leave for Rarotonga and New Zealand," community leader Vaine Rere explained. "We persuade adults to give land to their children as soon as they leave school. Children get a stake in the island, a steady income, and aren't tempted to go."

Today the fertile soil of Atiu's 6,650 acres supports a steady and mildly affluent population of 1,400. Once the terror of neighboring islanders, proud Atiuans now set an example for the entire Cook group.

I discussed their progress, back in Rarotonga, with the Cooks' gentle-spoken but vigorous 60-year-old Premier, Albert Henry. A teacher who spent more than 20 years in New Zealand as spokesman for Pacific islanders, Mr. Henry returned to the Cooks in 1965 with the advent of self-government. He took over leadership when his Cook Islands Party swept the polls.

"Atiu has set a good example," he agreed. "After so many years of paternal rule, the big struggle is to encourage the idea of self-help and personal initiative again. In the past everything has been handed out to the Maoris. Now they are learning that self-government means responsibility.

"The idea is being encouraged through a net of village committees. Behind them stand the traditional chiefs, in the new House of Arikis, which advises in matters of tradition and custom. Results—in just a few months—have been astonishing. In Rarotonga and elsewhere ground has been planted that lay idle for 50 years. There's a new spirit."

Tourism? "It might mean easy money," he said. "But tourism as it exists elsewhere could only lead Cook Islanders to bitter disillusionment. When we organize tourism, we won't have luxury hotels, night clubs, features alien to island life. I want to see simple tourist villages, each under control of an existing village. That way, everyone will gain. And the real attractions of the islands won't be destroyed."

Had self-government, I finally asked, come

too late? "It has come late," he said. "But I don't think too late. Migration hasn't been altogether bad. It's good for Cook Islanders to see something of the industrious outside world. With luck and hard work, we will entice many of them home."

After his wry and gently intelligent conversation, it was easier for me to be hopeful about the Cooks. Outside the Premier's office I ran into a papaa friend, young American Walter Hambuechen, whose story might illuminate the prospects of today's paradise-seekers. A onetime ecologist, he "discovered"

the South Pacific in the course of research, grew enchanted, and stayed. Now he lives with his Maori wife and children beside an idyllic Rarotongan beach.

But he has little time for lotus-eating. He may raise pigs and chickens, and fish the reef, but he also serves as chairman of his village committee and edits the daily *Cook Islands News*. "I'm working harder than I ever did in my life," he said, as he hustled past with a sheaf of paper. "But it usually seems worth it."

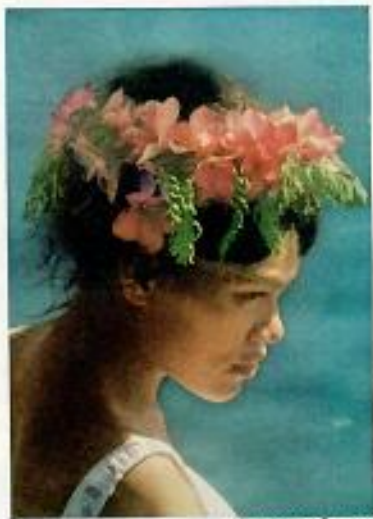
I journeyed to Ngatangiia village to eat a last meal of taro and raw fish with friends, and stood a while beside lagoon waters. Ngatangiia had a special meaning for me, a fair-skinned Pacific islander. For it was from here, centuries ago,

that Rarotongan Maoris began an epic 2,100-mile journey south to settle in my native New Zealand. But I felt I had been witness to the beginning of a new voyage as great and heroic in its way—that of a new Polynesian government in the Pacific.

For now only a boldness of spirit can save the dream islands of Western man from being handed back, one by one, to the waves and tides from which the fabled Maui fished them. Now only an imagination equal to that of the old voyagers can save the proud Polynesian, once noblest of savages, from becoming a soulless shell on display for tourists.

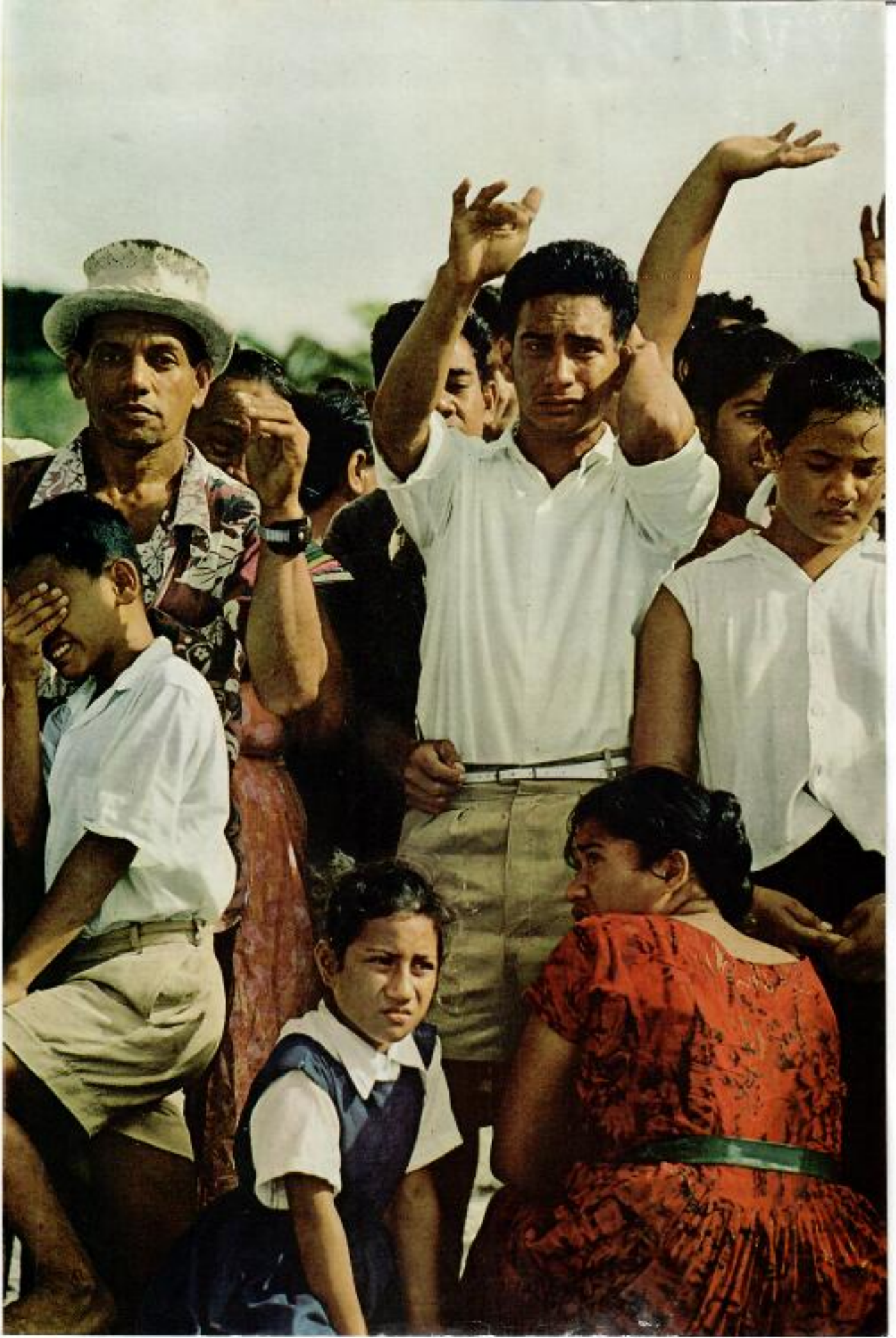
I had struck spirit, imagination, and growing hope. No new voyagers, launched upon this least pacific of centuries, could ask for much more.

THE END



KEONAL HOPKINS © N.A.S.

Heartache of the islands: Leaving her home on Atiu, perhaps forever, a young girl (above) casts one last longing look toward shore. At another sailing (opposite), those left behind give way to sorrow even as hands go up in a brave farewell.



FRISBIE
AND ISLAND TO HIMSELF

BRARY OF
GEORGE H. BAKER

THE HERMIT OF SUWARROW

by James C. Simmons



[Bette Thompson]

"A man is rich in proportion to the number of things which he can afford to let alone."
Thoreau at Walden Pond, 1845

IN THE END it was the stomach cancer that did him in and not, as everyone thought it would be, the hurricanes, sharks, malnutrition, or the craziness that creeps over most castaways on desert islands after years of solitude. For the better part of twenty-five years he had lived a relatively idyllic life alone on his tiny atoll, 200 miles from the nearest inhabited land. He became a legend throughout the central Pacific—a man known as the Hermit of Suvarrow.

Born in New Zealand at the turn of the century, Tom Neale was one of those rootless wanderers of the sort who had captured the imaginations of Joseph Conrad and Somerset Maugham: a piece of human flotsam drifting with the ocean currents from island group to island group. "I chose to live in the Pacific," Neale wrote much later, "because life there moves at the sort of pace

which you feel God must have had in mind originally when He made the sun to keep us warm and provided us with the fruits of the earth for the taking."

In 1943 the currents carried Neale from Moorea, near Tahiti, westward 800 miles to Rarotonga in the Cook Islands, then one of the most inaccessible of the Pacific island groups. There he met Robert Dean Frisbie, an American author and vagabond who had spent most of his adult life on some of the most remote atolls in the Pacific. One afternoon over rum Frisbie leaned across the cheap wooden table on his veranda and told Neale with great intensity: "Suvarrow is the most beautiful place on earth, and no man has really lived until he has lived there." The obsession which this declaration sparked was to consume Neale for the next thirty years of his life.

Lying 513 miles northwest of Rarotonga, Suvarrow appears lost in an immensity of sea and sunlight, so fragile one wonders how it ever survives the hurricanes which sweep the area with devastating regularity. The atoll consists of eighteen or so tiny chips of emerald islets scattered across the opal waters of a shallow lagoon, snugly tucked inside a twenty-six-mile-long coral reef which encircles them all like a loose fitting necklace. Never permanently inhabited before Neale, Suvarrow nonetheless enjoyed a curious and sometimes gaudy history of shipwrecked mariners, pearl poachers, buried treasure, murder, and seduction.

It was not until 1945 that Neale, as an engineer on the trading schooner *Tiare Taporo*, saw Suvarrow for the first time. A handful of coast watchers were stationed there as part of the war effort, and the vessel stayed three days. The peace, beauty, and solitude of the place captivated Neale, and he was determined to live there.

But another seven years passed before Neale returned. He bided his time working at odd jobs, mostly as a storekeeper on Rarotonga, growing increasingly restless and unhappy. He felt trapped and overwhelmed by civilization, even one organized as loosely as the town of Avarua, which in the 1940s was little more than an obscure South Pacific trading post. There were too many people, stores, and social conventions; too much noise and traffic. He was desperate to go to Suvarrow, but first he had to save enough from his meager wages to buy the supplies of food, clothing, and tools he would need to survive. Then there was the difficulty of finding a boat heading in that direction, for the atoll was 200 miles from the nearest shipping routes. And finally there was the biggest problem of all: obtaining official permission to settle on Suvarrow—and that the resident commissioner for the Cook Islands flatly denied.

But Neale persisted and by late 1952 events settled into place. An aunt died in New Zealand and left him a legacy of fifty pounds, the owner of the interisland schooner agreed to detour to Suvarrow, and a new resident commissioner gave his permission for Neale to settle there.

In October 1952 Neale finally reached Suvarrow and set about realizing that persistent and elusive dream of modern man—the escape to a desert island with its palm-fringed beaches. At dawn following his arrival, the *Mahurangi* chugged noisily out to sea. At this final break with the outside world Neale's only emotion was impatience that the boat took so long to get under way. Soon there were only the natural sounds of the atoll, the thunder of the waves upon the

While the fish struggled on his line, a great gray mass rushed on him like a torpedo.

distant reef, the faint rustle of the palm fronds, and the clamor of the frigate birds wheeling overhead. Standing ankle-deep in the shallows, he surveyed the palm-lined skyline and said to himself, "Well, Neale, here you are after all these years—and it's all yours."

Neale took up residence near the entrance to the lagoon on Anchorage Isle, a half-mile long and 300 yards wide, living in a two-room wooden hut used by the coast watchers during the war. His furniture consisted of four homemade easy chairs and two beds with wooden slats. There were three water tanks that held 1,000 gallons of rain water caught from the roof of the hut. His only companions were his two cats, Mr. Tom-Tom and Mrs. Thievery.

At the end of the first day he wrote in his journal: "Haven't had time for a proper look around but I can see miles of work sticking out. There will be no time for sitting under a tree and watching the reef, not for a long time anyway." Before unpacking, he cleaned the shack thoroughly, scrubbed the floors, and washed down the walls. Then he spent four days hard at work tearing down the vines which strangled the hut and out-buildings under a profusion of tropical growth. He plaited the veranda roof using palm fronds, built some shelves, and strung a clothesline between two hibiscus trees at the rear of the yard.

Next Neale set about securing his food supply. The reefs abounded with fish—ku, parrotfish, cod, eel, and lobster—and these were easily caught with hand lines or his homemade spear. "Every fish in the lagoon seemed to queue up for my table," Neale wrote much later. "Perhaps the easiest to catch was the reef cod which lay motionless in the pools as I approached. They never even moved until my spear was within six inches of them. And once I had them quivering on the shore, I carried them back to the shack and steamed them in salt water."

One moonlit night Neale stood in two feet of water, fishing for ku with a bamboo rod, when a big fish took the lure in a whirl of spray. He worked him skillfully to the edge of the reef and leaned forward cautiously to grip him by the gills. Some instinct made him hesitate. Suddenly, while the fish struggled on his line, a great gray mass rushed on him

like a torpedo. There was no time to move, no time even to panic. Before he could draw his hand away, a smashing blow whacked him across both legs, throwing him on his back. Neale gasped for breath, spitting out salt water. The fish was gone and the lure had vanished. He could see his bamboo rod floating in the water. The shark had missed his hand by inches as it took the fish, and in passing had hit him with its tail. Neale walked slowly back to his shack. The skin on his left leg was as rough as if he had rubbed sandpaper across it.

In mid-December Neale had his first omelette since arriving on Suvarrow. Thousands of terns settled on the island and started laying. "For a month I ate eggs every day, and fed the rest of my daily haul to the cats who loved them. It is amazing how almost any bird or animal appreciates a change of diet. Not to mention myself. They were the best omelettes I ever tasted."

A month after landing on the island Neale turned fifty-one. He noted in his journal on that "beautiful warm day, the breadfruit is doing fine. Took my tea down to the beach after catching fish for the cats. Cooked them on the beach just before dusk and watched the night fall on the lagoon."

THE MOST SERIOUS threat to Neale's survival during this period came not from the sharks or the near hurricane-force winds that swept across Suvarrow in January 1953. Rather the danger lay with five wild pigs that rooted about the island, destroying his banana plants and paw-paw trees. Neale's survival over the long term depended upon his successful cultivation of a garden. And that, he soon perceived, was impossible so long as the pigs remained alive.

So Neale determined to kill the pigs. During a period of heavy rains when he was confined to his hut, he painstakingly filed a broken machete blade until it was razor sharp and then he lashed it to the end of a stout pole. When the weather cleared, he spent three days constructing a platform twelve feet above the ground in a palm tree in the interior of the island and another two days clearing the brush from the tree's base.

The strategy appeared simple. All he had to do was to lure the pigs into the clearing beneath the tree. On the first moonlit night he broke open a dozen coconuts and scattered the contents around the clearing. Then he climbed slowly into the tree and waited. For four nights no pigs showed up. Only the giant coconut crabs appeared, some weighing up to eight pounds, and executed grotesque dances in the moonlight, their huge claws waving in the air, ghoulishly ripping at the white meat of the open nuts.

Then on the fifth night a dark shadow loomed silently out of the tangle of creepers and vines at the edge of the clearing. Moonlight glinted along its tusks, accentuating the black bulk of its massive shoulders. "Suddenly I was hardly able to breathe," Neale recalled later. "I felt cold but full of hatred and gripped my homemade spear more tightly." The pig paused directly beneath his platform. Neale aimed for just behind the neck and plunged his spear downwards with all his strength. The foot-long blade sank to the shaft, and the pig gave a half-human scream, wrenched away, and staggered off heavily towards the thicket. Neale chased after him, caught him as he reached cover, and cut his throat with one savage stroke of the machete, staining the coral with blood.

Neale wrote later: "Staggering back, splattered with blood, I thought for a moment I was going to be sick, but once the gurgling and thrashing stopped, I was overwhelmed with a sense of melancholy. All at once I was no longer a hunter, I was just an old man of fifty-one, alone on an atoll."

The brutal, gory business had to be repeated four more times, and by late spring of 1953 Neale had killed the last pig. At the end of it, the change was astonishing. Wild paw-paw shoots sprang up everywhere. The wild bananas began to flourish. Once the pigs were gone, Neale started on his garden in earnest. For several months he laboriously shoveled, sifted, and carried several tons of top soil from the opposite end of the island to his hut. In the new layer of soil he planted tomato plants, shallots, rock melons, water melons, pumpkins, cucumbers, and yams. Neale tended his plants assiduously, staking the tomatoes and stringing up the other plants as they blossomed. Everything went splendidly, and he expected his first fresh fruits and vegetables within days.

But the garden failed. The plants he had so confidently expected to see loaded with fruit produced nothing more than a couple of small tomatoes. He wrote gloomily in his journal: "Everything is growing vigorously and is full of flowers, but the fruit won't set; it just forms, then turns yellow and drops off. Must be the lack of bees."

There was only one thing to do. Since there were no bees, the blossoms had to be pollinated by hand. Neale carefully set about doing exactly that, breaking off the male part of the flower and rubbing the pollen on to the female flower. It worked perfectly. Once he had fertilized the blossoms, he enjoyed excellent crops. Within three months Neale was harvesting tomatoes; within four months, pumpkins and melons.

Throughout those same months Neale patiently worked to tame the wild chickens

on the island, remnants of a flock left behind by the coast watchers. In six months' time he had them all penned securely in a shelter constructed of ribs from coconut fronds.

Ten months after landing on Suwarrow everything finally settled into place as Neale had always imagined. By then he was almost entirely self-sufficient. He had more fish than he needed, plenty of fresh fruit and vegetables, a steady supply of fresh eggs, and a regular rooster for the pot.

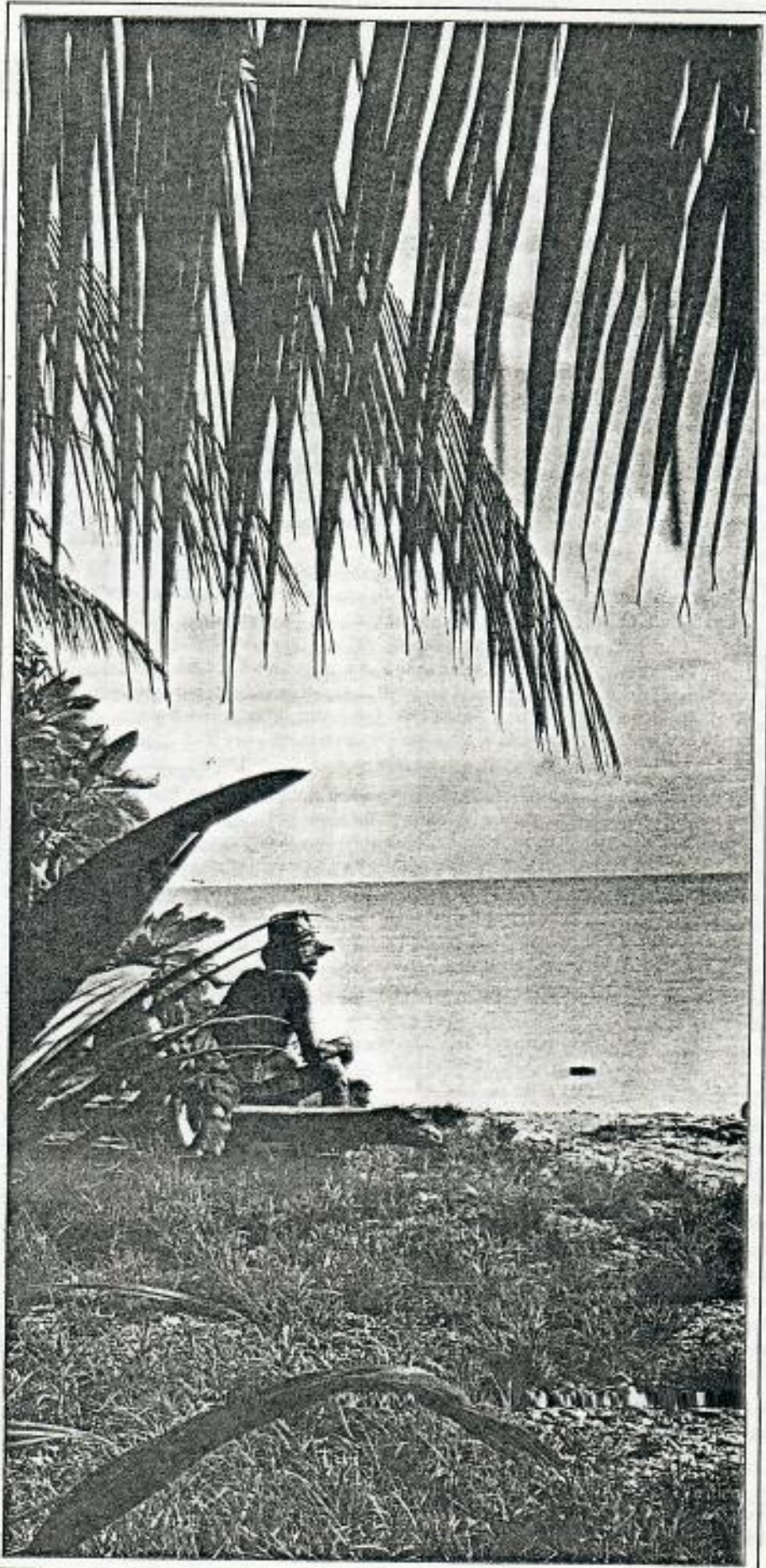
Throughout this time Neale found himself working harder than ever before. He recalled later that there "were so many incidental jobs, there never seemed time to relax. And in the months which followed, time seemed to slip away; for my day-to-day life had long since settled into a sort of rhythm and pattern, starting with my early morning breakfast and ending with tea on the beach and a read in bed."

Not once in all this time had another ship called at Suwarrow. But ten months after he had arrived on the island, Neale welcomed his first visitors, an American couple crossing the Pacific. They stayed for two days. On the evening after their departure Neale noted in his journal "how vastly different their lives were going to be from mine once their pleasant cruise was over—there would be bright lights, cars, busy streets, cinemas, and hotels; so-called luxuries which, however desirable, exacted their own price in tension, problems, and congested humanity."

What did Neale miss most about civilization? Apples! "There's no better fruit than an apple. But I tell myself: 'Neale, if you want an apple so badly, you can go where they are.'" He never missed human companionship and thrived on the solitude. He recalled in 1966 that those were "very happy days. I was never lonely, though now and again I would walk along the reef wishing somebody could be with me—not because I wanted company but just because all this beauty seemed too perfect to keep to myself."

But life in paradise had its rough edges. Neale labored for six months to construct a coral pier only to have a hurricane destroy his work less than thirty hours after he had completed it. The lack of variety in his diet, especially the absence of red meat, sent him into a slough of despondency which lasted for weeks. Things got so bad he hallucinated about "big pot roasts of lamb in front of me, at the foot of the bed, or on the shelf where I kept my books." His spirits were restored on Christmas Day, 1953, when he found a 300-pound turtle on his beach and ate red meat for a week.

The worst crisis came on 22 May 1954. He wrote in his journal that he had seldom felt



Portrait of a private paradise. For the better part of twenty-five years, Tom Neale (above and page 3) took his ease on a tiny Pacific atoll 200 miles from the nearest inhabited land, with only his cats and chickens for company. [Bette Thompson]

Why not a "summer house" on the outlying island where he might go for a "vacation"?

better that morning. The hurricane season was behind him, his garden was producing. "For once there was hardly a real care to worry about. Everything was perfect." Yet within a few hours he had dislocated his back. He ended the day in agonizing pain, trembling with fear. "I was horribly, almost petrifyingly aware of the terrible fix I was in. Here I was, virtually paralyzed, 200 miles from the nearest human being. Nor was there any reason why a boat should unexpectedly call at Suwarrow."

Neale painfully dragged his crippled body back to his hut. Unable to move, he lay on his cot, slowly dehydrating and growing more delirious with each passing day. Then miraculously there were voices in the next room. "Anybody home?" somebody called out. The second yacht within nineteen months had arrived—James Rockefeller and a friend leisurely bumming their way across the Pacific.

With his bad back it was clear to Neale he would have to return to Rarotonga. Two weeks later an interisland schooner diverted to Suwarrow and gathered him from his beach. As the atoll, his home of nineteen months, receded into the distance, Neale recalled an old Tahitian proverb: "The coral waxes, the palm grows, but man departs."

SIX YEARS PASSED before Neale saw Suwarrow again. They were years of continual frustration. The authorities refused him permission to return to the atoll, so he went back to work as a storekeeper. He loathed the position and "every moment found me nostalgically comparing this dreary commercial existence with the free and intensely satisfying life I had known on the island." In 1956 he married a Tahitian woman, who bore him two children.

Then his luck changed. In the spring of 1960 a yachtsman sympathized with his plight and offered to take Neale and his gear to Suwarrow. Back he went, leaving his wife, children, and job without regrets. Once again Neale put his island in order, clearing the hut of the thick mantle of vines, repairing all the damage to the buildings from storms and time, reestablishing his garden, and reconstructing a pen for his chickens.

The second stay lasted three and a half years, from April 1960 to December 1963, during which time only six yachts called at Suwarrow. Still he was never lonely.

This time Neale was determined to avoid what he considered to be his major mistake during his first visit: "In a curiously ironic way, I had unwittingly imposed on the timeless quality of the island the speed and bustle of modern cities from which I had been anxious to escape."

One day the thought struck him that Robinson Crusoe had built himself a secondary residence several miles from his stockade. Why should he not do the same? Why not a "summer house" on an outlying island where he might go for a "vacation" and a change of scenery? And this he did, building himself a rather substantial hut complete with kitchen on one of the smaller islets. Thereafter, whenever the pace became too "hectic" on Anchorage Isle, Neale closed up and went on holiday to Motu Tuo.

Neale's second stay on Suwarrow came to an abrupt end at the close of 1963 when eleven pearl divers from Manihiki invaded his paradise. They were a happy-go-lucky group that littered his beaches, partied every evening, and drank most of his fresh water. His heaven now a hell, Neale took advantage of the first boat to call at the island and returned to Rarotonga.

This time he had no intention of going back to Suwarrow. He settled in with his family, resumed his position at the store, and began writing about his years on Suwarrow for a British publisher. The memoirs, *An Island to Oneself*, a lyrical and sensitive evocation of his experiences on the atoll, appeared in 1966 and immediately became a best seller throughout New Zealand and Australia.

The writing of his book made Neale nostalgic for his island, so he returned again in July 1967, remaining this time for ten years. For this visit he used the royalties from his book to set himself up in style, arriving on Suwarrow with forty boxes of personal belongings, drums of fuel, two boats, and a miscellaneous collection of building materials. He tidied up his island and resumed his old routine.

But this time things were different. Ironically, it was Neale's own success in describing the beauty of solitude that finally broke down his isolation and brought the outside world down upon him. The authorities on Rarotonga, anxious to promote tourism to the Cooks, declared Tom Neale a national resource, appointed him postmaster general of Suwarrow, and then advertised the island as the world's only one-man post office. Soon philatelists from around the world de-

luded Neale with requests for envelopes with their stamps canceled on Suwarrow, and the interisland schooner detoured twice a year to the island to cast up on his beach bulging bags of mail.

Then there were the fan letters. "You'd be amazed at the variety of stuff I'm asked to send along," Neale complained in exasperation to an American friend. "Sand, dirt, leaves, coral—and endless questions. To hell with 'em. It's a wonder someone doesn't ask for a turd from my old cat!"

The British newspapers sent in correspondents on chartered boats to do interviews with the now-famous Hermit of Suwarrow. A visit with Tom Neale became a badge of distinction among the yachtsmen who crossed the Pacific. Whereas before never more than two yachts a year had called at Suwarrow, now a dozen or more would anchor in the lagoon. And each time Neale would have to disrupt his routine to show his visitors about, serve them tea, and suffer through countless sessions of picture-taking.

The yachts left behind their magazines and newspapers. Copies of *Time*, *Newsweek*, and *The Economist* accumulated regularly. Neale found himself growing increasingly concerned about the month-to-month problems of the world. His letters from Suwarrow throughout the 1970s are filled with expressions of concern about such issues as environmental pollution, the oil embargo, the impending energy crisis, Watergate, changing weather patterns, and even the Ford-Carter race of 1976. ("The dollar seems to be taking a thrashing," he wrote to a friend in 1973, "and those damned currency speculators ought to be shot but I suppose Watergate doesn't help any.") Neale had become a celebrity and not even the incredible isolation of Suwarrow could give him back his privacy or his peace of mind. Things had changed for good.

The idyll's end was augured in early 1977 when Neale developed a chronic pain in his stomach. It grew worse as the months passed, and in May a calling yacht found him seriously ill. The interisland schooner diverted for the last time to take Neale to the hospital on Rarotonga, where the doctors found he suffered from terminal stomach cancer. Early in the morning of 30 November 1977 the man who had once defined himself to a visiting yachtsman as "just an ordinary guy who wanted to go it alone" died. Later that same day Neale's body was laid to rest in a small cemetery by the sea.

James C. Simmons is a free-lance writer specializing in travel, wildlife, and history, and a lecturer at San Diego State University. He met Tom Neale shortly before his death on Rarotonga, and visited Suwarrow this past summer.

PAPER No 5
SESSION III - Country reports

DOCUMENT No 5
SECTION III - Rapports nationaux et territoriaux

COOK ISLANDS

by

Walter H. Hambuechen,
Agricultural Investigations and Information Officer,
Cook Islands

LES ILES COOK

par

Walter H. Hambuechen,
Chargé des recherches et de l'information
au Service de l'agriculture
des îles Cook

Summary

A brief description of the geography, the population and the economic situation of the territory is given. Reefs and lagoons play an important part in the protein food supply, but the marine fauna has been much reduced by new fishing methods. It is likely that in some areas pollution has been caused by concentrations of agricultural chemicals. Acanthaster planci has caused problems in some lagoons. Soil conservation is not practised in the Cook Islands, and erosion exists on some high islands.

Plans for future economic development are noted, but it is pointed out that the Cook Islands are not in a position to indulge in new projects which could prove costly and not economically remunerative in the long run.

* * *

Résumé

Bref aperçu de la situation géographique, démographique et économique du territoire. Récifs et lagons jouent un rôle de premier plan dans l'alimentation protéique mais la faune marine a considérablement diminué depuis l'introduction des méthodes modernes de pêche. Il est probable que certaines zones sont polluées par la concentration des produits chimiques utilisés dans l'agriculture. L'étoile de mer épineuse (Acanthaster planci) fait des ravages dans certains lagons. Aucune mesure de conservation du sol n'est prise et certaines des îles hautes sont atteintes par l'érosion.

Il existe des plans de développement mais les îles Cook n'ont pas les moyens de se lancer dans des entreprises coûteuses qui risqueraient, en fin de compte, de ne pas être rentables.

* * *

I. Socio-geographic situation

The atolls and high islands of the Cook Group are flung over some 850,000 square miles of the central Pacific between 8°59' and 21°54' S. and 157°21' and 165°49' W. The total land mass is a mere 93 square miles of which barely 15 square miles are classed as suitable for annual and tree crops. The country is divided into two groups of islands, the Northern and the Southern. The former consists entirely of low atolls supporting little agricultural activity beyond copra production and limited subsistence growing of Colocasia and Cyrtosperma; the latter or Southern Group consists mainly of islands of volcanic origin the two largest being Rarotonga, containing the capital, and Mangaia, 16 and 14 square miles respectively. Soils in the Southern Group are relatively fertile, contributing to the production of citrus, bananas and pineapples for export and processing. However the soils have been heavily cropped over the past half century, and increasing amounts of fertilizers are required to keep up production. Erosion in regions of agricultural use with even moderate slope is common.

As at September 1966, the total population of the Cook Islands was 19,247, but the figure probably now approaches 21,000. The 1966

census revealed that numbers of males and females was almost equal, and the total economically active population was 5,561. The latter figure has probably increased slightly as a result of the international airport construction and allied building boom, but the 1966 figure of 2,129 engaged in agriculture and fishing, has probably decreased as more money jobs become available.

II. Economic situation

Government is the largest employer, but by far the largest proportion of the country's earned income is from the sale of agricultural produce, namely citrus, bananas, copra and pineapples, in that order, as revenue producers. The 1970 gross income from these items plus a few minor exports of taro, avocados, tomatoes, arrowroot starch, etc. came to about \$NZ1,017,000. About \$NZ381,000 was earned in 1969 through clothing manufacture, crafts and pearl shell. The majority of the population, particularly in the outer islands, lives to a greater or lesser degree on semi-subsistence fishing and cropping with a few poultry, pigs, goats and cattle.

III. Reefs and lagoons: their role in island food supplies

Approximately half the population of the Cook Islands lives in the outer islands, where reefs, reef flats and lagoons play a leading role in the protein food supply. Even in Rarotonga, it would be safe to say that marine foods, locally available, contribute to about one quarter of the protein intake. Every variety of reef fish large enough to eat, Tridacna clams, turban snails, members of the Tellinidae, octopus and other mollusks especially the Aplysidae at certain seasons, various holothurians, and echinoderms, all play a role in local diet, although the Northern Group islanders normally disdain most of the latter items, but relish Tridacna, octopus and selected reef fish. Crayfish are prized on all islands.

The growing Rarotonga population and the use of improved forms of nylon nets and spearguns, dynamite, derris root and organo-chlorine poisons, have indisputably reduced numbers of reef fish and other reef foods on that island. Although there is legislation against the use of poisons and dynamite, such ordinances are very difficult to enforce. In any case, it is likely that the stream and ground water run-off has carried concentrations of agricultural chemicals, particularly DDT and Lindane, into offshore waters where they have affected various marine life cycles, particularly in the sensitive arthropods.

Other islands of the Southern Group have also undoubtedly been affected by most of the above noted factors, particularly those islands where export fruit is produced and much spraying of these crops is practised. These problems probably do not apply so much to Northern Group atolls, where fish supplies are more plentiful, and, with the exception of Pukapuka, the human populations remain low. Fish poisoning is not practised in the Northern Group. It is important to note that because of limited shipping, Northern Group islanders probably derive almost 90 per cent of their protein from marine sources locally available.

The Crown-of-Thorns starfish, Acanthaster planci, appears to be a serious problem in the lagoons of Manihiki and Penrhyn, where it has badly damaged the Acropora and other hard corals, and may have caused a reduction in pearl shell spat through environmental destruction. In Rarotonga and Aitutaki, large herds of the starfish have had noticeable impact, particularly off the north coast of the former island. In Aitutaki, numbers of Acanthaster are now seen in reef-flat pools between the main reef and the Motus or the lagoon. The "Westward" scientists report much damage off Manuae (Hervey Islands).

IV. Soils conservation

To date, there is no practice of soils conservation in any of the Cooks, and rather serious erosion is evident on slopes in all the high islands where agriculture is practised. A few citrus orchards are protected by windbreaks of Eugenia jambolana and other trees, and there is a new scheme to protect banana plantations by windbreaks of young coconut trees which serve a dual purpose. The meaning of ecology and conservation is almost unknown, but in the atolls the importance of the very limited soils is more recognised, and organic matter such as coconut husks, leaf mulch, etc. is frequently used.

V. Conclusion

In conclusion, we note a few plans the Cook Islands Government is proposing or is investing in. Government has invested \$30,000 in the Total Atoll Project, as proposed by Mr T.A.P. Pryor of the Oceanic Foundation. Construction of the fishpond and plastic Greenhouse are presently underway. There is a 40 acre pineapple scheme underway for the island of Atiu, and harbour improvements are planned there. A 50 acre expansion of the citrus scheme, to supply fruit for the Island Foods Ltd. factory is underway at Mauke. A fisheries co-operative has been formed

and new diesel-powered fishing boats are being made available to interested parties under the Economic Development Fund loan scheme. Grower's associations have been formed for the supply of fresh vegetables and fruits in an attempt to make these items more plentiful and less expensive.

Finally, the Agriculture Department is now beginning soils testing, and is making available a wide variety of vegetable seeds, seedlings, and Pythium-rot-resistant taro shoots to the public. Mr George Chan is being consulted on the possibility of setting up a pilot project for his waste digester now functioning in Suva and in New Guinea, this with a view towards improving the atoll food supplies. However, it must be noted that the Cooks, with extremely limited finances, are not in a position to indulge in projects which could prove costly and not economically remunerative in the long run. Particularly, this applies to projects which may affect the very limited land and reef resources upon which such a large part of the population depends.

SOUTH PACIFIC COMMISSION

Regional Symposium on Conservation of Nature

- Reefs and Lagoons

Proceedings and Papers

Held at Noumea, New Caledonia
at the Headquarters of the South Pacific Commission
5 to 14 August 1971
in collaboration with the
International Union for Conservation of Nature
and Natural Resources
(IUCN)

Published by the South Pacific Commission,
Noumea, New Caledonia, 1973

2-24-75 South Pacific Comm. 26.65

ATOLL RESEARCH BULLETIN

NO. 198.

NOTES ON THE VERTEBRATE FAUNA OF
TONGAREVA ATOLL

by Roger B. Clapp

Issued by
THE SMITHSONIAN INSTITUTION
Washington, D.C., U.S.A.

February 1977

NOTES ON THE VERTEBRATE FAUNA OF TONGAREVA ATOLL

by

Roger B. Clapp¹

Tongareva (or Penrhyn) Atoll, at 9° S, 158° W in the south central Pacific Ocean, is the northernmost of an isolated group of islands north of the Cook Islands, and like them is administered by New Zealand. Tongareva is a typical ring atoll about 40 miles in circumference and contains a lagoon of about 108 square miles (Buck, 1932).

The vertebrate fauna of the atoll has been little studied despite relatively frequent visits by missionaries, anthropologists, and zoologists. The atoll was visited by the Kaimaloa Expedition in December 1924 and in September 1936 and April 1937 by William F. Coultas and R.W. Smith, respectively. Both Coultas and Smith collected birds but no formal reports on the collections were ever written.

On 13 June 1965, Tongareva was visited for 9 hours by a survey team of the Smithsonian Institution's Pacific Ocean Biological Survey Program (POBSP). Only the "bird islets" including Vaiari Islet at the southwestern corner of the lagoon and portions of the northwestern rim were visited.

Recently Batham and Batham (1973) presented observations on the birds of the atoll made during a visit from 12 August to 20 September 1968. The present paper presents additional information on the vertebrates of Tongareva Atoll and comments on Batham and Batham's useful contribution. Appendix Table 1 lists bird specimens collected in 1936, 1937 and 1965.

¹
National Fish and Wildlife Laboratory, U.S. Fish & Wildlife Service,
National Museum of Natural History, Washington, D.C. 20560
(Manuscript received February 1975 -- Eds.)

Mammals

At the time of the POBSP visit, cats (*Felis domestica*), dogs (*Canis familiaris*), and pigs (*Sus scrofa*) were being raised by the natives. Comments in Ward (1967) and by Lamont (1867) suggest that the pigs may have been introduced to Tongareva in 1853 from the shipwrecked vessel Chatham. Rats (*Rattus* sp.) were numerous in 1965, but as no specimens were collected their identity is unknown. Lamont (1867) stated that in 1853 "... [the natives] had never seen an animal larger than a very small rat, that lives principally in the cocoa-nut trees" Lamont's description suggests that the rats on Tongareva are *Rattus elegans*, a species widely distributed on the Pacific Islands.

Reptiles

Although native informants indicated that turtles (most likely the Green Turtle [*Chelonia mydas*]) were frequently caught at Tongareva no turtles were observed during the POBSP visit. Lamont (1867) and Buck (1932) indicate that turtles were caught by the natives for food.

Burt and Burt (1932) in their report on the herpetological results of the Whitney Expedition stated that the collections of the American Museum of Natural History contained one specimen of the Mourning Gecko (*Lepidodactylus lugubris*, AMNH 41749) and one of the Blue-tailed Skink (*Emoia cyanura*, AMNH 41748). They also indicated that E.H. Bryan, Jr., had collected these specimens while a guest of the Whitney South Sea Expedition in 1925. In fact, these specimens were collected by the Kaimaloa Expedition in 1924 (E.H. Bryan, Jr., *in litt.*) and mentioned by Gregory (1925). Ball (ms.) added that the single example of Mourning Gecko seen was collected and that the skinks were common but difficult to capture.

More recently the POBSP collected 28 specimens of four species of lizards. The more abundant species, the Mourning Gecko (14 specimens, USNM 158325-338) and the Blue-tailed Skink (10 specimens, USNM 158340-349) were those reported by Burt and Burt. The other two species collected were the Snake-eyed Skink (*Cryptoblepharus boutoni*, 1 specimen, USNM 158339) and the Polynesian Gecko (*Gehyra oceanica*, 3 specimens, USNM 158322-324). Both of the latter species were widespread on well vegetated central Pacific atolls but neither has been recorded previously from Tongareva.

Birds

Annotated List

In the following species accounts the presence of brackets about the name of a bird indicates that the occurrence of the species on

Tongareva is not well documented and that its occurrence there should be considered hypothetical

[White-tailed Tropicbird

Phaethon lepturus]

Native informants indicated that this species is rarely seen at Tongareva.

Red-tailed Tropicbird

Phaethon rubricauda

About half a dozen birds were seen by the Bathams, but no definite evidence of nesting was obtained by them. One bird seen under a bush may have been in the pre-laying stage.

Brown Booby

Sula leucogaster

The Bathams found a bird incubating two eggs; this is the only record of nesting for this species on Tongareva. The only other record of occurrence is that of a Brown Booby banded on Jarvis Island, 30 May 1940 and recovered at Tongareva on 15 February 1941 (Munro 1944).

Red-footed Booby

Sula sula

These birds were seen and collected in 1936, 1937, and 1965. All three of the POBSP specimens were collected from a group of ten birds seen on the southwestern bird islets. No evidence of nesting was found.

Two Red-footed Boobies banded elsewhere were recovered at Tongareva. One was banded 9 August 1938 on Jarvis Island by George C. Munro and recaptured at Tongareva on 28 February 1941 (Bryan, 1970). Another banded as a nestling 24 June 1965 on Malden Island by the POBSP, was recovered at Tongareva on 15 June 1966.

Great Frigatebird

Fregata minor

This species, like the Red-footed Booby, was seen and collected in 1936, 1937, and 1965 but was not recorded by the Bathams. There is no evidence that the species breeds on Tongareva. Munro (1960) reported a Great Frigatebird that had been banded on Enderbury Island of the Phoenix Islands and recovered on Tongareva.

Lesser Frigatebird

Fregata ariel

Large immature young were recorded by the Bathams during their visit, and approximately 150 birds were seen on the southwestern islets during the visit by the POBSP. The POBSP personnel found about 10 nests with eggs and 2 with nestlings in nests 7-8 feet up in 10 to 12 foot high trees (*Pemphis acidulus*). Native informants indicated that the species formerly nested in much greater numbers.

The Bathams stated that natives told them that band recoveries of *Fregata* from Australia and the United States had been obtained at Tongareva. It seems very unlikely that there have been any band recoveries from Australia. The "recoveries from the United States" presumably refers to the Great Frigatebird recovery mentioned above.

Pintail

Anas acuta

An adult female banded 16 August 1949 at Tule Lake, California, was shot 15 November 1949 at Tongareva. This is the only record of this species from Tongareva.

Domestic Fowl

Gallus gallus

Chickens were being raised by the natives when the island was visited in June 1965. Probably these birds were first introduced to Tongareva in September 1853 (Ward, 1967; Lamont, 1867).

Golden Plover

Pluvialis dominica

The POBSP saw six Golden Plovers along the west side of the island. The Bathams reported that this species was widespread on the atoll. They also stated that natives told them that this species and the Ruddy Turnstone nest on Tongareva but did not comment on this obviously erroneous information.

Bristle-thighed Curlew

Numenius tahitiensis

The POBSP saw two of these curlews and collected one.

[Asiatic Whimbrel

Numenius phaeopus variegatus]

This race of the Whimbrel, listed as *Numenius variegatus* by the Bathams, was stated by them to occur in small parties of two to nine on open areas of old bare coral. Although it is possible that this western Pacific species was seen, it seems much more likely that this record (and a similar record by the Bathams for Suvarov Atoll) were of the Bristle-thighed Curlew, which could be expected to occur on these atolls in some numbers.

Ruddy Turnstone

Arenaria interpres

Turnstones have been recorded only by the Bathams, who found them on every islet visited.

Wandering Tattler

Heteroscelus incanus

Wandering Tattlers were first recorded by the Kaimaloa Expedition in 1924 when a few were seen (Gregory, 1925). Subsequently six specimens were collected in April 1937 by Smith, and three were recorded along the west side of the atoll during the POBSP visit in June 1965.

[Black-naped Tern

Sterna sumatrana]

Native informants indicated that this species is rarely seen at Tongareva.

Sooty Tern

Sterna fuscata

Three birds were seen offshore in December 1924 and about 40 were seen flying over the island by the POBSP. The Bathams received six eggs which were attributed to this species, but further documentation of the nesting of this species on Tongareva would be desirable.

Blue-gray Noddy

Procelsterna cerulea

A nestling preserved in spirits at the American Museum of Natural History is the only record of this species from Tongareva. The bird was collected 26 September 1936 by Coultas.

Brown Noddy

Anous stolidus

Ball (ms.) first recorded these birds on the atoll in December 1924 when they were incubating eggs in nests in the coconut trees. Brown Noddies were commonly seen when Tongareva was visited by the Bathams. Nests with young and one with an egg were seen. Only two large nestlings were found during the visit by the POBSP. Both were in nests in *Pandanus* trees. In all, an estimated 300 birds were seen during the June 1965 visit, about 100 along the southwestern islets and the rest along the northwestern portion of the atoll.

Black Noddy

Anous tenuirostris

These birds were the most abundant seabird on the atoll when it was visited by the POBSP. An estimated 3,000 birds were seen on the small islets at the southwestern corner of the lagoon. At this time between 1,000 and 1,200 nests were present but birds were associated with only about 150 and all these contained eggs. Nests were primarily constructed of leaves of *Pandanus* and grass (*Lepturus* sp.) and were located in *Pandanus* and *Tournefortia* trees. Later in the season (of a different year), the Bathams found both eggs and nestlings, some in *Pandanus* and a few others in *Pisonia grandis*.

White Tern

Gygis alba

These terns were fairly abundant when the island was visited by the POBSP. Sixty-five counted among the islets at the southwestern corner of the atoll, and another seven were counted at the northwestern corner. No nests were found during the POBSP visit, but gonad data from the four specimens collected suggest that the birds were breeding in June 1965. Both eggs and young were found by the Bathams in August-September 1968.

Populations evidently decrease considerably during the northern hemisphere winter as only a few of these terns were seen by the Kaimaloa Expedition in December 1924 (Gregory, 1925). During this visit, Ball (ms.) considered the species uncommon.

[New Zealand Cuckoo

Eudynamis taitensis]

The Bathams reported a bird that the natives called "Koekoea", which was purportedly this species, but did not see one. The occurrence of the New Zealand Cuckoo on this atoll should be watched for.

Summary

This paper briefly summarizes what is known of the vertebrate fauna of Tongareva Atoll. Four species of mammals, dog, cat, pig, and an unidentified rat (*Rattus* sp.), occur on the atoll as does an unidentified turtle, probably *Chelonia mydas*. Four species of lizards, all of wide distribution in the central Pacific, are present. Two of these, the Snake-eyed Skink and Polynesian Gecko, are reported from the atoll for the first time.

Excluding species of hypothetical occurrence 16 species of birds are known from the atoll. Of these, the Brown Booby, Lesser Frigatebird, Brown, Black, and Blue-gray Noddies and White Tern are seabirds that breed or have bred on the atoll. Four other species of seabirds, Red-tailed Tropicbird, Red-footed Booby, Great Frigatebird, and Sooty Tern, visit the island regularly. The Red-tailed Tropicbird and Sooty Tern may breed on Tongareva.

The remaining six species include four migrant shorebirds, the Golden Plover, Bristle-thighed Curlew, Ruddy Turnstone, and Wandering Tattler, a vagrant duck (the Pintail), and the introduced Domestic Fowl.

Acknowledgements

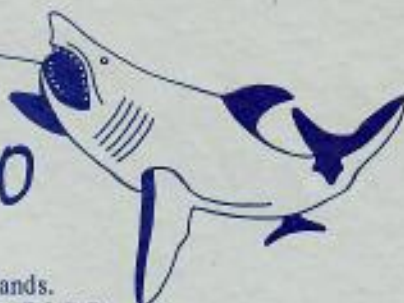
I am indebted to the members of the POBSP survey team, Fred C. Sibley, Robert R. Fleet, Lawrence N. Huber, C. Robert Long, Dennis L. Stadel, and Robert S. Standen, upon whose field work this report is based. I also thank M. Ralph Browning, John S. Weske, Marshall A. Howe, and Philip S. Humphrey who read and commented on the manuscript. This is paper number 110 of the Smithsonian Pacific Ocean Biological Survey Program.

References

- Ball, S.C. (ms.1924) *Field notes taken while on the Kaimaloa Expedition* . Original in the B.P. Bishop Museum, Honolulu.
- Batham, J. and A. Batham. 1973. Field notes on birds observed on the 'motus' of two atolls (Penrhyn and Suwarrow) in the northern Cook Islands, 1968. *Notornis* 20: 97-101.
- Bryan, E.H., Jr. 1970. History of bird banding in Hawaii. 2. Review of articles in the *Elepaio*. *Elepaio* 30(11): 100-103
- Buck, P. 1932. Ethnology of Tongareva. *B.P. Bishop Mus. Bull.* 92: 1-225.
- Burt, C.E. and M.D. Burt. 1932. Herpetological results of the Whitney south sea expedition. VI. Pacific island amphibians and reptiles in the collections of the American Museum of Natural History. *Bull. Amer. Mus. Nat. Hist.* 63: 461-597.
- Gregory, H.E. 1925. Report of the Director for 1924. *B.P. Bishop Mus. Bull.* 21: 1-55.
- Lamont, E.H. 1867. *Wild life among the Pacific Islanders*. London, Hurst and Blackett.
- Munro, G.C. 1944. Notes on migration and straggling birds. *Elepaio* 4(6): 33-34.
- Munro, G.C. 1960. *Birds of Hawaii*, revised ed. Rutland, Vermont, Charles E. Tuttle Co.
- Ward, R.G. (ed.) 1967. *American activities in the central Pacific 1790-1870*. vol. 3, Ridgewood, N.J., Gregg Press.



RAROTONGA MARINE ZOO



P. O. Box 659, Rarotonga, Cook Islands.
Telephone: 22-450 Telex: 62026 SSIRARO RG

Allan Watters
Managing Director

Dated May 23, 1984.

Dr. G.H. Balazs
NMFS
P.O. Box 3830
Honolulu
Hawaii 96812,
U.S.A.

Dear Dr. Balazs,

During the last months, we have had some problems with green turtles (*Chelonia - mydas*) in the Rarotonga Marine Zoo. We send you this letter, hoping that you can give us some pieces of advice or give us the address to someone who may be able to help us to solve the problem.

The Cook Islands is a country where the turtles are not protected by any law. Almost every ship from the atolls in the northern group (e.g. Penrhyn) bring living turtles to Rarotonga. We sometimes buy turtles from them, but are uncertain about how they have been treated during transport.

In our Zoo, we are very concerned about the health of our animals and try to give them the very best care. A lot of visitors (Cook Islanders as well as tourist) have realized that it is important to conserve these interesting reptiles.

In our oceanarium, with circulating sea water, we keep green turtles together with Hawksbill turtles (*Eretmochelys imbricata*) and different fishes. Every day they are fed sea cucumbers (*Holothuroidea*) fish meat without bone (tuna and Parrot fish), crustaceans and (during the season, January - March) marine grasses. The Temperature in the tank is about 26.C.

We have lost a few green turtles (adults as well as sub adults) due to a disease we can not identify. Symptoms: After feeding perfectly, the turtle suddenly stops to eat, without any previous sign of distress. It is then floating around on the surface, without diving. The eyes are shrunked in and the animal is very weak. No mucous or blood comes from the nostrils and it does not show any other sign of illness than mentioned.

All turtles have died if not being given any medical treatment. We have treated one specimen (length: 14 inches, weight: approx 12 pound) and it is still alive, although still very weak. It has been given Penicillin (Chrystapen, for human use), 600 mg (injected in the back leg, solved in distilled water) twice a day for three days. It has also been given Becozym (a vitamin B complex for human use, consisting of vitamin B1, B2, Nicotinamide, B6, Panthenol, B12 and Biotin/ vit. tt.), 2ml (injected in the leg) twice a day for six days and now once a day, as a stimulance for the appetite. During the first six days it was kept isolated on a fresh watered sandbed with shelter and placed on the belly (we know that it had perhaps difficulty to breathe in that position.)

Some fixed tissues from a diseased green turtle were sent to the Animal Health Reference Laboratory, Wallaceville Animal Research Centre, New Zealand. The examination of the tissues revealed a mild infestation with parasitic eggs (ovoid, brown coloured, encapsulated, about 150 to 200µ by 50µ, some containing up to about 30 basophilic nuclei) of undetermined origin in various tissues. There was a moderate inflammatory response to them in the oesophagus, but only minimal changes elsewhere. The oesophagitis may have made the animal reluctant to feed, but would not be likely to be the immediate cause of the death, according to the laboratory.

2.../

- Fact sheet
+ STATUS
- PAPER+ Manual
+ Hunt Syn.Questions:

1. Do you recognize these symptoms ?
2. Why do the turtles get this disease ?
3. How should it be threated ? (medicine, vitamins, doses etc.)
4. What would be the best diet for green turtles and hawksbills of different age?
5. Do you think it is a good idea to give young turtles an extra amount of vitamins and calcium in the food and is any special vitamins extra essential ?
- CONFERENCE VOLUME { 6. Could you recommened some current publications on the diseases of turtles, their threatment and how to keep and breed them in captivity ? (since we do not have any international scientific library here, we would be grateful for the addresses to the authors or the publishers, so we can order a copy)
7. Is it possible to breed these species in captivity and do you have any general recommendations on the care of turtles ? (what is their optimal temperature ?)
8. We often get questions from visitors on the age of the turtles. What is the age of green turtles and hawksbills in nature and captivity ? What is the relation between size and age.
- TOY IT. send + COPIES 9. Is it necessary for sea turtles (especially green turtles) that they have an opportunity to lay basking in a dry spot? (I have read that they go ashore in Hawaii for basking).
- X 10. Is it dangerous to keep sea turtles in fresh water for a few days during a threatment period?

If you have any ideas that could help, we would be very grateful.

Yours Faithfully.

Thomas Malm

Thomas Malm, Curator.
Rarotonga Marine Zoo.
Cook Islands.

Post-mortem?
Blockage?

NATIONAL MARINE FISHERIES SERVICE
HONOLULU LABORATORY
P. O. BOX 3830
HONOLULU, HAWAII 96812

June 28, 1984

F/SWC2:GHB

Mr. Thomas Malm, Curator
Rarotonga Marine Zoo
P. O. Box 659
Rarotonga, Cook Islands

Dear Mr. Malm:

By now you should have received the various published reports (Research and Conservation Manual, FAO Hawksbill Synopsis, etc.) that I mailed to you last week in partial response to your letter of inquiry dated May 23, 1984. Your letter was waiting for me when I returned to Honolulu from field work tagging sea turtles in the Northwestern Hawaiian Islands. In this present letter I will answer your specific questions as best I can. In addition, I am enclosing several more publications that should be useful to your efforts to maintain sea turtles at the Rarotonga Marine Zoo.

The disease symptoms that you described are only familiar to me in a very general sort of way. Your turtle diet seems well balanced, and the seawater temperature at 26°C is entirely acceptable. I assume that your turtle tank is supplied with ocean salinity seawater, and that there is a regular exchange (continuous?) in order to remove fecal matter and urine. Waste products from captive sea turtles, including uneaten food, can build up rapidly and cause an unhealthy situation. In the turtles that have died, have you been able to go through the gastrointestinal tract carefully to determine if any blockage has occurred? Sometimes food compaction can take place, especially in the lower intestine. If this is happening, you would want to increase the amount of marine benthic algae and/or sea grasses that are being consumed.

You mentioned that sea cucumbers sometimes form a part of the turtles diet. Do you feed them quantities of this invertebrate? To my knowledge, it is not a normal food source for green turtles living in the wild. In addition, it is my understanding that certain portions of some sea cucumbers contain toxins.

Sea turtles, and especially the green turtle, are subjected to physiological stress when placed in fresh water. Such a condition creates an imbalance for the salt excreting glands (lacrimal) located behind the eyes. Sea turtles placed in fresh water have been known to survive long periods, but it is not a healthy environmental circumstance.

Terrestrial basking areas are by no means needed for sea turtles in captivity. In fact, as you mentioned, remote areas of Hawaii are one of the very few places left where green turtles display this interesting behavior in the wild. Hawaiian green turtles held in captivity where they have access to a sloping area also regularly bask. If you have the

PAPER No 16

SESSION IV - Problems of conservation and planning for their solution; 2. Soil pollution

DOCUMENT No 16

SECTION IV - Problèmes de conservation et plans d'action pour les résoudre; 2. Pollution du sol

PESTICIDES IN THE COOK ISLANDS

by

Walter H. Hambuechen
Agricultural Investigations and Information Officer
Rarotonga

LES PESTICIDES AUX ILES COOK

par

Walter H. Hambuechen
Chargé des recherches et de l'information
au Service de l'agriculture
Rarotonga

Summary

Since World War II, there has been a dramatic increase in the use of pesticides for agricultural and public health purposes, but few tests have been carried out on residual amounts of chemicals present in local soils and water. However, dramatic effects on fish in both streams and lagoons have been observed, and it is believed that the increase of Acanthaster planci and consequent widespread reef destruction may have been indirectly caused by the effects of pesticides on the predators of this starfish.

A list is given of pesticides imported into the Cook Islands since 1963, and of the purposes for which they were used. The bulk of Cook Islands earnings comes from crops, and pest control

measures are therefore essential; however, the public should be educated in the use of appropriate measures.

Marine resources supply a high proportion of the territory's protein requirements, particularly in lower-income areas. These resources must be safeguarded.

A thorough systematic study of the problem should be undertaken.

* * *

Résumé

Depuis la deuxième guerre mondiale, l'emploi de pesticides pour l'agriculture ou la santé publique accuse une augmentation spectaculaire, mais peu d'analyses de sols et d'eau ont été faites pour rechercher les résidus de produits chimiques. Et pourtant, les effets désastreux de ceux-ci sur les poissons de lagon et d'eau douce ont été constatés et l'on pense que la prolifération de l'étoile de mer épineuse (Acanthaster planci) qui ravage le récif résulte indirectement de l'effet des pesticides sur ses prédateurs.

Liste des pesticides importés aux îles Cook depuis 1963 et de leurs usages. La culture étant la principale source de revenus, la lutte contre les nuisibles est essentielle, mais il faudrait apprendre aux insulaires à la pratiquer dans les règles.

Les produits de la mer fournissent à la population la majeure partie des protéines dont elle a besoin, surtout dans les régions les plus pauvres. Il importe donc de les protéger.

Il y aurait lieu d'étudier la question avec méthode.

* * *

Introduction

The use of pesticides to combat introduced insect pests affecting export and subsistence crops in the Cook Islands has increased dramatically since the end of World War II, at which time

DDT became widely hailed as the panacea. As contact with the islands became more frequent, it appears that the numbers of pests increased proportionally. And as extensive damage to commercial crops - particularly citrus and tomatoes - became evident, control measures intensified.

At the same time, Public Health officials sought new and more effective chemicals to control mosquitoes and flies, cockroaches and ants, in homes, shops, restaurants, and around the community refuse dump.

It soon became evident that agriculture and health officials were turning to the long residual action chlorinated hydrocarbons, initially DDT, then in the early 1960's to Lindane and Dieldrin. The latter two chemicals particularly, came to public notice when they were found to be acting as powerful fish poisons in Rarotonga streams and lagoons. It is likely that agricultural spray gangs and possibly health officials had washed their spraying rigs in island streams. The poisoned fish were taken to the public who, in ignorance, soon began obtaining amounts of Lindane and Dieldrin which they used to obtain fish rapidly and simply. It should be explained that some time previously derris root (*Derris elliptica*) had been imported from Papua by missionaries, who showed the people how to use it for fish poisoning. Derris root became known as "Rakau Papua", and when chlorinated hydrocarbons were seen to have similar effects, people promptly began to use them also, in the streams, pools and lagoons.

The undesirable effects of DDT and Lindane were noticed in the early or mid 1960's, when they caused dramatic reductions in honey bees and in lady-bird beetles (introduced into the islands in the hope they would help to control aphids in citrus).

The more disturbing ecological and health implications of these chemicals became evident following their widespread use by island planters and the Fruit Control Section. Startling ignorance in the proper mixing and application of chlorinated hydrocarbons may have had profound ecological effects - but it must be noted that practically no tests on residual amounts of the chemicals in soils and in water have yet been made in the islands.

2. Trends in recent years

In 1965, the writer brought the matter of indiscriminate and dangerous use of chlorinated hydrocarbons to the attention of the

newly formed Government following a series of alarming fish poisonings in streams draining the southern side of Rarotonga. A publicity campaign was mounted, using an illustrated sheet showing the dangers of DDT, Lindane and Dieldrin when used in streams and lagoons, and when incorrectly used as sprays on food crops. In 1967, the Cabinet called a meeting in which the writer and other Agricultural and Health officials participated, to assess the extent and seriousness of the use of these chemicals, and to make recommendations on restricting their use. Samples of poisoned fish from the Aroa stream on the southwest side of Rarotonga had been sent to the New Zealand Department of Scientific and Industrial Research and found to contain 1/10th of 1 percent lindane. At the same time, serious implications of the use of dieldrin as a tomato spray became evident following the death of a four year old child who had been eating quantities of the ripe fruit which had been sprayed with this chemical. No autopsies are permitted as a rule in Polynesian families, so no definite evidence could be obtained. It should, however, be noted that the use of dieldrin was never recommended by the Department of Agriculture and that the amount used for spraying the tomatoes had been obtained illegally through the Public Health Section of the Department of Health. The latter discontinued the use of dieldrin in 1969. 2

3. The "Westward" expedition

In March 1971, scientists on the Oceanic Foundation's research ship "Westward", suggested that the use of large amounts of chlorinated hydrocarbons, especially DDT, may have reduced the numbers of predators on Acanthaster planci around the reefs of the Cook Islands. It is believed that many of the predators affect the Crown-of-Thorns starfish in the free swimming larval stage. The amounts of pesticides draining off the islands in streams and in underground drainage, could concentrate in eddies around the islands and affect some part of the life cycles of the predators. Scientists found that the entire southwestern reef of Aitutaki was dead, possibly from the effects of the Acanthaster, possibly due to effects of a drum of DDT lost overboard from a lighter off the main passage, in addition to the long-term pollution by DDT carried by rivers and streams draining the islands. The actual results of the various tests carried out by the "Westward" had not been published when this paper was written.

4. Pesticides imports

Many of the Agriculture Department records were lost when the hurricane of 1968 wrecked the Departmental office on the Avarua

wharf side. However, it is evident that DDT was first imported to the Cook Islands around 1948, when it was brought to control damage caused by Cryptoblabes plagiocleuca, the blossom moth which severely affected citrus crops. Lindane and dieldrin probably in the late 1950's or early 1960's.

Records since 1963 give the following figures for the imports of the chemicals:

DDT	- 27,792 lbs of 50% wettable powder	1963-1971
DDT	- 1,736 lbs of 2% powder	" "
DDT	- 2,000 lbs of 25% wettable powder	" "
LINDANE	- 1,584 gallons of 20% emulsion	" "
GUSATHION	- 112 lbs brought about 1967	
DIELDRIN	- 1,787 gallons as sheepdip and Dieldrex 15	1961-1967
DIELDRIN	- 2,380 lbs as 50% wettable powder	1961-1968.

The largest amounts of DDT were imported during 1967-1969, when a total of 8,016 lbs of 50% wettable powder were landed, plus the 2,000 lbs of 25% wettable powder and the bulk of the 2% powder. The bulk of the lindane arrived in 1963 when 24 drums of 44 gallons each were landed. The dieldrin was discontinued as an import in 1968, but the largest quantity was imported in 1962.

5. Uses

The main purpose of importing DDT and lindane was to control citrus pests, tomato pests, and later the banana borer. The approximate acreage of citrus is as follows:

Rarotonga	- about 250 acres
Aitutaki	- about 120 acres
Atiu	- about 100 acres
Mauke	- about 65 acres.

DDT is also used to control the following pests: the sphinx caterpillar infesting sweet-potatoes or kumara, the tomato fruit-worm or caterpillar, green vegetable bugs, the caterpillar eating Colocasia leaves, leaf hoppers and cabbage caterpillars, including those which attack silver beet and Brassica chinensis.

Lindane is used for: aphids in citrus and all the pests mentioned above under DDT. Dieldrin was used for: spraying of pit toilets, refuse damage, dwelling-houses, shops and restaurants against roaches and ants and also illegal agricultural spraying. It has not been used

since 1967 or 1968 and the Health Department claims that much of the supplies had leaked out of rusty containers in their storeroom; the rest was drained and buried in the Rarotonga community dump.

6. Discussion

The bulk of Cook Islands earnings comes from the production of crops. The income derived from these crops in 1970 was:

Oranges	-	\$322,576	export and local canning
Mandarins	-	96,137	
Tangerines	-	23,775	
Grapefruit	-	28,265	
Lemons	-	<u>4,955</u>	
Total citrus		<u>\$475,708</u>	for 1970.

Other crops contributing major earnings were:

Bananas	-	\$250,000	
Copra	-	186,000	
Pineapples	-	79,000.	

Thus it is evident that the 1970 earnings from agricultural produce came to over NZ\$ 1 million and that the import and use of pesticides to safeguard the crops from which these earnings are derived is an imperative matter. Because of the small total land area of the Cooks, 53 square miles, the ecological dilemma posed by pesticide residues is equally evident.

The Agriculture Department has to date relied on DDT as the most widely used pesticide, the main reason being that the officials recognise the relatively careless and ignorant attitude taken towards pesticides by the public and even some of the Departmental labour. DDT is deemed the least toxic of the controls. Unfortunately, only in the past months has interest been focused on new pesticides, particularly DuPont "Lannate", methomyl insecticide. The most widely used alternative to DDT in all the islands has been Malathion, which is likely to continue to have a leading role in control of various pests.

A widely accepted but totally erroneous view taken by many islanders could be termed "the stronger and the more, the better". Because of it, it is common to find small planters mixing DDT with Lindane and/or Malathion. Double or more than the recommended dosages

are quite commonly applied and human health is largely disregarded. A potential threat means little to the islander, and the threat only becomes real if he actually sees the ill effects of a pesticide upon the health of another individual. Efforts have been made in the past year to educate the average planter through the radio and local press, but much ignorance still prevails. There appear to be no plans to study the effects of pesticides upon the environment, as a whole, particularly upon the marine environment which provides a moderate percentage of the local protein diet - particularly in islands other than Rarotonga.

7. Limited environment

The main factors emerging from the above figures and discussion are that the Cook Islands, with only 53 square miles of land area, of which probably less than half can be classed as arable or economically useful, represent an extremely fragile environment upon which over 20,000 people depend and that the use of persistent and ecologically damaging pesticides has never been properly examined. Only in the past three or four years have the Government leaders been alerted to the dangers of various pesticides or made aware of the meaning of ecology.

8. Marine resources

Marine resources supply the bulk of the protein for islands other than Rarotonga. It would be safe to say that the atoll environments of the Northern group are 90 percent dependent upon protein derived from the sea, the bulk from the reefs. In the outer islands of the Southern Cooks, it is likely that about 60 percent of the protein consumed comes from the reefs and offshore waters.

All reef fish are eaten, with the exception of the puffer (Tetraodon hystrix) which is known to be poisonous. Holothurians or sea slugs, octopus, turbo snails, clams and other shellfish are common items of diet. For Rarotonga's population, now increasingly dependent upon imports of tinned and frozen meat and fish, the marine resources provide probably less than 25 percent of the protein consumed. There can be no doubt, however, that at certain times of the year, particularly the warm months from November through April, reef sea foods play a vital part in the semi-subsistence living of the majority of the Cook islanders.

9. Low income

The 1966 census indicates that by far the largest number of people in Rarotonga had no income at all. The largest income group earned less than \$200, namely 809 people. Seven hundred and thirty-nine people earned between \$200 and \$399, and 665 people earned between \$400 and \$599. The total 1966 population was 9,685 for Rarotonga, of which 6,895 people were classed as earning no income.

In the outer islands the income is much lower and semi-subsistence cropping and fishing provide the bulk of food requirements, so that it becomes increasingly evident that the judicious use of any imported chemicals which could affect this food supply must be carefully investigated.

10. Conclusion

With the rapid population growth, soon to be augmented by the arrival of expected thousands of tourists each year, the ecology of these islands, and any disturbance of this ecology, must be a matter of primary concern to scientists and statesmen alike.

Depending upon agricultural production both for income and for subsistence living, the Cook Islands would be in a dilemma were it not for pesticides which control the now numerous pests which annually ravage the crops. But in the long term the use of these pesticides may so affect the fragile island environment that, with rapidly increasing population and demands upon land and marine resources, ecological disasters may be part of the future. A thorough, systematic study of these matters is called for. Certainly the lessons learned by larger countries should be taken into urgent consideration.

H.I.M.S. LIBRARY

SOUTH PACIFIC COMMISSION

Regional Symposium on Conservation of Nature

- Reefs and Lagoons

Proceedings and Papers

Held at Noumea, New Caledonia
at the Headquarters of the South Pacific Commission

5 to 14 August 1971

in collaboration with the
International Union for Conservation of Nature
and Natural Resources
(IUCN)

Published by the South Pacific Commission,
Noumea, New Caledonia. 1973

2-24-75 South Pacific Comm. 26.65

c/- Education Department,
Box 97,
Rarotonga,
COOK ISLANDS,
19 August 1984.

need -
Aquarium
notes
+ response

9-4 -
sent
Tahelou

George Balazs,
Institute of Marine Biology,
University of Hawaii,
P.O. Box 1346,
Kaneohe,
Hawaii 96744-1346

Dear George,
Kia Orana.

I am an educational science advisor here and for the last couple of year have been working on a series of books on Cook Island Natural History. The idea is to have a general, readable text and photographs of all conspicuous plants and animals. The books are for general distribution and will provide background material for teachers.

I was in Pukapuka a couple of years ago when your request for information arrived. Unfortunately it arrived on the boat on which I left so I was unable to assist the locals in filling-in the questionnaire.

I would expect that you now have all the returns which are likely to be sent back and maybe have had time to analyse the results. I was wondering if you would send me a photocopy of all the returns from the Cook Islands.

(Also could you send me a copy of any analysis of the Pacific situation which you have completed.

I am returning to the Northern Cooks early next year and will have an opportunity to question people up there. However the returns which you have received will give me a good idea of the situation and therefore make my questioning more fruitful.

There is also a small freshwater turtle (or maybe a tortoise) on the island of Manuae. This turtle is small (say up to 10 inches) and has a very long neck. I believe that every few years one will be caught in the taro swamps on Rarotonga. I gather it is a fairly secretive turtle. I have never seen one. THE QUESTION IS: HAVE YOU ANY IDEA WHAT IT IS????? (If you have a few possibilities, could you send me a photocopy of some information on them so if somebody can get me one I can identify it.)

I would be very grateful if you could assist me with information on the above problems.

In anticipation of assistance, I thank you very much.

Yours faithfully,

Gerald McCormack.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

September 7, 1984

F/SWC2:GHB

Mr. Gerald McCormack
Education Department
Box 97
Rarotonga, Cook Islands

Dear Mr. McCormack:

By now you should have received the literature on sea turtles that I sent in partial response to your letter of 19 August 1984. Enclosed are the remaining items you requested. We are pleased to make this material available for use in your educational science program.

Concerning the long-necked freshwater turtle you described at Manuae, it would be very difficult for me to determine the species without photo documentation. I suspect that it is something from the Chelidae family, having been introduced from New Zealand or Australia. Chelidae, as well as Derochelys and Chelydra, are described and partially illustrated on the enclosed pages photocopied from a large reference book on turtles. If you are ever able to observe one of the Manuae turtles, please send me several dorsal and ventral photographs and I will see to it that an accurate identification is achieved.

I received two responses to the letters I wrote in 1982 asking for current information about sea turtles in the Cook Islands. Copies of these letters (from Mauke and Mangaia) are enclosed, as you requested. I look forward to receiving any similar information you may have gathered during your time at Pukapuka.

A few months ago I received a request for information about sea turtle from Thomas Malm, curator of the Rarotonga Marine Zoo. I sent a substantial quantity of literature along with the enclosed copied letter. As yet, I have not heard back from him to learn if the problems he was experiencing with captive sea turtles have been alleviated. If you know Mr. Malm, would you please make a personal inquiry on my behalf. Many thanks.

I look forward to hearing from you again when your time permits.

Sincerely,

George H. Balazs
Wildlife Biologist

Enclosure

ATLANTIC MONTHLY 1929. Vol. 13: p. 462-466
Cook Islands

pounds weight not ten pounds are wasted. The Puka-Pukans eat the flippers, shell, and tail, while the head is given to the man who catches the turtle. The hard bony carapace and plastron shells are considered the most delicate parts, and the result is that when the turtle feast is over there is hardly enough refuse left to fill a hat.

II

Old William and I dug out one hundred and six round white eggs that day, each about the size of a hen's egg. The fully developed eggs are not particularly palatable, but quite good enough for a meal on Frigate Bird Islet. William decided that this batch had been laid two days earlier, so that we might expect Mrs. Turtle to return in a little more than a week. We would lie in wait and catch her by the simple process of turning her over on her back; then go to the north side of the islet and light the signal fire which would inform the rest of the Puka-Pukans across the lagoon that a turtle had been caught, whereupon they would all paddle joyously over for the feast.

The following eight days passed as I should like all days to pass for the rest of my life. I swam in the lagoon with my water goggles on, looking down on the fantastic peaks of submarine mountains, watching the gorgeously colored fish swimming in and out of caves and crevices among the coral; or I would lie on the beach and sleep, or wander idly through the groves inland, listening to the lonely cries of the sea birds. Each day I grew stronger and soon reached that stage of health where one derives the keenest delight from the mere fact of being alive.

On the eighth night old William and I walked the beach during high tide, but old Mrs. Turtle failed to appear; so we

digs a round hole to the surface and wobbles clumsily out. At his heels, better, his flippers — is a second, a third, and so on, all the little ones marching in single file to the shore, where they dive happily in. In the tragedy begins, for there is no one daintier than a baby turtle, and my sea creature seems to be waiting for the feast. Of the hundred or more turtles that leave the beach, not one will succeed in getting as far as the water's edge. A dozen more will be gobbled by spotted eels. The moment the little company are through the breakers, the large fish outside swirl them, devouring them, usually, to the last turtle.

Then I think of the innumerable ones of the young turtle, I marvel at the way of them escape to reach maturity. But some do, of course, for old Mrs. Turtle makes due allowance for casualties. She lays from four to six hundred eggs yearly, so that in the course of five hundred years a few of her two hundred and thousand offspring are bound to survive.

There are thousands upon thousands of them in a female turtle; some are eggs of just-forming eggs no larger than a pinhead, and from these they grow in size to the fully developed stage. The smaller ones are a great many, but somehow, with me, half the measure in eating them is lost. I think of the thousands of eggs I have I am destroying through the work of my molars. It is a law on Puka-Puka that the entire turtle belongs to the entire nation. When only one turtle is found and shared among the five hundred and fifty-odd inhabitants, the individual portions, one would suppose, must be small. But they are larger than I anticipated might think, for of the average green turtle's three hundred

MRS. TURTLE LAYS HER EGGS

BY ROBERT DEAN FRISBIE

Half an hour after our arrival at islet, old William returned in excitement from a reconnoitre of the beach. He had found a turtle only a few hundred yards from the little thatched hut. I followed the spot. It must have been a turtle, for the track was a good foot wide and ploughed deep into sand.

Looking at the trail she had left behind her, I wondered that there any of these great turtles left the sea. The natives of all these islands know, of course, that a turtle lays eggs every ten or twelve days, or on five occasions during the month of November and December. So a trail is discovered, one has to lie in wait during high tide. Mrs. Turtle may be caught when she returns to lay another batch of eggs for she will lay her successive batches within a few hundred yards of the first one.

I have read that a turtle is very fond of hiding the spot where she lays her eggs, but this is nonsense. From shallow to the upper beach she digs a track behind her as plain as a road. The spot where she lays is hollowed out much like a shallow, the sand being heaped on either side to the height of a foot or more. After the eggs are deposited and the wobbles straight back to the reef, leaving another trail so plain that it is impossible to see it, one has to be very careful not to stumble into it. When the eggs hatch, the first

For the past four years I have lived as a trader on the atoll of Puka-Puka, in the South Pacific, but it was only recently that I became personally acquainted with the midnight ramblings of Mrs. Turtle. I had been dangerously ill from ptomaine poisoning, so I decided to close the trading station and take a two weeks' vacation on Frigate Bird Islet, one of the three islets which, with the reef and the lagoon, comprise the atoll. It is contrary to the local tabus for anyone to visit Frigate Bird Islet except during the copra-making seasons, when the whole population moves; but as I am a white man, and had been very ill, the village fathers generously consented to my sojourn on Frigate Bird for the purpose of convalescence. Furthermore, it was then November, the season when the turtles come ashore to lay their eggs, and I had promised the natives to lie in wait for one.

Taking with me an old retainer called Uiliamu (William), I paddled across the lagoon and was soon comfortably settled on Frigate Bird Islet, in a grove of tall puka trees. There the wind moaned with a pleasant dolorousness and innumerable sea birds were blown about the sky, settling from time to time on their perches in the tops of the trees. Frigate Bird was also a favorite nesting place for the *rupes*, island doves whose cooing is as lonely-sounding as the music of the wind in the branches of the puka trees.

returned to our little hut in the puka grove and went to sleep. William said that mother turtles seldom cross the reef at low tide, but this is not an invariable rule.

An hour later I awoke, as completely refreshed as though I had enjoyed a long and dreamless night's sleep. William was snoring at the other end of the hut, and I heard an owlish shearer squawking a discordant love song to the moon.

I rose and crept out of the mosquito net, thinking that perhaps Mrs. Turtle might have stolen a march on us and might even now be fashioning the nest for her eggs somewhere up the beach. Sure enough; I had not gone more than a hundred yards along the shore when I came to a freshly ploughed track from the shallows to the shore brush. I halted and listened.

The water in the outer shallows lay steely-calm halfway to the reef, and the shadows of branching coral were outlined with striking clearness. But the first tiny wave of the incoming tide was moving shoreward, a wall of water about a foot high, jet-black in the moonlight save for flashing points of spray that rose and subsided as the tide wave foamed gently across the shallows to break with a faint hiss on the sandy beach. A moment later it was on its way back to the reef and soon the shallows were calm again, although the water was a few inches deeper than before.

I seated myself on the sand near Mrs. Turtle's track and gazed into the shadows of the shore brush. Once I thought I saw a dim ungainly shape moving there, and several times heard the crackle of breaking twigs as she broke through the bushes.

She rested for several moments, and then I heard a sharp scraping noise followed by the patter of sand against the foliage. I rose, crept close, and turned

the light of my flash lamp into the bush. At my feet, so close that I might have touched her, was a green turtle weighing at least three hundred pounds. She turned her head to stare at me with cold passionless eyes; then with a deliberate, almost haughty motion she again turned, and without paying the least further attention to me went on with her work.

I sat down and placed my flash lamp on the ground so that the light was fully upon her. I expected her to move away, but she did not, and the natives have told me that once a turtle has started to dig the pit for her eggs nothing can frighten her away. The eggs must fall and she will proceed, oblivious of everything, until she has them nested.

There was something solemn, almost religious, about that midnight labor so beset with danger. I watched with a feeling akin to awe, as though I were eavesdropping at an esoteric rite. What, I wondered, did old Mama Turtle make of my flash lamp? Was she aware that death awaited her only a few feet away, that she would never again cross the reef to plunge into the cool sanctuaries of the sea? If so, she gave no evidence of the fact. More than likely she was the stoic she appeared to be, a fatalist whose hundreds of years of experience had placed her above worrying over the vicissitudes of life and the fear of death. The light of my flash lamp was merely another of those strange phenomena turtles must expect on dry land. I wondered about all sorts of things as I watched her—a man will harbor curious thoughts in the wee hours of a moonlight night on the remote beach of an uninhabited islet.

She had already started digging her pit when I first approached her. She used her hind flippers, the right and left ones alternately. With one she would reach to a spot under her tail, scrape

I must have waited a full hour longer, for the moon had dropped Arai Reef, and I could see the foam and spray where the long smooth combers humped their backs and broomed over the sunken reef. Venus had risen and in another hour the puka tree would be outlined in the first jig of dawn. Twice I flashed my light in the bush, only to see Mrs. Turtle lying motionless, resting after her labor. Presently I nodded, and dozed in the midst of a series of disjoint reflections.

I was roused by the sound of some thing dragging over the sand. I ceased the moment I looked up. The stood Mrs. Turtle, perfectly still, no more than ten feet from me. I was directly in her path; all I must do was to walk up to her, get a firm hold on her carapace shell above the tail, and turn her over—but there was plenty of time for that.

I watched her for fully ten minutes then, of a sudden, she breathed. It was a mucous respiration, startlingly loud in the still night air. It may have been that my long exposure under the moon's full light had given me what the Puka-Pukans call 'moon madness' however that may be, it occurred to me that old Mama Turtle was an exceedingly likable, human sort of creature. Therefore I decided to have a little confidential chat with her.

Although at first the sound of my voice startled me a little, I explained to Mrs. Turtle the foolish risk she has taken in coming to an uninhabited island to lay her eggs. 'In your hundreds of years,' I said, 'you should have learned that only the loneliest sand banks are safe for you, and that your greatest danger is from an encounter with man.' 'And now, madam,' I went on with a little flourish, 'see what your lack

away about a handful of sand and gravel, and, cupping the bottom of her flipper, bring the sand to the surface and deposit it. The other flipper would then be swung into the hole, while with the first she would brush away the sand already brought out. This was done by scraping the flipper vigorously across the ground, and it was that sound I had first heard after discovering her track.

She worked automatically, for evidently she must dig her pit in the age-old manner or not at all. It was interesting to observe that, though one flipper was shorter than the other, when the hole became too deep for her to reach bottom with the shorter one she still went through the motions of scraping, cupping, and brushing the ground where the sand should have been. This somewhat lessened my opinion of Mrs. Turtle's wisdom.

When the pit was as deep as she could make it—about twenty inches—she dropped one hundred and fourteen eggs into it, filling the excavation to within three or four inches of the surface. Then, working both her hind flippers at once, she scraped the sand into the pit, patting it down firmly and pushing it under her until she had a mound a foot high over the eggs. Then she put her powerful front flippers to work for the first time. Reaching out, she scraped them across the ground so vigorously that a shower of twigs, sand, and gravel went flying into the air. This was done, I suppose, in an effort to cover and conceal the spot where the eggs were laid—an entirely futile attempt. Half of the first shower rained on me, with such force that I moved away at once. Deciding that I had seen enough of Mrs. Turtle's private affairs, I moved some distance away to sit on the beach near her track. For ten minutes longer I could hear her flinging the sand about; then she was silent.

of foresight has brought you to! To-morrow you will be split in two — *rawji-ake*, as the Puka-Pukans say — and eaten to the last corner of your shell. You will have ceased to exist. For many hundreds of years you have flopped across the reefs of lonely atolls, ploughed up the beaches, and laid your hundred eggs. For centuries you have paddled with dignity and deliberation about the seven seas, dining on the choicest turtle grass and contemplating the starry firmament through long tropic nights. All these centuries you have escaped being made into soup for aldermen's dinners; you have escaped the ropes and spears of savages; and most amazing of all, at about the time when William the Conqueror crossed the English Channel, when you hatched out on some remote and moonlit tropic beach such as this, you escaped your enemies in the sea and by some freak of chance managed to grow to maturity, safe from all sea creatures, only now to be unceremoniously flopped over by a mere South Sea trader.

'Outside the reef old Papa Turtle is waiting for you. When he rises to breathe he gazes shoreward, wondering what is keeping you so late. But he will never see you again. He will wait beyond the reef for a few days, and then, doubtless, paddle off in search of another mate. To-morrow your body, from the tip of your nose to the end of your tail, will be crushed between the jaws of five hundred hungry savages. What a forlorn end to a life of adventure such as yours!'

Again Mrs. Turtle breathed hoarsely, and this time she struck her flipper on the sand, as though annoyed that I

should keep her waiting. I rose and, stepping behind her, grasped her shell. I made a feeble attempt to turn her over, but she was very heavy, so I did not try again, for I was willing to believe that I was still weak from my recent illness. She waddled with stately deliberation down the beach, while I stood where I was, watching her. When she had nearly reached the water I called after her: 'Madam, I will give you three pieces of advice: Dive deeply and at once whenever you see a ship, boat, or canoe. Never go ashore at an island where you see fires at night. And above all, avoid man, your greatest enemy.'

Old Mama Turtle wobbled on without so much as a glance back. A moment later she flopped gracelessly into the water and I saw her no more. Dawn was at hand as I walked back to the puka grove. Old William was still asleep.

When he awoke he soon discovered the turtle track and my own as well, and all that day he would not speak respectfully to me. He knew at once what had happened, but he was unable to account for my strange behavior. Why, if I were unable to turn the turtle over, had n't I called him? There was really no satisfactory reply to be made to that question. The next day when we returned to the main island William told the story, and I was in disgrace. For a week not one of the village fathers would consent to buy so much as a popgun from me, or a bag of marbles. Nevertheless I am glad that I acted as I did. And if old Mrs. Turtle is capable of emotion and reflection, I am sure she is glad, too.

THE PUBLIC LOOKS AT PILLS

BY AGNES REPPLIER

I

SOME years ago a society of distinguished physicians and surgeons invited a well-known journalist to speak to them on 'The Doctor from the Layman's Point of View.' It was the chance of a lifetime, but the journalist made nothing of it. He filled his allotted hour with some appropriate display of scholarship (mainly Oriental), and a great many well-turned compliments. His audience, gratified but a trifle bored, expressed their sense of appreciation, and have had none but professional lecturers ever since.

In truth the layman's point of view, as it has come down to us through the centuries, is one of mockery and derision. The French adage, 'Never waken the sleeping doctor,' is a little like 'Never warm the frozen viper.' The old Italian epitaph, 'I was well: I wished to be better: I took medicine and died,' turns up in divers tongues and in divers ages. Pausanias is said to have attributed his length of years to his avoidance of all drugs. English comedy, like French, rings with laughter at the expense of a profession from which so much was expected that a broad margin was left for discontent. George Colman's sneer, —

But when ill indeed,
In dismissing the doctor don't always succeed,
A forced and mechanical alongside of
My's swinging lines: —

Men may escape from rope and gun,
Some have outlived the doctor's pill.

Dryden, more serious an wrote decisively: —

God never made his work for me
Which was being very much
in Zion.

The layman, writing upon of medicine, has never drawn distinction between a staten fact. He gave us in the p gives us in the present, a gr interesting reading which, circumstance, is apt to be e true to life. We learn fro Burton, who bravely quotes that in the days of Jerusalem and pride there lay open in t a great book written by King and containing remedies for a of diseases. To this book the free access, and each man f the cure for his ailment. B kiah caused it to be taken a ing that it made the peopl and that they forgot the nee ing upon God for help, b their too great confidence in S wisdom.

Burton himself was far ahe generation in sense and ration cism. His words are the wort dom. He makes plain the ad of dieting, which all men hate unadvisability of taking other remedies, a habit dear to me hearts. Neither does he thin for laymen to read medical r and draw their own conclusio one should be too bold t tise upon himself without an a

to the latter method of disposal. Gill is, I think, speaking of both Mangaia and Rarotonga when he says that it was usual to bury with the dead body some article of value—a stone adze or a white shell used in dancing beside a man, and a cloth mallet beside a woman—and these articles were never touched afterwards by the living¹. Whatever was laid on the corpse was buried with it, and no further notice was taken of it, but whatever was placed by the side, without touching it, was repaid². Gill also says that the blue beads given by Cook to a native were specially valued and were buried, as a great mark of distinction, with a woman³. In Rarotonga, when a man of rank was buried, his adze, hafted and ready for use, was put into his right hand, the stone part resting on his shoulder, while by his side were laid his staff and his drinking-cup for his use in the spirit-world⁴. Gill also says that in Rarotonga they buried with a woman of rank the cloth mallet and utensils she was accustomed to use⁵.

I draw attention to the reference to the distinction made between objects that had been laid on the corpse and buried and those that had been placed by it without touching it. Placing things so as not to touch the body might or might not conceivably, according to Polynesian beliefs, make them taboo; but placing them on the body would, I imagine, certainly do so. The articles placed by the side of the corpse, without touching it, and which had to be "repaid," would be gifts by friends, apparently towards general expenses, in return and exchange for which the family of the deceased had to give to the donors something of equal value⁶. Probably the valuable things that were buried, and had perhaps been put on the corpse, were intended for the use of the dead man's soul. The placing of the adze in the dead man's hand, and of his staff and drinking-cup beside him, is significant, or at least suggestive, of a belief that these things would be used by his soul in the spirit-world as stated by Gill.

Food for the dead

In Mangaia, on the disposal of a corpse, the mourners chose five old coconuts which were opened one after another and the water poured out on the ground; the nuts were then wrapped

¹ Gill, *L.S.J.*, p. 75.

² Gill, *S.L.P.*, p. 174.

³ Gill, *L.S.J.*, pp. 77 sq.

⁴ *Ibid.*, p. 78.

⁵ Gill, *Journal*, p. 87.

⁶ *Ibid.*

in leaves and native cloth, and thrown towards the grave¹; there is a recorded case of the funeral of a girl, whose friends came one by one at brief intervals, after the corpse had been let down into the burial chasm, and opened coconuts and made other food offerings². When a corpse was let down with cords into the burial chasm of Auraka, the nuts and other food were thrown down upon it one after another, the people each time calling the name of the departed, and saying, "Here is thy food; eat it"; and when the fifth nut and accompanying *raroa* or pudding were thrown down, the mourners would cry, "Farewell! we come back no more to thee!" This custom of feeding the dead forms the main subject of a "death talk" called "Koroa's lament for his son Kourapapa³"; and it is stated that the belief was that the soul ate the "essence" (*ata*) of the food. The custom of giving these food offerings to the dead had its origin, according to Mangaian beliefs, in the temporary return to earth of Veetini (the first man to die a natural death). He told his rejoicing parents that he had been permitted to revisit the upperworld for the purpose, among other things, of showing mortals how to make offerings of food to the dead⁴; the event is the subject of an ancient song⁵. We shall see, when considering the evidence as to souls after death, that Rarotongan souls had to be provided with food to be presented by them to Tiki, in order to be allowed to enter his house in *Ataiki*, which was the Rarotongan paradise.

Removal of sins

According to a story of the island of Aitutaki, told by Large, Iro, the voyager of whom there were many traditions in Polynesia, committed the offence of not sending to Puna, the chief of the island, a turtle which the people of Puna had caught but which had come into Iro's possession, and only sending him a small portion, which was carried to him by Iro's son Tautu, who in offering it said that he would return and fetch the rest of the turtle for him. Puna's priests, however, told him not to taste the portion brought him, saying that the rest of the turtle had been eaten by Iro; so Puna was very angry and killed Tautu, cutting off his head. Afterwards Tautu's soul re-entered the head and went to Puna and asked him for what offence he

¹ Gill, *Myths*, p. 187.

² Gill, *S.L.P.*, p. 120.

³ Gill, *Myths*, p. 187.

⁴ *Ibid.*, pp. 202-6.

⁵ *Ibid.*, p. 183.

399pp.

by R. W. Williamson
1933

Religious and Cosmic Beliefs
of Central Polynesia

Pac. Br 2600
US

had killed Tautu. Puna's priests, by his direction, explained the matter to Tautu's soul, the explanation beginning with a reference to the greatness of Tautu's sin, and after referring to some other matters, concluding with the following words:

There are two gods of this bright world, the Sun and the Moon.
The sins of the East and the sins of the South bind them together,
Put them in the canoe, and take them to Vavau.
There are the gods Tane-roa, Ti and Akarimen.

Then Tautu's soul answered that the sin had been blotted out, having been blown through the coconut, built into the canoe, and scooped with the fishing-net, and again asked what was the sin for which Tautu had been killed; to which other priests of Puna replied that the sin was that of Iro in eating the rest of the turtle, to which again Tautu's soul answered denying that Iro had done so, and saying that the remains were intact. Puna then directed others of his priests to explain to Tautu's soul what the sin was, and their reply to this was, "We do not know, and we are not clear that he has committed any sin." Tautu's soul then warned Puna that his own head would be cut off by Iro, after which it "left and became extinguished".

The turtle is in many parts of Polynesia a sacred animal which, when found, should be taken to the head chief, and in some cases, at all events, it seems to have been regarded as a sin against the gods to omit to do this. Puna was evidently supposed to have considered that Iro had committed the offence of killing the turtle and eating all of it, except the portion which had been sent by the hand of Tautu to himself, and that Tautu had been involved in this crime; but afterwards Puna's priests, understanding that Iro had not eaten the rest of the turtle, were unable to say that any sin had been committed.

If we compare what seem to have been, or may have been, the conceptions of Samoa, the Society Islands, and Aitutaki respectively, we find features of similarity and difference, to which I will draw attention.

(1) The Samoan evidence refers to illnesses and disasters generally—not, apparently, only to those of the dead man—and the latter was asked to take them with him, and let the survivors live; but it does not mention sins; and the intention was that these illnesses and disasters should cease to trouble the survivors. In the Society Islands the god was asked that the dead

¹ J.P.S. vol. XI, pp. 134-599.

man's sins should be deposited in the hole, that the anger of the god should be appeased, and that the sins should not attach themselves to the survivors; and the dead man was asked to bury his disease with him in the grave, and admonished to let the guilt remain with him. In Aitutaki the evidence only refers to a tradition, and not to a subsisting practice; but we may believe that the ideas disclosed by the tradition would be in accord with prevailing conceptions, and, perhaps, customs. In this case the idea was, apparently, that the sin supposed to have been committed by the dead man should be taken in the canoe to Vavau, where the three gods lived; but there is no reference to any benefit or security which this would give to living persons.

(2) In Samoa there was an appeal to the dead man, that he would go with a good will, and without vexation against the survivors. In the Society Islands the dead man's soul was called upon to be satisfied in the world of spirits, not to inflict his disease on other people, and not to look towards or return to and distress the survivors. In the Aitutaki account there is no reference to any appeal to the soul.

(3) In the Society Islands the idea evidently was that war or sickness arose in consequence of sins committed; so these sins and the sickness [or impulse for war?] were sent out to sea in a model of a canoe. In Aitutaki the sins were supposed to be taken away in a canoe.

(4) In Samoa there were the references to disaster in the west, happiness in the east, and misery in the south. In Aitutaki the sins of the east and the sins of the south were referred to. I can offer no explanation of this, though the conception of happiness in the east and disaster in the west might possibly be connected with some idea of birth and death; but this would not explain the matter. The importance of the evidence is that it helps to indicate a similarity between the beliefs of Samoa and Aitutaki; and this similarity gives us some further justification for supposing what, as I have suggested in my comments on the Society Island evidence, seems probable, namely, that though sins are not actually mentioned in the Samoan statement, they were the cause of which the sickness and calamities that are mentioned were the result.

Different though these accounts from the different islands are, there are elements of similarity between them which make me think it probable that the beliefs to which they point were based upon conceptions, the underlying idea of which was that

To George,

This is the letter from
the fisheries officer here in
Rakahanga.

22nd February 1996

The Marine Officer
Conservation Service
Tararua

Best regards
Jacqui.

Dear Edwin

Kia Ora. I am very grateful in receiving your letter of the 13th of February 1996, and also regret with the issue given to you by Cere Makira that he had given to my office here of a report of the green turtle survey.

I honestly inform you that I did not receive any report from Cere Makira or even any report to my main office in Tararua.

However according to your request I am very pleased to give you my support to assist you with your report to the IZM.

The total number of green turtle that lay eggs during the period of July to November 1995 are 12 altogether.

The laying of eggs are in all different places around the island. Two were found on the southwestern side of the island that were the village, 3 on the northwestern side and 4 on the northeastern side of the island and both spots are about 5km from the main village.

The smallest number of eggs laid by each turtle are 140 and the highest 224 on both clutches.

We have monitored and find out that the last and final nesting was in 12 to 14 days interval. The depth of the body pit is 34cm to 40cm but its depend on the size of the turtle.

Hatching period is 55 days to 70 days and our normal temperature is 23 to 31 degrees celsius. The newly hatched turtle is 5cm in carapace length.

Five of the nest were transferred to a artificial nesting ground in the main village near the seashore and 1 nest were still at the natural nesting ground.

Because of the insufficient material to support our project we only make one 3 x 3 ft square and 3 ft high fence which can only hold 200 young turtle. we only keep in the fence up to 7cm in carapace length of the young turtle and we released it to the lagoon to allow them to survive from their enemies but in the ocean.

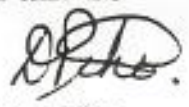
The total hatchlings been released is 2,345 ~~individuals~~ ~~artificial and natural nesting.~~

There is 3 more artificial nest not yet hatched I am afraid the egg might run bad.

However this brings to your attention when I hear your programme over radio Cook Island about the year of the turtle, last year. That how your staff get involved with the monitoring of the green turtle around our shore here in Rakahanga.

I hope that everything is clear to you and much appreciate to hear from you more about other environment to be conserved.

Kia Manuia



Danny Pano
Senior Fisheries Officer
Deputy Mayor

To George.

This is the letter from
the fisheries officer ~~from~~ in
Rakahanga.

Best regards
Jacqui.

22nd February 1996

Mr Edwin Eperiu
Conservation Service
Rarotonga

Dear Edwin

Kia Ora. I am very grateful in receiving your letter of the 15th of February 1996, and also regret with the issue given to you by Gere Makira that he had given to my office here of a report of the green turtle survey.

I honestly inform you that I did not receive any report from Gere Makira or even any report to my main office in Rarotonga.

However according to your request I am very pleased to give you my support to assist you with your report to the S.S.I.E.I.

The total number of green turtle that lay eggs during the period of July to November 1995 are 12 altogether.

The laying of eggs are in all different places around the island. Two were found on the southwestern side of the island that where the village. 5 on the northwestern side and 4 on the northeastern side of the island and both spots are about 3km from the main village.

The smallest number of eggs laid by each turtle are 140 and the highest 324 on both clutches.

We have monitored and find out that the last and final nesting was in 12 to 14 days interval. The depth of the body pit is 34cm to 40cm but its depend on the size of the turtle.

Hatching period period is 35 days to 70 days and our normal temperature is 28 to 31 degrees Celsius. The newly hatched turtle is 6cm in carapace length.

Some of the nest were transferred to a artificial nesting ground in the air village near the consulate and 15 nest were still at the natural nesting ground.

Because of the insufficient material to support our project we only take one 1 x 1 ft square and 3 ft high fence which can only hold 200 young turtle. we only keep in the fence up to 70cm in carapace length of the young turtle and we released it to the lagoon to allow them to survive from their enemies but in the ocean.

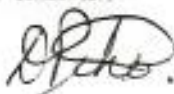
The total hatchlings been released is 2,345 ~~hatchlings~~ artificial and natural nesting.

There is 3 more artificial nest not yet hatched I am afraid the egg might run bad.

However this brings to my attention when I hear your programme over radio Cook Island about the year of the turtle, last year. That how my staff get involved with the monitoring of the green turtle around our shore here in Rarotonga.

I hope that everything is clear to you and such appreciate to hear from you more about of other environment to be conserved.

Mia Menuia



Barry Pilo
Senior Fishery Officer
Deputy Mayor

Jacqui Evans
Cook Islands Environment Service
PO Box 371
Rarotonga
Cook Islands

13 May 1996

Dear George,

Thankyou so much for the information on Cook Islands Turtles. It is invaluable to me. Etty received hers and says a big thankyou. I have also received the photos - thankyou.

It was also wonderful for us to meet you - an absolute privilege. We are presently re-drafting our turtle project proposal because we want to pick up some of the ideas other countries had for their campaigns.

I have just been to Samoa for an FAO meeting - a lot of bureaucratic jargon involved. I thought the turtle meeting was bad, but the FAO meeting made it look like an extremely valuable and enjoyable exercise! It's the last time I'm going to anything that has "FAO" on the invitation.

Well, I will sign off here. Take care of yourself.

Jacqui



**COOK ISLANDS
NATURAL HERITAGE
PROJECT**

Prime Ministers Department
P.O. Box 781, Rarotonga
Cook Islands

Ph. (682) 20959, Fax. (682) 21874

12 May 1996

George Balazs,
Honolulu Laboratory,
NOAA, NMFS,
2570 Dole Street,
Honolulu, HI 96822-2396

Concerning **Cook Islands Marine Turtles Poster**

Dear George,

Kia orana.

Slightly before or after the arrival of this letter you should receive copies of the poster, which was finally printed late last year. Although it took more than 18 months to find suitable photographs, we are now very pleased with the appearance of the poster.

Thank you for making your slides available and you will note that we used your Green hatchling.

Thank you also for checking the information for the poster, and for the many years of interesting correspondence on turtles.

The poster will be distributed free to schools and Government Offices throughout the Cook Islands. We hope it will gently move people towards a greater understanding of sea turtles, and the need to conserve them.

If you would like any more copies of the poster please let me know.

Many many thanks,

Kind regards,

Gerald McCormack
Director

Enclosure: **Your seven slides.**

23 May 1996

Mr George Balaz
Marine Turtle Research Programme
National Marine Fisheries Service
Honolulu Laboratory
2570 Dole Street
HONOLULU
Hawaii 96822-2396



Dear George

Kia Orana. Thank you so much for the packages we both received from you. I'm really sorry to inform you George that Dr Steven Kavana passed away some years back. I believe he died of cancer. His wife Tai is now living in Hong Kong with second husband but always comes back regularly to see her family. The Arorangi Hotel is still there under new management and is now known as the Manuia Beach Hotel. As for Desmond Clark I made a few enquiries but was not able to get any information of their whereabouts.

I am really thrilled with the materials you sent us. Some of the information I wasn't even aware of. Jackie and I are thinking of producing a teachers handbook containing turtle information, local legends/stories etc. Of course this largely depends on whether Sue Miller will give us the funding. However in preparation and anticipation of approval from Sue, I'm now in the process of collecting materials that could be included in the handbook. I was wondering if you could please help us with the biological information. I would most appreciate any material or information that you will be able to send us for inclusion in the handbook. Perhaps you may like to give us a few hints of any topics that you think should be included as well. I was thinking to gear the materials for teachers and secondary school students. Last month, a curriculum developers workshop included "Turtles" as a topic of its own in the school syllabus for secondary schools.

I really would like to include Frisbie's story in the handbook but I'm not too sure whether I can do that or not. What do you think? I know some of his children very well (Charlie and Johnnie) and I don't think they would mind. I'm only concerned about the copyright from the publishers side. Could you send me more details of how or where the story was published?

There is another thing that I wanted to ask you. Jackie and I were very much impressed with both yours and Colins presentations during the workshop. We both learnt a lot from them. So I was thinking that it would be good if the Service had a set of the slides that you showed us which would help us with our education awareness follow-up programme. The thing is would you mind if we duplicated your slides? Perhaps SPREP could do it as part of their regional commitments. I don't know. Its just my thinking. I haven't written to Sue yet. I thought I would wait for your comments first.

Theres so many other things that I would like to ask but I'll do that after I hear from you. People are wanting to use this machine so I'd better get off.

Kia Manuia and Best Regards
Edith Ngariu

A handwritten signature in black ink, appearing to read "Edith Ngariu", is written below the typed name.

Cook Islands Fisheries Bibliography

Robert Gillett and Tangiau Tearii

March 1989



Field Document 89/2



FAO/UNDP Regional Fishery Support Programme

RAS/87/002

Suva, Fiji

Skipjack Programme Technical Report No.3, South Pacific Commission, Noumea, 249 pages, (FAO/SP).

Skipjack Programme (1982). An assessment of baitfish resources in the South Pacific Commission area. [Cook Islands included in tables], Working Paper 12, 14th Regional Technical Meeting on Fisheries, South Pacific Commission, Noumea, 8 pages, (FAO/SP).

Tearii, T. and N. Sims (undated). Preliminary report on the artisanal troll fishery around Rarotonga, with notes on the significance of FADs. 4 pages, (Marine Resource Files (file 11.2)).

Waldron, K. (date unknown). Fish school and bird flocks in the central Pacific Ocean, 1950-1951. [shows sightings in the Cook Islands], U.S. Bureau of Fisheries, Special Scientific Report - Fisheries 464, 20 pages, (FAO/SP).

Turtles

Anon (1978). Report on the South Pacific Commission Turtle project in the Cook Islands, 21 August 1974 - 21 August 1977. South Pacific Commission, Noumea, 7 pages, (SPC Lib).

Baird, R. (1974). Progress of the special project on inshore fisheries development: turtle farming sub-project. South Pacific Islands Fisheries Newsletter, volume 11, South Pacific Commission, Noumea, pages 3-4, (cited in Balazs 1977).

Balazs, G. (1977). South Pacific Commission turtle project - a constructive review and evaluation with recommendations for future action. [review of turtle projects in the Cook Islands and Fiji], Hawaii Institute of Marine Biology, Kaneohe, 54 pages, (FAO/SP).

Balazs, G. (1979). Status of turtles in the central Pacific Ocean. Working paper at World Conference on Sea Turtle Conservation, 31 pages, (SPC Smith).

Brandon, D. (1975). SPC inshore special project: turtles, Cook Islands. Fisheries Newsletter No.13, South Pacific Commission, Noumea, pages 13-14, (CIL).

Brandon, D. (1977). Turtle farming - progress report on the South Pacific Commission turtle farming project in the Cook Islands. Working Paper 21, 9th Regional Technical Meeting on Fisheries, South Pacific Commission, Noumea, 8 pages plus appendices, (CIL, FAO/SP).

Frisbie, R. (1929). Fishing for steak and eggs. [turtle fishing on Pukapuka], St. Nicholas Magazine, April 1929, pages 437-439 & 501, (CIL).

Frisbie, R. (1929). Mrs. turtle lays her eggs. [information on turtles at Pukapuka], Atlantic Monthly, No.143, pages 462-466, (CIL).

Grandperrin, R. (1977). Report on visits to Fiji and the Cook Islands. [contains information on the turtle project], South Pacific Commission, Noumea, 19 pages, (SPC Lib).

Grandperrin, R. (1978). SPC activities in fisheries other than skipjack. [information on Cook Islands' turtle project], Working Paper 10, 10th Regional Technical Meeting on Fisheries, South Pacific Commission, Noumea, (cited in Anon 1978).

Powell, R. (1957). Breeding turtles for profit. [information on experiments at Palmerston], South Pacific Bulletin, volume 7, no.3, South Pacific Commission, Noumea, page 41-42, (Cons).

Whales and Whaling

Langdon, R. (1984). Where the whalers went: An index to the Pacific ports and islands visited by American whalers (and some other ships) in the 19th century. [contains sections on the Cook Islands], Pacific Manuscripts Bureau, Australian National University, Canberra, 297 pages, (CIL, FAO/SP, SPC Lib).

Powell, R. (1982?). Whaling in Rarotonga. 9 pages, (Cons).

Miscellaneous

Andrews, G. (1987). Marine ecological survey of Pukapuka Atoll. [contains information on benthic organisms, water movements, fishing practices, traditional conservation], Commonwealth Science Council - Australian Institute of Marine Science, Townsville, 133 pages, (SPC Smith).

Anon (1979). Cook Islands - country statement. Working Paper, Regional Training Workshop on Joint Venture Agreements in Fisheries, Manila, 15-27 January 1979, 1 page, (SPC Smith).

Anon (1983). Population of the Cook Islands. [contains information on employment in the fisheries sector], ESCAP/SPC Country Monograph Series No.7, South Pacific Commission, Noumea, 222 pages, (SPC Smith).

Anon (1986). SPC/FAO/UNDP Regional Refrigeration Training Course Rarotonga, Cook Islands, 9 June - 17 October 1986. 35 pages including appendices, (FAO/SP).

Author unknown (1981?). Game fishing at Rarotonga. Australian Fishing World Magazine.

Author unknown (1984?). Fishing by Hobie Cat in Aitutaki Lagoon. Australian Fishing World Magazine.

Baird, R. (1973). Report to the Government of the Cook Islands on the setting up of a fisheries service. South Pacific Commission, Noumea, 7 pages, (SPC Lib).

Banner, A. and D. Banner (1967). Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, XI - Collections from the Cook and Society Islands. Occasional Papers 23, Bernice P. Bishop Museum, Honolulu, pages 253-286, (cited in Miller 1980).

Broodbaker, N. (draft, 1989). Ground and freshwater crustaceans of the Cook Islands. 6 pages, (Cons).

9 December 1994

George Balazs,
National Fisheries Service,
Honolulu Laboratory,
2570 Dole Street,
Honolulu
HAWAII 96822-1290



Concerning Cook Islands Marine Turtles

Dear George,

Thank you for your letter of 5 October. Sorry for the slow reply, but there were quite a few things to bring together before we could make a decision on whether we could actually produce a satisfactory Turtle Poster.

Thank you for the slides, which started to make the project look as though it could go ahead. Unfortunately my enquires for an underwater photograph to form the centrepiece were unsuccessful - both here and in Australia. Then, about three weeks ago, a consultant concerned with waste disposal came to get information on native plants and birds in inland Rarotonga. Later in the conversation he showed me how his son was making a living manipulating photographs with his computer, and one of the samples was a underwater photograph of a Green Turtle which would have been ideal as the centrepiece for a poster. Although the negotiations with the photographer are not complete, it looks as though we will get free use of the photograph. To cut the story to size: we now have adequate photographs and information to produce a Turtle Poster for the Cook Islands. **All we need now is the funding OK from SPREP.**

Certainly, we will acknowledge your photographs and you are welcome to a dozen or so posters - if SPREP allow us to do it. We greatly appreciate your rapid and encouraging support.

I appreciated all the background information, which was essential if we wanted a reasonable poster. I have enclosed a small article for the Cook Islands News on the life-cycle of the Green Turtle along with a couple of illustrations. **I would greatly appreciate it if you could read over these materials and pick up any misleading impressions - or God Forbid, any errors of fact. Please write your corrections as annotations on the script itself.**

The idea in this particular article was to say nothing about how we should conserve the turtle, but to put forward core information as a basis for on-island discussions on the best ways to conserve turtles. In this sense the things that are of special concern include: the number of times a turtle comes ashore to lay eggs as the local opinion is twice which makes it all right to kill them after the second egg-laying; and the importance of the "swim frenzy" which is interfered with by the method of well-intentioned headstarting which is common on at least two islands in the Cook Islands.

While I'm very pleased with the lifecycle illustration, which is modified after the one distributed by SPREP, getting across the visual feeling of the migration has not been so easy. Initially I was going to use the tagging data type illustration but the unidirectional emphasis is too strong. **I would be interested in your opinion of the generalised migration illustration which although misleading in terms of the fact that Green Turtles breed in little pockets all over the South Pacific, does at least give a feeling for the migration pattern of Cook Islands Turtles - and in the end, these are the only ones the Cook Islands can do anything about.**

GOOD

Eggs in Turtles:

An informant told me that a turtle killed on Rakahanga had 75 white eggs (about 40mm diameter), and about 250 yellow eggs divided about 50:50 into 20mm and 10mm groups. **Could you tell me how long the yellow eggs take to develop to the laying stage?** Again, this type of data would be important for local people in terms of deciding to not kill any female turtles on land during the main breeding season (October to December). **Are there any eggs visible in female Greens at the completion of the breeding season?**

There is also a local belief that if you touch turtle eggs with your hands they will not develop? Your comments would be appreciated. I was also most interested to see your mention of turtles hatched from eggs removed from a female killed on Scilly - was this a reliable report?

Years ago you sent me that excellent "Synopsis of Biological Data on the Hawksbill Turtle, FAO Fisheries Synopsis No. 137". **Is there any such compilation of data on the Green Turtle?**

Satellite tracking in the Cook Islands

Unfortunately we have little worthwhile information on turtle breeding on any island. We have recently distributed a record sheet in the hope of developing an ongoing record for each island. See enclosed sample.

Nevertheless it seems that reasonable numbers nest in the southwest part of Penrhyn lagoon and on a couple of islets on Palmerston. Whether the availability of motor boats on Penrhyn has much reduced the population in Penrhyn lagoon I do not know - but it would not surprise me as the same boats have had a devastating effect on the Sooty Tern colonies on Penrhyn.

There is a plane to Penrhyn once a week at NZ\$1,100 return. There is an Excursion Fare of \$975 but if you change your dates there is a penalty of 25%! The regular fare is expensive but flexible. Palmerston is accessible only by ship and there is one every few weeks. If the time-duration is a problem I would go to Penrhyn, but, if time is not a problem, then Palmerston may be more interesting. In fact, if you opted for Palmerston you could look at the shipping schedules when you arrived on Rarotonga or immediately before arrival, and if this was unsatisfactory, you could change plans and fly to Penrhyn.

We would be very interested in such an experiment during the next breeding season, as it would help focus attention on the turtle. If you decide it is a possibility let me know and I'll see that someone sends you the **Application to do Research**. I'm on the Research Committee and there will be no problem with your proposal but we do like to keep records on all the research being carried out in the country.

50c Coins

I have enclosed a few of the turtle coins - a pleasure, no cost.

could only find 2 at the moment if you need more please say.

I look forward to hearing from you again. Merry Christmas and Happy New Year.

Kind regards,

Gerald.

Gerald McCormack
Director

Enclosures:

1. Information on Green Turtle and illustrations
2. Survey Form on local turtles
3. Turtle coins

VHS

Text for
a information
release in newspaper
as part of a ongoing
series on Natural
Heritage Topics

The Green Turtle's Remarkable Journey

593 words

The two marine turtles nesting in the Cook Islands are the Green Turtle and the Hawksbill Turtle. While the widespread traditional name 'Onu (Fonu, Honu, Wonu) applies to both species, it more typically refers to the Green Turtle, the turtle most favoured as a subsistence food. On some islands the Green Turtle has a species-specific name, such as Fonu Pokaikai (Manihiki & Rakahanga) and Wonu Taepu (Pukapuka & Nassau).

The Green Turtle breeds throughout the tropical oceans of the world, although excessive harvesting has reduced its global numbers until it is now threatened with extinction. Within the Cook Islands it is still moderately common on some low-islands, such as Palmerston, Penrhyn and Suvarrow, but rare elsewhere. Unfortunately, the slow growth and complicated life-cycle of the turtle makes the isolated colonies easy to destroy and difficult to conserve.

The adult Green Turtles of the Cook Islands, Samoa and French Polynesia are not permanent residents. The mature adults visit these breeding areas only once every two to four years. The main breeding season in Polynesia is October through December, although a few vagrants nest at other times of the year. During the few

months of the breeding season the turtles court and mate in the ocean near the nesting beaches, and occasionally feed on the local seaweeds.

Under cover of darkness, and assisted by the high tide, the pregnant females climb over the reef and crawl onto the coral sand above the tide mark to dig a shallow hole in which they lay 50-150 eggs, each about 50mm in diameter. After nesting three to five times, usually at intervals of about 14 days, the females leave the Cook Islands to return to their traditional feeding areas in the west, where seagrasses and more suitable seaweeds are abundant.

Tagging and satellite tracking of turtles in Scilly (or Fenua Ura, northeast of Aitutaki) and Rose Atoll (southwest of Pukapuka) have shown that our turtles migrate to feeding grounds in the shallow waters around Fiji and Vanuatu. From Scilly the 3000km journey to Fiji took about 80 days, while the 1500km trip from Rose took about 40 days. The longest Pacific journey was for a Green Turtle tagged on Rangiroa (Tuamotus) and killed in the Solomon Islands, more than 5000km to the west.

In warm sand the eggs hatch mainly as females, after about 2 months, while in cooler sand they hatch mainly as males,

after about 3 months. Upon hatching they burrow upward together until they are assembled just under the surface of the sand, and then, under cover of darkness, they burst through the surface, run to the sea and swim frantically away from the island for one or two days. Although many are lost to predatory fish and birds, the "swim frenzy" enables a few to survive. Once they are away from the island they just drift westward in the ocean current, eating other small organisms in the surface layers of the sea. It is not known where they drift during the one to five "lost years" before they are found with the adults in the feeding areas around Fiji and Vanuatu.

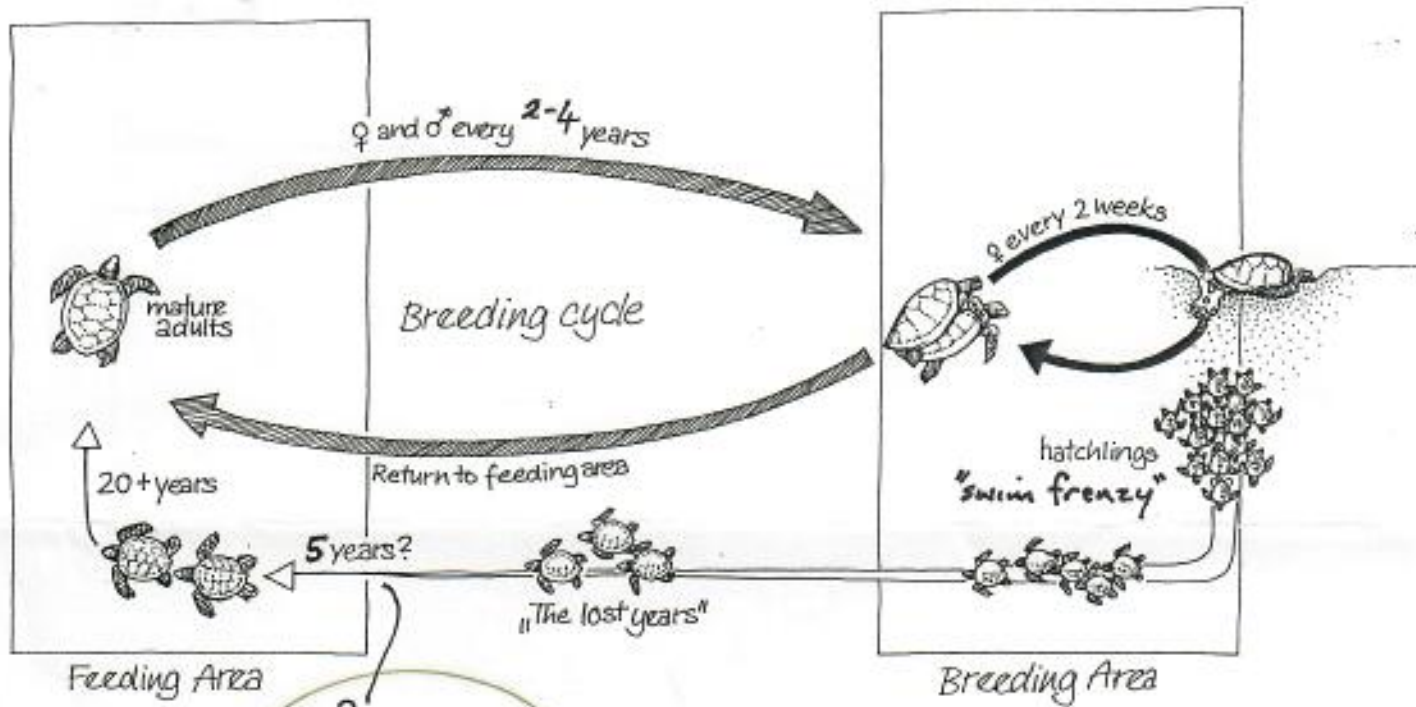
After more than 20 years in the feeding areas the young turtles, now about 40cm in shell-length, become sexually mature and swim back to the islands on which they hatched. It is not known how each turtle navigates to its birth-island, but the "swim frenzy" after hatching is thought to be important in teaching each hatchling how to find and recognise its birth-island after an absence of more than 20 years.

1. *Chelonia mydas* 2. *Eretmochelys imbricata*

(c) 1995 CINIP

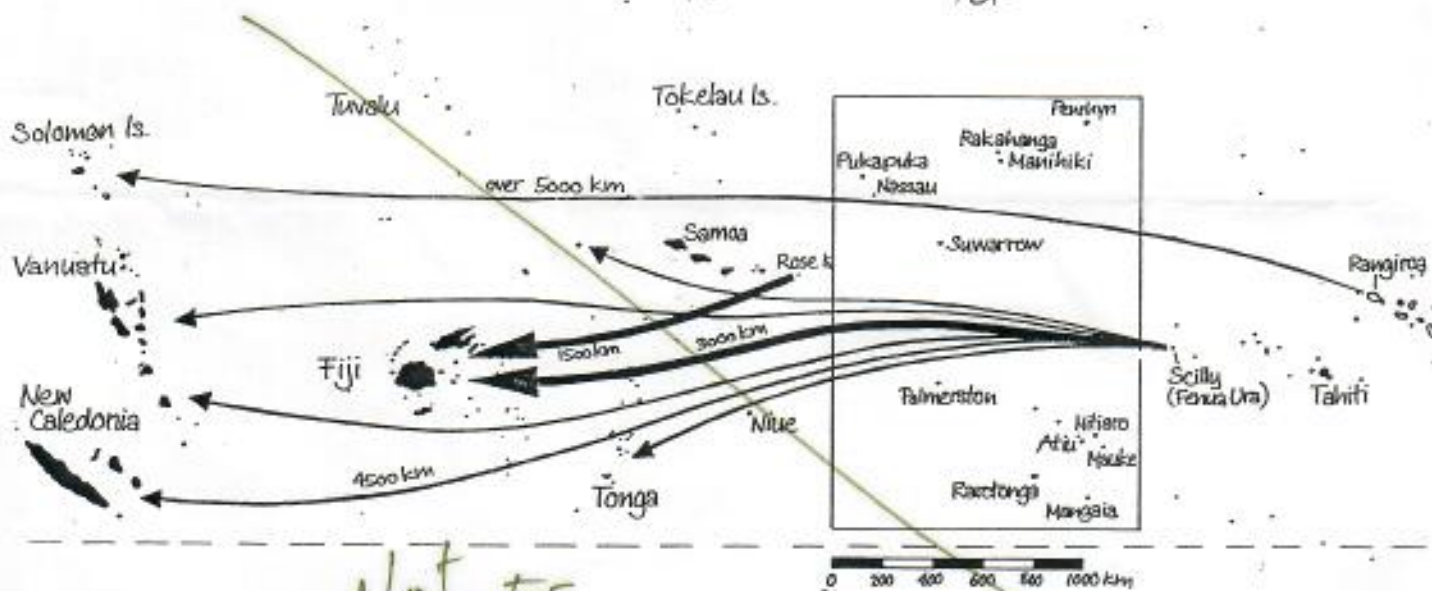
Text by Gerald McCormack
Illustrations by Judith Kunzle

Hatchlings - dark above & white below
(Hawksbill - dark above & underneath)



Is there any good evidence on the time here?

~~Tahiti + Hawaii = Honolulu~~
~~Fiji = Vunu~~
~~Tokelau = fonu.~~ 3

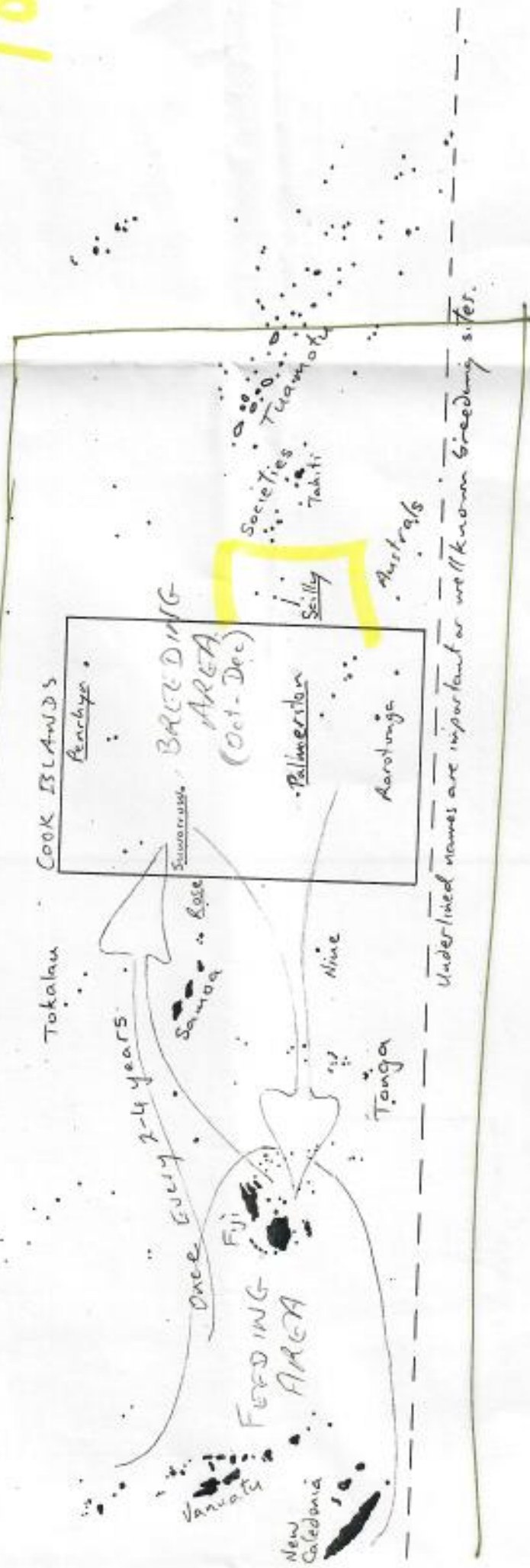


Not for poster.



TÖKE

For poster with colouring & shading.



Does it give a fair & understandable impression for the behaviour of central Pacific Green Turtles?



FAXED
3-12/9:40
SK/IPG

17 February 1995

George Balazs,
National Fisheries Service,
Honolulu Laboratory,
2570 Dole Street,
Honolulu,
HAWAII 96822-1290

GERALD - THIS
ANSWERS YOUR QUESTIONS,
THE SLIDES ARE BEING
RETURNED BY
AIR MAIL.
BEST REGARDS,
George Balazs



COOK ISLANDS
NATURAL HERITAGE
PROJECT
Prime Ministers Department
P.O. Box 781, Rarotonga
Cook Islands
Ph: (682) 20959, Fax: (682) 2989

Concerning **Turtle Identification**

Dear George,

Thank for the slide of the young swimming green turtle. Will return in due course - we're still awaiting SPREP approval to do the poster.

We have asked various people and organisations for the use of slides of turtles and some good ones have come in. The strange thing is that they claim that all the slides are of Hawksbill Turtles, yet I think some of them, such as the Digital-by-Design one, are Green Turtles. So I'm sending them to you for your expert identification, as it is most important that they be correctly identified on the poster. Could you just complete the following table and return it? Please note the "giveaway feature" of the slide!

Slide	Owner's opinion	George's identification
Digital by design	Hawksbill	Green Turtle 100% Correct ✓
0.93.07.01.11 (1991) swimming	Hawksbill	Green turtle 100% Correct ✓
0.91.227.09.01 (J 1991) head closeup	Hawksbill	hawksbill " "
0.91.227.05.03 (J 1991) rear view	Hawksbill	Green Turtle 100% Correct ✓
0.91.227.07.10 (J 1991) Weighing	Hawksbill	hawksbill " "
0.91.209.01.07 (F 1991) Measuring length	Hawksbill	hawksbill " "
0.91.209.01.08 (F 1991) Returning to the sea	Hawksbill	hawksbill " "
0.91.227.03.01 (J 1991) Turtle on tar	Hawksbill	hawksbill (No true evident)

We have just received the advance copies of a *Cook Islands Whales and Dolphins* poster and although it is rather too blue it is overall OK. It is very difficult to oversee colour printing in Auckland from the Cook Islands, even after we approve the cromalins. The poster is aqueous coated to help it last in the tropics, and printed with light resistant inks for the same reason. We used a slightly modified design to print posters in French and Tahitian for French Polynesia as well. It was a joint project with Michael Poole. I'll send a couple through to you when the bulk arrive in about three weeks.

I look forward to your reply and thank you in advance for your support.

Regards,

Gerald McCormack
Director

Gerald

George Balazs
3/11/95



9 January 1995
Fax (808) 943-1290

Mr. Gerald McCormack, Director
Cook Islands Natural Heritage Project
Prime Minister's Department
P.O. Box 781, Rarotonga
Cook Islands (Fax 682-24894)



Dear Gerald:

I trust that you received my handwritten fax, sent last week, offering use of my friend's excellent photo of a green turtle underwater. I'm writing now to answer the other points in your letter of December 9th which, unfortunately, took nearly a month to arrive here in Hawaii.

I fully agree with your comment that the unidirectional emphasis of tag recoveries (from nesting beaches to foraging pastures) is very misleading to many people when casually illustrated. Your proposed map nicely solves this problem (with overall accuracy) by showing arrows going in both directions. I've done the same in things I've written several times over the years.

You asked how long ^{||} yellow eggs ^{//} take to develop to the laying stage. If the yolks are full size, then deposition of albumin and shell occurs in only 10-15 days or less. That is, during the interesting interval, the time between successive clutches during the same nesting season. The yolks themselves also form quite fast, from pea size to full size, with body stores of fat in the female being mobilized over a several month period.

You asked if any eggs are visible in the female at completion of the breeding season. Normally there shouldn't be, but our scientific opportunities to make this determination have been limited. However, on several occasions over the years I have reliable reports of post-nesting females migrating home with a dozen or more shelled eggs still inside them. I can only assume that this represents a physiological "mistake" of some sort. Certainly not an uncommon event in the animal kingdom.

You asked if touching turtle eggs with one's hands might stop their development. No, not when the eggs are first laid, or for about 12 hours thereafter. However, if handling (i.e., rotation) takes place after 12 hours or so, some embryos will die and overall hatch rate of the clutch will decrease. The longer one waits to handle the eggs, the greater the mortality (except during the very latter phase of development when no embryonic mortality will result). Hence, when eggs absolutely must be moved from the nesting site, handling should always occur at the earliest time possible.

Yes, I was told on good authority while at Scilly that shelled oviductal eggs buried from a butchered nesting female had

produced hatchlings. This has not infrequently been reported elsewhere worldwide for several sea turtle species. The problem is that some people who do this believe it "compensates" for the killing of the female- clearly a serious fallacy. Also, there is often a very low hatching rate exhibited by eggs obtained in this manner.

A synoptic report on the green turtle in the Pacific has been mailed to you today.

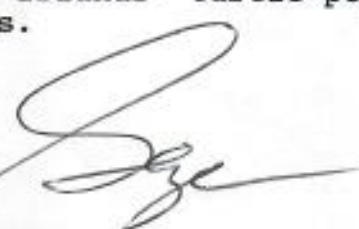
Thank you for the helpful briefing on the situation at Penrhyn and Palmerston, including transportation options. I'm not certain what the possibilities might be for SPREP to fund a Cook Islands' project of this nature for the coming nesting season. Of course, it would never hurt to try. However, any request or preliminary inquiry, would have to come directly from the Cook Islands and be conducted as a Cook Islands' project. Any involvement on my part would be of a "back-seat unpaid consultancy" nature.

The text for your information release looks to be in fine shape. There were a few small points, however, that I wanted to mention. Note that the 5000 km "journey" by a green turtle (from Tuamotus to Solomons) was a juvenile head-started individual released from captivity. I would be more inclined to reference the longest migration of naturally occurring Pacific greens, nesting at Scilly and returning to home pastures in New Caledonia and the Solomons. Also, note that there is a typo of "...now about 40 cm in shell-length become sexually mature.." The 40 cm should of course be about 90 cm.

Regarding your life history diagram, I agree that listing a range of years for the "lost years" would be more appropriate. I recommend 3-5 years based on some of the more reliable data that Colin Limpus and I have compiled.

Again, thank you very much for taking the time to send me those attractive turtle coins. I look forward to adding an equally good looking Cook Islands' turtle postage stamp to my collection one of these days.

Sincerely,


George H. Balazs
Zoologist and Leader,
Marine Turtle Research Program

COOK ISLANDS
22
DUNEDIN
(PR) 3/18/81
LAXED

To: George Balazs to forward to **David & Teresa Schrichte** who I cannot connect with on 499-3497. Many thanks, George. Where did the Rose to Tahiti Green finally end up?

From: Gerald McCormack
Natural Heritage Project, Prime Minister's Department,
P.O. Box 781, Rarotonga, COOK ISLANDS. FAX (682) 24 894



Date: 9 August 1995 Pages (include. this one): 1

Concerning **Photo of a swimming Hawksbill Turtle**

Dear David and Teresa,
Kia Orana from the Cook Islands. For about a year I have been looking for a suitable photograph of a Hawksbill Turtle to include on our Turtle Awareness Poster. The search for a suitable photograph has lead through George Balazs, Greenpeace (Auckland), Kay Kepler (Athens) and finally Jim Richardson. He tells me he has been in contact with you and knows you have excellent photographs. And this I also know as we already have your beautiful Juvenile Green photo via George - many, many thanks.

So the question is: Do you also have a good photograph of the Hawksbill in motion? The main emphasis on the poster is on the complicated migratory life cycle of the Green which is the turtle commonly eaten in the Cook Islands. But we would like the less common Hawksbill to also feature as a dynamic marine creature. Photographers are acknowledge on the poster beside their photographs and the printing is funded by the South Pacific Regional Environment Programme. The paste-up should be with the printer in three weeks so this is the final effort to include the Hawksbill.

I look forward to your reply. Kind regards,

Gerald

[Handwritten signature]

Fax Cover Sheet

SCHRICHTE'S UNDERWATER PHOTOGRAPHY

5028 Iroquois Ave. Ewa Beach, HI 96706

Phone & Fax: (808) 499-3497

TO: GERALD McCORMACK EXTENSION: _____
 PHONE # _____ FAX# 68224894
 COMPANY: _____ DATE: 8/14/95

DEAR MR. McCORMACK,

IT HAS COME TO OUR ATTENTION THRU GEORGE BALAZS AND DR. RICHARDSON, THAT YOU HAVE BEEN TRYING TO LOCATE US. WE HAVE BEEN IN TRANSITION FROM FLORIDA TO HAWAII. WE APOLOGIZE FOR ANY INCONVIENCE THIS MAY HAVE CAUSED.

WE WOULD BE HAPPY TO DONATE A TURTLE PHOTOGRAPH FOR YOUR UPCOMING POSTER TO PROMOTE AWARENESS FOR THE TURTLE. WE DO NEED TO VERIFY THAT THIS POSTER WILL NOT BE SOLD FOR COMMERCIAL PURPOSES. IN ADDITION, PROPER PHOTO CREDIT SHOULD READ: DAVID AND

**** PLEASE DELIVER THIS FAX IMMEDIATELY ****

TOTAL PAGES (INCLUDING THIS SHEET):

PAGE 2.

THERESA SCHRICHTE.

WE DO HAVE ONE CONCERN. IF YOU DO DECIDE ON THE TURTLE ECLIPSE PHOTO, WE ARE MARKETING THIS PHOTOGRAPH IN A POSTER TO NUMEROUS TARGET STORES ON THE MAINLAND AND HAWAII STARTING IN SEPTEMBER. WE DO NOT WANT THE EDUCATIONAL POSTER TO CONFLICT WITH UPCOMING SALES ON THIS POSTER. WE HAVE WORKED VERY HARD FOR THIS. TO SOLVE THIS PROBLEM, WE HAVE SEVERAL SLIDES OF THIS TURTLE WITH THE SUN BURST IN A VERTICAL FORMAT, IN A SLIGHTLY DIFFERENT POSITION. ALL JUST AS BEAUTIFUL. IF YOU COULD GIVE SOME INFO AS TO THE DISTRIBUTION SIZE, ETC. ON THE POSTER, THAN I CAN DECIDE IF THIS APPROACH IS EVEN NECESSARY. THE HAWSBILL TURTLE SLIDE IS ALSO AVAILABLE TO YOU UPON YOUR REQUEST.

WE APPRECIATE YOU THINKING OF US. WE ARE HAPPY TO BE A PART OF AN ONGOING EFFORT TO EDUCATE THE PUBLIC ABOUT ENDANGERED SPECIES. PLEASE CALL OR FAX ME WITH THIS INFORMATION AT (808)499-3497.

SINCERELY, *Theresa*

THERESA L. SCHRICHTE

SCHRICHTE'S UNDERWATER PHOTOGRAPHY

CC GEORGE BALAZS AND DR. JIM RICHARDSON



"A MILE FROM SHORE WE RESTED FOR A LITTLE WHILE"

FISHING FOR STEAK AND EGGS

By ROBERT DEAN FRISBIE

Illustrated by Mable Blaine

THE day was breathlessly hot. Ura, the diminutive chief of police on the Pacific atoll of Puka-puka (Danger Island), where I am a trader, steamed and sweated as he lolled from one door of his coral-lime house to another in a vain attempt to intercept the ghost of a breeze. At length he abandoned hope of finding comfort indoors and sent his numerous children in search of the three village policemen.

In the course of time they appeared and having consulted with their chief, they went off to their respective villages to cry the law of Ura: every man, woman and child was to go to the outer beach for a grand community turtle-hunt.

I was weighing copra when the Central Village policeman announced the event in front of the trading-station. Men and women rose from their morning slumber to stagger out into the blazing

sunlight. They blinked stupidly, rolled their tongues in their cheeks, scratched their heads, and still half asleep, turned to cross the islet to the outer reef. Hitching up a *pareu* and hanging a pair of water-goggles around my neck, I followed.

Community fishings are common occurrences on Danger Island. Periodically one of the villages rouses itself and issues a challenge to the other two to join in a fishing competition for rock grouper, snappers, bonito, albacore, flying-fish, turtle, or whatever kind of fish happen to be plentiful at the time. When the day's fishing is over, each participant takes his fish to the churchyard where it is counted and scored for his village. The winners celebrate, generally with a song and dance, and then the fish are divided equally among all the men, women and children of the

three villages. Finally the people go home to cook their fish, none too fragrant after a day in the full blaze of the Puka-puka sun.

Ura, being chief of police, could not, of course, lower his dignity by opening any trifling competition such as grouper fishing, where there would not be the slightest risk of any one being killed or maimed for life. With him it must be torch-light netting along the treacherous Arai reef, or best of all, because most dangerous, turtle-hunting. Although little Ura could not possibly bring in a turtle, he could at least send out his neighbors to hazard their lives, and personally accept the credit for a big catch.

Benny, my store boy, overtook me before I had reached the reef. He was carrying a piece of light native wood about four feet long and six inches wide. It was for me, he explained, to be used as a

head-rest while at sea, so that if I wanted to I could take my usual siesta.

On reaching the outer reef I was startled at the sight of the gigantic combers roaring along the serrations and knife-edges of coral; but Benny was not in the least alarmed. He flung my board beyond the breakers and without waiting for a lull ran confidently out to a spot where an immense comber was just curling to fall. In another instant he would have been crushed to death on the coral, had he not plunged headlong into the foam. I lost sight of him for half a minute, but presently he bobbed up beyond the breakers, smiling, and as happy as a porpoise.

I knew how he had done it, having seen the same thing done many times before, but I had never had the courage to attempt it myself. Benny had merely hurried out between breakers to a point where the undertow would carry him to sea, although the foam above him was rushing shoreward. After swimming with the undertow until nearly out of breath, he had brought himself to the surface with a few strong strokes.

While hesitating I heard a cackling voice cry, "Come on, Ropati!" It was old Mama, my cook. She hobbled industriously past, her breath coming short and raspingly. As unconcernedly as Benny she made her way across the reef and with a flutter of grass skirts, flopped into a billow of foam. A moment later she reappeared far beyond the break of the surf.

I hesitated no longer, for I imagined I could see old Mama laughing at me. I rushed out, threw myself into the next comber with suicidal abandon, and dived until my hands touched the coral. Then, to my astonishment—for I expected only to make myself ridiculous—

I found that I was being carried rapidly seaward. The foam thinned, disappeared, and, as I was wearing my water goggles, I could pilot myself through the fantastic forests of coral. There were mountains that seemed to be standing upside down, cañons wider at the base than at the top, dark caves from which slimy things stared, coral trees whose roots were spread out in the water while their boughs were imbedded deep in the sea, bottomless abysses, and colors such as we poor humans who live on land never dream of. A huge fish finned lazily, only a few feet away, and a shark eyed me as he swam gravely past.

On crossing a crevice in the coral I saw the head of a conger-eel, his cold bloodless eyes watching me as though deliberating whether or not to attempt such a large morsel. His fang-toothed mouth was quite large enough to have taken my leg. I had heard of men being seized by giant keptocephali and held beneath the surface until they drowned. Panic seized me and I swam frantically for the surface. Then of a sudden my fears vanished, for there was Benny at my side, grinning reassuringly. He had come down to see to it that nothing happened to the boss of his store. My confidence returned at once: I felt that I could have returned and kicked the conger-eel out of his hole.

The long swells and the wide hollows between them were dotted with heads, for most of the inhabitants of Puka-puka had come out. Little Ura, with a gorgeous red and yellow *pareu* about his loins was chattering away, ordering the young men of his village to catch many turtles for the honor of the chief of police. Mama was by no means the only old grandma present, for the octogenarians had turned out *en masse* from their huts and lean-tos and were paddling about, diving and splashing as unconcernedly as though they really belonged in the sea rather than on land. Some of them were buoyed up with pieces of wood such as mine, and they were so completely at home in the water that they actually dozed off for a few minutes from time to time, resting on their little supports.

On other islands, Penrhyn and Manihiki for example, there would have been much concern about sharks, but at Puka-puka no one pays the slightest attention to them. It is claimed that no one on the island has ever been attacked by a shark, and I know from experience that they treat these monsters with complete indifference.

My store boy and I swam leisurely along the reef. With our water-goggles adjusted we gazed at the fishes displaying their poly-



"HERE I WAS IN THE MIDDLE OF THE PACIFIC, ABOARD A BOAT I WAS AFRAID EITHER TO TURN LARGE OR TO STAY ON."

chromatic scales to the sea world, as, with true Puka-puka languor, they linned from coral to coral. Presently Benny suggested that we swim a mile or two out to sea and hunt for a giant turtle. As is commonly known, these green turtles found in tropic seas live for a thousand years and weigh three or four hundred pounds. They have jaws capable of snapping a man's arm off with the ease of a shark bisecting a jellyfish. But it is not commonly known, I believe, that the tails of the males only — are their most deadly weapons.

Benny explained this to me as we swam leisurely seaward. The male's tail is much longer than the female's, and he has the habit of hooking it around anything that touches it, holding it in a viselike grip, and sounding. So, when a man is grappling one of the giant chelonia, if he allows his arm or leg to touch the tail, he is instantly caught, the tail hooking the limb and pinning it against the shell. Thereupon he loses his hold on the turtle's flapper, or fluke, while vainly trying to free himself, and is dragged beneath the surface to drown. For this reason, the man who alone brings in a male turtle is looked upon as a *toa* (a superman) by the people of the atolls.

A mile from shore we rested for a

little while, propped up on my wooden support. The water was like polished steel, and now we were far enough from the reef to be in the midst of the great undulations of the Pacific. When we sank into the long troughs the island would be lost to view below the oily backs of the rollers, and then it required but little imagination to believe oneself hundreds of miles from land. But the next undulation would raise us, showing the island ablaze in the sunlight, an emerald of dazzling beauty resting lightly on the bosom of the sea. Benny was explaining the method of catching the giant turtle.

"The easiest way is the most dangerous. You grasp the turtle by the skin at the nape of his neck, and then steer him ashore, riding on his back. This is seldom done with the male turtle for your legs come too close to his tail. If we find a female turtle to-day, you can ride her in this manner, but if it is a male, leave him to me. We hold the papa turtle by getting the right arm under his left front fluke; then, reaching up, we catch hold of the front edge of his upper shell. This too is dangerous, because, during the struggle the hands may come within reach of the turtle's mouth. That is how

King Pirato's father was killed: the turtle grabbed him, carried him down and drowned him. In either of these ways the turtle cannot sound, and, since he is very clumsy, you can easily guide him by jerking him from one side to the other. Now, Ropati, you take the mama turtle and I will take her husband. Ura will be surprised when he sees us coming in."

"But hadn't we better find the turtles first?"

"There they are," said Benny. "I saw them a long time ago, but being a white man, you are not supposed to notice such things."

Following his gaze, I saw what appeared to be two coconuts floating a hundred yards or so away.

"Grab her like this," said Benny, taking me by the scruff of the neck, "and steer her this way." He jerked me from side to side in a most unceremonious manner. "Swim close behind me and take the one I leave. We can surprise them because they are asleep."

We swam to within twenty feet of them, adjusted our water-goggles, and dived, Benny first, I following. They woke up and moved when, in a flash, Benny twisted his arm around the larger turtle's left flapper. Instantly I

lost them in a cloud of foam. I swam past, too excited to think of fear. The female was sounding, but her movement was so slow I soon caught up with her. Following Benny's directions, I caught her by the nape, wound my legs around her shell, and pulled upwards. She responded immediately, flapping to the surface in a panic, and just in time, too, for my lungs were bursting.

By the time I had overcome my excitement sufficiently to be aware of what I was doing, I found my pelagic
(Cont'd on p. 501)



"BENNY TWISTED HIS ARM AROUND THE
LARGER TURTLE'S LEFT FLAPPER."

As we watched him he hopped slowly up to a plantain and began eating the green leaves greedily. In an hour or two he had wholly recovered from his "tight pinch," and we set down

another item in our nature book: "Plantain is the toad's antidote for snake-poisoning."

Verily, we are living in a wonderful world, full to the brim with interest.

FISHING FOR STEAK AND EGGS

(Continued from page 439)

Pegasus swimming mightily for the coast of South America, many thousands of miles away. I had lost my board, and at the moment I could see neither Benny nor the island, as they were behind me; and here was I in the middle of the Pacific aboard a brute I was afraid either to turn loose or to stay on. I was helpless and was about to loosen my hold when I heard Benny yelling behind me. He was telling me to turn the creature landward. For the moment I had forgotten his instructions about guiding; now, putting them into practice, my fiery turtle turned like a well-broken mare. A moment later, rising on the top of a swell, I saw the island before me and Benny, all submerged but his head, driving his papa turtle toward the reef.

The male turtle was swifter than the female, reaching the reef in about thirty minutes, while my chelonia needed a good three quarters of an hour; so Benny had his safely turned over before I arrived. I was glad, for I enjoyed the glory of coming in alone, and when, about two hundred yards from the reef, I met two pretty little water nymphs, it gave me a great thrill to hear the first shout:

"Aue! The white man has got a big turtle!"

They swam beside me, one on either side, and no Roman conqueror could have ridden the high horse with more vainglory than I rode my lowly Mrs. Turtle. As we approached the reef, however, I had grave doubts as to how my triumph would end. I now knew how to get out to sea but had not the faintest notion of how to weather the surf in getting ashore. But with my companions watching me I did not hesitate. I drove straight on, willing to get a good tumbling rather than be shamed.

The third of Mr. Frisbie's stories, "The Sea Afire," will appear in ST. NICHOLAS next month, with a cover in color that will give you some idea of this fascinating sport. And a sheaf of stories of life in the South Seas will appear in "The Book of Puka-Puka," to be published by The Century Co. in the autumn. Make a note of that, for they will be worth your reading.

EDITOR.

It turned out to be both easy and exciting. A great sea lifted us high, and crashed down with a deafening roar, carrying us swiftly along on light foam as soft as eiderdown. As we were swept across the reef the turtle's plastron shell protected me from the coral. My two companions had no need for protection; they were as much at home in the surf as a pair of periwinkles.

Sitting on his turtle, with many flourishes and more lies, Benny told the people of Puka-puka how I had bravely grappled my ferocious brute, and how I had insisted on bringing in the male one, only he would not allow it. He added many marvelous details, in the true native fashion, for unless it is bragging about themselves, there is nothing in which Puka-pukans delight more than in telling of the prowess of their friends.

EIGHT turtles were caught that day, only one of which came from the people of Ura's village. The chief of police was mortified beyond words. He returned to his splendid coral-lime house, wrapped his head in a bundle of dirty rags, pleaded sick, and refused to be seen for three days. But on the fourth day he emerged, resplendent in blue trousers and red silk shirt, and summoning his policemen, he held a grand session of court to fine the villagers for straying pigs. All the pigs on Puka-puka stray all the time, and as every one owns pigs Ura had no difficulty in choosing his victims. Thus, Leeward Village, which had shamed him by catching more turtles than his own settlement, was summoned *en masse* and each man fined a shilling. So Ura's dignity was re-established. But the fines were a small matter, for at Puka-puka no one ever pays them.



Race with the breeze in your Old Town

"Up anchor — hoist the mains'! — clap on the jib! Run aloft there my hearties, and break out the royal topgallants. A long pull and a fair breeze — yo-ho!"

It's not as complicated as all that when you sail your Old Town. But it's just as much fun. With this special sailing equipment on your Old Town Canoe you can race with the breeze, come about and tack against it — maneuver any way you want. Real sport, canoe sailing.

Write today for free catalog. It shows and prices many light, water-tight models. Paddling, sailing and square-stern canoes, extra-safe Sponson models, dinghies and sturdy family boats. Also speedy craft for outboard motors — racing step planes and hydroplanes. Old Town Canoe Co., 944 Fourth Street, Old Town, Maine.

"Old Town Canoes"



a magazine that has been published every month since November 1870 — a magazine that has maintained, through all these years, its high standard of good publishing — adhered to its fine ideals — always building along progressive and constructive lines — a magazine that is "bought" and not "sold" — having a natural high-class circulation among people of refinement and culture financially able to buy the best — a magazine in which worth-while manufacturers can appropriately advertise their goods and know that the Century reader as a customer represents good business.

Subscription Price

One Year \$5.00 Two Years \$8.00
Foreign Postage \$1.00 per year extra
Canadian Postage 60c per year extra

The Century Co.

353 Fourth Ave. New York

250 TA J

ETHNOLOGY OF TONGAREVA

BY
TE RANGI HIROA
(P. H. BUCK)

BERNICE P. BISHOP MUSEUM
BULLETIN 92

AM 101 . B442
NO. 92

HONOLULU, HAWAII
PUBLISHED BY THE MUSEUM
APRIL, 1932

KRAUS REPRINT CO.
New York
1971

platform, though it is conceivable that in marae which had no platform the pavement may have taken their place.

A variation of the stone pavement is the L shaped alignment of coral slabs set on edge in a single row, as seen on Mahue (fig. 28), Hoenga-waka (fig. 30), Te Rupe (fig. 32), and Nukurea (fig. 33) marae. One limb of alignment is directed in the front to the back axis of the marae, and the other joins the back end, from which it is directed toward the left, except that in Nukurea it is directed toward the right. On the Mahue and Hoenga-waka marae the alignments are in pairs, and on Te Rupe and Nukurea they are single. It is probable that a pair was the usual number, and that the singles point to the removal of material. The careful clearing of all the marae would probably reveal more of these accessory structures.

Upon the pavements or on the gravel beds defined by the L shaped alignments coconut offerings may have been laid, before the priest ascended the stone platform during the marae ceremony.

The defining curbs of small houses on the marae were seen at Nae (fig. 28) and Te Vete (fig. 37). Though search was made without success for defining curbs on the other marae, the overgrowth was so thick in some that they may have been overlooked. In others curbing may not have been used. Lamont (15, p. 162) mentions a small house on the Hangarei marae:

This, I was informed, was the island of "Hangarei," and belonged to our family. A considerable portion of it was occupied by a more extensive "mara" than any I had yet seen, though, from the number of weeds that filled the space and climbed round the huge grey stones, and also the condition of the house in its centre, which was mouldering to decay, it had evidently been long out of use. Anxious to see what the place contained, I was about to enter it, when violent screams of terror uttered by the boys arrested my steps, and I was obliged to proceed with them towards a point whence their cries had been answered.

The person who answered was the priest, Moniti, who, when told by the boys what Lamont had been about to do, at first looked incredulous and then laughed heartily. It is evident that the house was tapu. It is to be regretted that Lamont did not enter to find out what the house contained, but he clears up the matter in his account of a subsequent ceremony on the marae at Motu-unga in which he states (15, p. 180) that an old priest entered the "mara-house" and brought out a long stick with an immense bundle of feathers and other things tied at one end. This was the local god.

It is thus evident that the marae house was a fairly constant feature, that it was used to contain the material representation of the gods, and that it was tapu to those not belonging to the priesthood. It is difficult to see what other sacred objects could have been kept in the marae house, for the Tongarevans had no special religious regalia or such objects as the

temple drums that were stored in the temple houses of Tahiti and Hawaii. Lamont made no mention of a house on the Rakahanga marae in his detailed description of the ceremony that took place. The explanation is that on this particular marae the material forms of the gods were made from freshly cut coconut leaves which were afterwards discarded. There was thus no use for a marae house. It may, therefore, be inferred that the groups that had permanent forms for their gods in wood and feathers built houses on their marae in which to store the tapu representations, whereas the groups that were content with temporary ones did not build marae houses.

In some marae, for example Hoenga-waka (fig. 30) and Rakahanga (fig. 36), short alignments of coral slabs set on edge were placed outside the middle of the front line, and the space between was filled with clean coral gravel. From their position, they seem to indicate the correct approach into the marae inclosure. They suggest local attempts to embellish the marae. In a few others which I did not record, these structures are on the outside of the side boundaries. They are spread with clean white coral gravel and might have been used in ceremony. Lamont's account (15, p. 121) of the manner in which coconut husk was placed at certain parts of the marae suggests that these small inclosures were used to receive the coconut husk offerings.

INDIVIDUAL MARAE. (SEE TABLE 9.)

1. Kirihuri marae in Motu-unga, on the lagoon side of the island in the vicinity of the ruins of a stone church.

Because of the removal of both pillars and curb stones for a church and graves the original marae lines can not be distinguished. Close to the church is the mound that formed the turtle oven connected with the marae. On top of the mound is a hollow 22 feet in diameter, but the hollow may have been increased by the recent uprooting of a large hala (*Pandanus*; Tongarevan, *hara*) tree that had been planted on top of the mound by one of the early missionaries. The presence of the turtle oven indicates that Kirihuri was the marae which Lamont (15, p. 182) mentions in connection with the cooking of a turtle on an elevation of stones. Lamont states that this marae was different from the one at which he had helped to officiate on the previous day, but, though my informants knew of only one marae on Motu-unga, another may have existed. The Kirihuri marae, said to have been established by the ancestor Tarua, is reported to have been large, well kept, and of higher status than the well-known marae on the neighboring island of Tokerau.

2. Tokerau marae in the Rangiriri Division of Tokerau, is on the lagoon side of the island on dry raised ground, free of shrubs and weeds (fig. 23).

All the pillars except one have been removed to form a wharf. The curb stones, however, are in position and plainly indicate the boundaries of the marae. The inclosure is almost rectangular, with but a difference of 2 feet between the narrower back and the wider front. The long axis is between the ends and runs due north and

south, with the back toward the lagoon on the south. The distinguishing feature of the marae is the raised platform, which has four walls of short limestone slabs set upright to form a quadrangular inclosure. The back line is continuous with the back line of the main inclosure and has one upright pillar. The interior is filled with lumps of coral which do not rise to the top of the inclosing walls, some of the stones evidently having been removed. The Tokerau marae is said to have been one of the most important ceremonial marae of Tongareva.

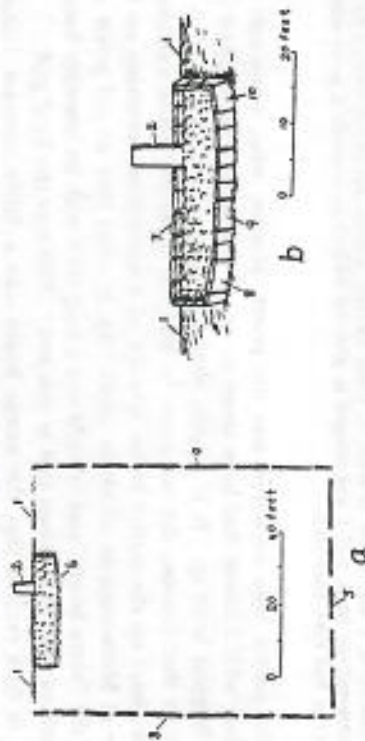


FIGURE 23. Tokerau marae: a, general plan; b, raised platform. 1, curbed back line continuous with back wall of raised platform; 2, standing pillar in back wall of platform; 3, left curbed line showing gaps, pillars removed; 4, right curbed line with gaps; 5, front curbed line with gaps; 6, raised platform; 7, back wall of raised platform; 8, limestone slab in front wall, 4 feet 3 inches wide and 1 foot 7 inches high; 9, limestone slab, 3 feet 7 inches wide, 1 foot 1 inch high; 10, limestone slab, 3 feet 8 inches wide, 1 foot 2 inches high; other wall slabs narrower. Platform does not occupy exact middle position on back line.

3. Nui-te-kainga marae on the island of Nui-te-kainga on the north side of the lagoon was not seen. It is reported to be well preserved and much like the others.

4. Te Tohi marae in the Punua division of Ruahara, on the sea side of the island close to the raised bank, with the back toward the sea (fig. 24).

The long axis of the marae is between the ends. The sides are approximately equal in length, but the back is 4 feet 3 inches wider than the front. The back line has 6 pillars standing, 5 of which are flanged or notched. Another flanged pillar is broken. Standing pillars are fairly close together. Long intervals indicate that at least 4 have been removed, making about 11 pillars on the back line. The two end pillars abut against the side lines, and there are no curb stones between the pillars. The front line is marked by curb stones, and wide, short pillars are standing. The right side is curbed and has three pillars standing, two of which have unilateral horizontal flanges. One pillar is broken off and two others are missing, making a total of six pillars for the right side. The left side line is obscured by a thick growth of *ngoro* shrubs. The pillars have been removed, but the line is curbed. Toward the back there is a short, narrow pavement of flat *koraka* slabs, and near the front on the left are three coral slabs set on edge to form an open rectangle. The inclosed space is

covered with white coral gravel. It looks like a fireplace, but there is no evidence of charcoal or burned coral in this or similar inclosures. Offerings in connection with the religious ritual were probably laid upon them.

5. Sivalau marae on Ruahara. The second marae in the Sivalau division on Ruahara was not examined.

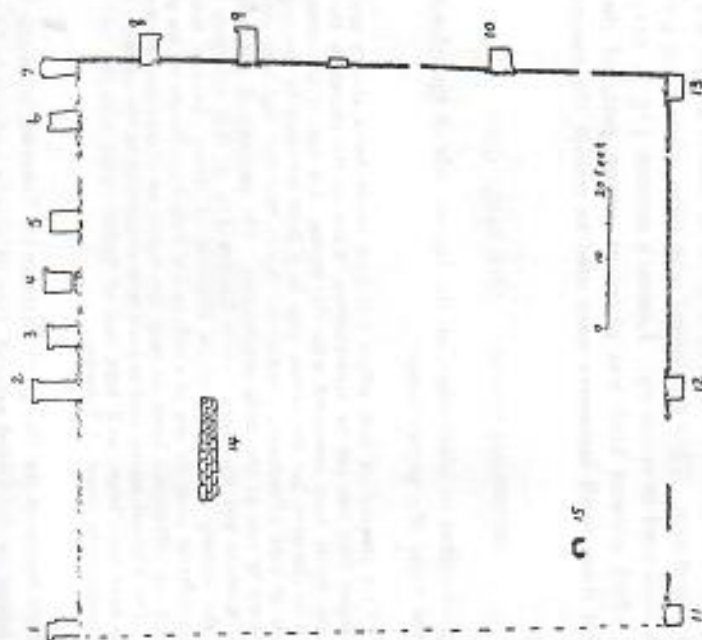


FIGURE 24. Te Tohi marae: 1-7, pillars on back line; 8-10, pillars on right side line, average space between pillars on right when all standing, about 10 feet; 11-13, low pillars on front line; 14, short pavement; 15, open rectangle of two side slabs of coral 10 inches long and end piece 12 inches long set on edge and projecting upward about 10 inches. Pillars 1-11 range in height from 2 to 6 feet, in bottom walls from 1 foot 8 inches to 2 feet 10 inches, in top walls from 1 foot 8 inches to 3 feet 5 inches. Average space between pillars 2-5, 5 feet 1 inch. Pillar 2 shown in figure 25, a, 6; pillar 7, figure 25, b, 4.

6. Te Hara-taurekareka marae on Rukutia, on the sea side of the island with the back to the sea, close to the raised shore, where rocks have been heaped up close to the back but distinct from the boundary of the marae (fig. 25).

The full name of the marae is Te Hara-taurekareka-te-sau-a-longa, which means "The beautiful hala growing in the south." The marae is said to have been built by

that same coarseness in moments of emergency which enabled the Polynesians to conquer the Pacific.

3. Anchored hook fishing. The large shark hook was used, and also a short line, one end of which was tied to a stone anchor. The hook was baited with the tentacle (*maoangano*) of a squid. The fisherman dived down with the hook and anchor, set it on the bottom and covered the line with sand. He then came up and watched from his canoe or boat. When the fish took the bait it was prevented from getting very far by the heavy stone anchor. In the struggles of the fish, however, the anchor could be heard bumping on the ground, and the fisherman dived down and secured his line and the fish. Besides shark, *mazata*, which may weigh as much as 80 pounds, were caught in this manner.

NETS

Fish nets were made of two-ply twisted semit fibre (*hau ato*), but commercial twine has now completely superseded semit. A netting needle (*ta*) and a mesh gage (*matu*) were said to have been used. As *ta* is the widespread Polynesian verb meaning to make a net, and as *matu* is the mesh, the lack of specific terms indicates that special implements were not used. Lamont (15), however, saw the *toto* hand net in use, so there is no doubt that the netting technique was known. The knot is the same as that in Rarotonga, New Zealand, and Samoa (29, p. 471). The small meshes are termed *matu hiobio*, and the large ones, *matu hau manui*. Four types of net were described:

1. Ordinary hand net (*toto*). The *toto* was the commonest net. It had an oval frame made of two thin pieces of wood tied together at either end and with a crossbar tied across a few inches from the thicker end to spread the frame out into oval form. A bag net was made, a circumferential two-ply cord was run through the circumferential meshes, and another cord was run spirally around the circumferential cord and the oval frame to keep them together. The net was used to scoop up fish in sweeps and draves. It was also set in the channels where fish were driven into it.
2. Fine meshed scoop net (*scun*). The *scun* had a finer mesh than the *toto*, but otherwise was similar.
3. Bag net (*tukete*). The *tukete* was a bag net without a wooden frame but with ropes attached to it to keep the mouth stretched and open. It was set on the bottom of the lagoon on one side, with the opening in vertical position. Stones were set on the part of the net opening that lay on the bottom.
4. Baited net (*tafo*). The *tafo* was a bag net with a hoop of *nguaré* around the opening. A line was attached to the hoop, and the net was baited. It was lowered with the line, and fish such as *kokoi* were caught by drawing the line up quickly when the fish were felt biting at the bait.

A flying fish net with a long handle similar to that used in the Cook Islands (28, p. 288) is now also used in Tongareva. As the *araro* drive method of catching flying fish was recognized, it seems probable that the present form of flying fish scoop net has been introduced in post-European times. The flying fish net seen had two crossbars across the frame at the handle end.

the people were expert. Fish spears with metal points are now used exclusively, and no information concerning the spears originally used was available.

ANGLING

The general term for fishing with a line is *ji* or *sisi* (Maori, *hi*). Since foreign lines, hooks, and sailing boats have come into use the following native methods of catching fish with the hook have been almost entirely abandoned. Hooks are described on pages 202-211.

1. Fishing from an anchored canoe (*tubutabu*). In *tubutabu* (to keep letting down) the baited line was lowered from a canoe which was kept stationary by an anchor resting on the bottom. The length of line was therefore not great. A baited circular hook was used.
2. Diving (*tubutabu*). The U shaped hook (*matu si rahi*) was attached to a very short line, the end of which was tied to the middle finger of the right hand. The hook was baited and held in the midst of a handful of ground bait in the right hand. The mouth also was filled with ground bait. As the line was too short to reach the fish near the bottom, the fisherman dived down with the hook. The Tongarevans maintain that fish are not afraid of anyone under the water. On reaching the fish the fisherman opened his hand and let go the ground bait and the baited hook. He removed the first fish that he caught from the hook and placed it under his left arm. If the first fish was caught quickly there was still time to catch a second one. Seeing that his bait was intact on the hook he blew the ground bait out of his mouth, taking care that the baited hook was in the cloud of ground bait. He often reappeared from the depths with two fish. If he had a canoe he placed the fish in it and repeated the diving as long as he had success. In fishing beyond the outer reef it was not always convenient to launch a canoe, so the fisherman nonchalantly walked over the edge of the reef and swam out to sea with a piece of wood which served as a float or a buoy. The float gave him a certain amount of support when he desired to rest, but its main use was to buoy up the catch of fish and the bait. The same method of fishing was used, but on coming up he would thread the fish through the gills with a *tari* strip from a coconut leaf *mālele* and tie it to the float. After a catch was secured the fisherman tied the string of fish in a loop over his shoulder and swam ashore.

Although the fisherman had no fear of sharks, sometimes a shark did attack, not the man, but the string of fish. Mr. Wilson, resident Government Agent, and other eye witnesses tell of a fisherman who, swimming ashore with his catch of fish looped over his shoulder, had just such a difficulty. He called for assistance, and two men swam out to help him. Supporting him on either side, they enabled him to reach the reef and obtain foothold, when he walked calmly up on to the dry part of the reef. The man had a shark imprisoned horizontally across his back with its head under one arm and its tail under the other; the shark had a grip on the inner side of the upper arm that held its head. The shark, attracted by the fish, had followed the fisherman and commenced eating the fish string from his shoulder. The next thing the fisherman knew was that the shark had gripped him by the arm near the fish. The fisherman thereupon promptly closed his arm, pivoting the shark's head against his side, and then coolly reached back with his other arm and brought its tail in under his other arm. He had the shark jammed helpless, while he himself swam with his feet until assistance reached him. The shark let go when released, but it had removed a large piece of flesh from the arm of its captor. The shark was promptly slain by the fisherman's excited relatives. The hero in this fishing adventure made a perfect recovery, but the scar, which was deprecatingly shown to me, remained as a witness of

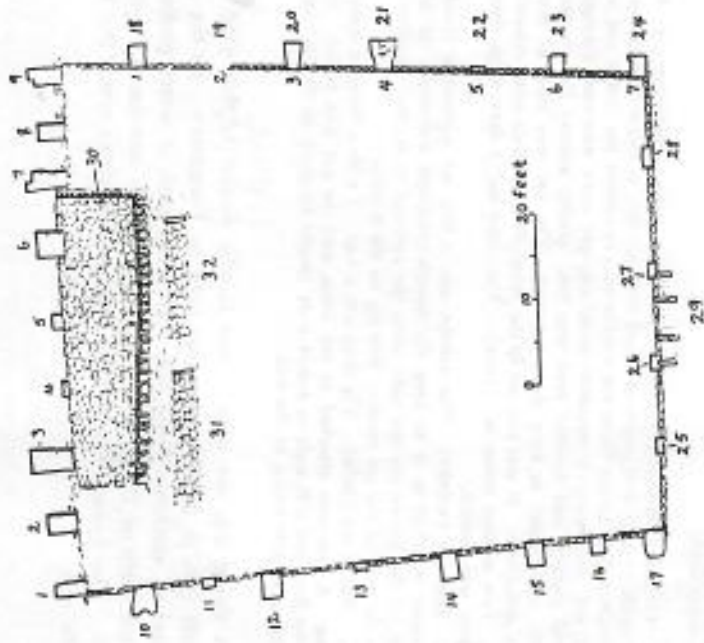


FIGURE 39. Te Reinga marae: 1-9, pillars on back line, average space between pillars 5 feet 6 inches; 10-17, pillars on left side, average space between pillars 6 feet 6 inches; 18-24, pillars on right, pillar 19 missing, pillar 22 broken; 25-30, pillars of front line, very low, one being 11 inches high; 30, four rows of coral slabs set on edge at right angles to curb; 30, platform (height ranges from 22 inches on left to 23 inches opposite pillar 6 and 20 inches on right wall); 31, left pavement; 32, right pavement. Pillar 7 is notched on right (fig. 22, b, 3); pillar 9, notched on left (fig. 22, b, 2); pillar 10, curved median ditch (fig. 22, c, 4); pillar 21, perforated (fig. 22, c, 5); pillar 24, simple flange.

is covered with a layer of coral gravel. Long recesses are formed between what correspond to the arms and the body, and another shorter recess lies between the short legs. There are two other recesses on the body, that on the right being connected externally with the recess between the right arm and body. Upon the surface of the platform seven rectangular inclosures are defined by coral slabs set on edge. The seven rectangular spaces, which resemble grave inclosures, contain white coral gravel in shallow layers that rest on the coral boohler filling of the marae. The gravel was turned over and searched, but no bones or other objects were present in any of the inclosures. The larger inclosures may have been used for the exposure of dead bodies which were afterward removed.

This structure shows such a marked departure in ground plan and construction that it would not have been classed as a marae were it not for the assurance of Pa, who is not only the oldest man on the atoll, but owns the land surrounding the

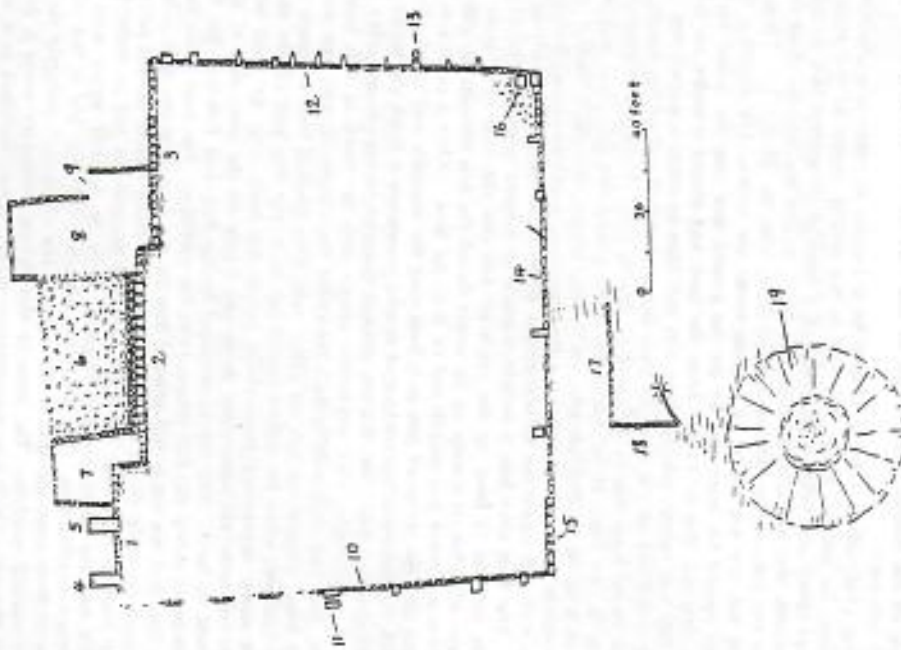


FIGURE 38. Hangarei marae. 1-3 sections of interrupted back line: 1, left section; 2, middle section defined by limestone slabs which in middle part of section form front wall of raised platform (6); 3, right section defined by low limestone slabs. 4, pillar 6 feet 5 inches high, 2 feet 3 inches wide at bottom, and 2 feet 10 inches wide at top. 5, pillar broken, 6 feet 9 inches high and 10 inches thick. 6, raised stone platform, differing from platforms in Tokerau, Rauahara, and Te Reinga in lying outside of back line (front boundary formed of coral boulders built up above the back line (2) of limestone slabs, 3 feet above marae floor; coral boulders forming platform somewhat scattered, due to operations of seckers after land crabs that seek refuge under stones). 7, left back inclosure above level of marae floor defined on left by single line of low stones, with similar line at back and no traces of house foundations. 8, right inclosure above level of marae floor, no traces of house foundations. 9, gap. 10, left side with few small pillars standing. 11, broken pillar 3 feet 4 inches wide and 2 feet high. 12, right side, number of small pillars standing, height ranging from 18 to 26 inches except broken pillar (13). 13, pillar 3 feet 6 inches high. 14, front line, three standing pillars and two broken. 15, left corner with higher coral slabs. 16, right corner raised and filled in to height of 12 inches to level marae floor. 17, line of stones. 18, line of stones. 19, turtle oven on mound of accumulated discarded coral used in cooking, 130 feet in circumference and about 6 feet high with hollow at top containing charcoal and ashes

side as the functioning point. As the point has to be cleared, the part of the shell between the point and the base has to be followed out. The point piece thus carries the technical "bend" of the hook as well as the functional point and the base for lashing. For lashing purposes two holes are drilled through the base, which must be deep enough to hold the holes. (See fig. 56, *c, d, e*.) In three out of four hooks in Bernice P. Bishop Museum the proximal perforations broke through the upper edge, forming grooves. In three hooks the point was everted.

The bonito hook lashing is shown in figures 57-60.

The Tongarevan point is characterized by the proximal prolongation of the base with two holes for lashing and the material of shell. Beasley (1, pl. 14) figures a point with the typical proximal prolongation of the base but with three lashing holes, giving base as the material. No mention is made in the text of the hook to which the point belonged. Because of the difference in material and number of holes the locality needs confirmation.

Supporting the theory that the bonito trolling hook was introduced, Solomon of Taotua stated that the drill with the crossbar and two cords was unknown in ancient times.

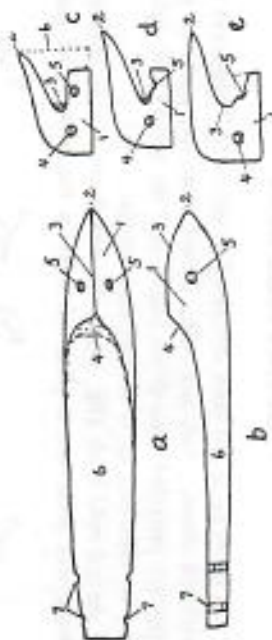


FIGURE 56. Bonito hooks: *a, b*, shank; *c, d, e*, points. *a*, front; *b*, side of shank; 1, thick hinge part ground on both sides in curve to proximal point; 2, point; 3, median line at meeting of sides ground inward at slant, forming triangular head, maximum thickness about 14 mm; 4, surface of hinge; 5, transverse hole drilled through horizontally below median ridge at about 18 mm. from point; 6, shank beyond head, gradually diminishes in width to about 12 mm. and in thickness to 4 or 5 mm. at tail end, where it is cut off square or with slight convexity from side to side; 7, two shallow grooves cut vertically on both sides at tail end. Longitudinal natural curve of back and corresponding front concavity apparent. *c, d, e*, points, side view: 1, base in *c*, 22 mm. wide and 6 mm. high in clear proximal part, in *d*, 19 mm. wide but only 5 mm. high in clear proximal part, causing proximal hole (5) to break through upper edge, and in *e*, 23 mm. wide; 2, point, slightly everted (*c, d*) and straight (*e*); 3, bend cut out between base and point; 4, distal hole bored through base; 5, proximal hole or hole broken through to upper edge (*d, e*) because of high placement, and leaving groove (*e*) effective in lashing; 6, distance between point and shank (*c*) 23 mm., and corresponding clearance (*d, e*) between point and shank 17 mm.

was picked up in the stone circle on Nane. The edges of this piece of shell show curved depressions as if flakes of the material had been pressed off with some stone flake or hard portion of *Tridacna* shell. The depressions have not the clear-cut appearance of perforations made with a hand gimlet, and they vary in size. On completion of the rough shape the hook would have been rubbed down with shark skin or the rough skin from the back of the tail of a skate. The skin rasp was also used to form the correct inner curve of the hook. The hook is used principally in catching the *ruhi* fish, one of the best eating fishes in Tongarevan waters. It was pronounced a *matou si ruhi* (hook for catching *ruhi*).

The circular hook is used for catching fish less than 9 inches in length, such as the *marou* and the *kokivi*.

No Tongarevan baited hooks with lashings were seen but, judging from similar Rakuhangan hooks, they must have been attached to three-ply twisted snoods of semit fibre. The lower thicker end of the snood was unraveled, and each ply separately bound round the shank and knob in a particular technique. A fine two-ply twisted thread of semit was then bound over the snood attachment by making figure-of-eight turns around the shank on one side and alternately above and below the shank knob on the other. The end of the thread was finished off with a number of close transverse turns around the snood ending in half hitches and stoppered with an overhand knot.

A bait string (*aur/c*) is formed of a fine two-ply twisted semit cord, which is tied with a slip knot below the angle made by the point with the point limb. It is used for tying the bait on to the hook.

COMPOSITE HOOKS

1. The pearl shell bonito hook (*matou uhi*). Whether introduced or not, the bonito hook deserves description, as it is now made locally.

The hook is composite, consisting of a shank and a separate point. (See pl. 8.) The shank is made of strips of shell averaging 18 mm. in width and cut so as to include a part of the thick hinge at one end. Four shanks in Bernice P. Bishop Museum range in length from 113 to 124 mm. The hinge end is termed the head, and the other thinner end, the tail. The nucleus inner surface of the shell forms the front of the hook. The rough outer surface forming the back of the hook is ground down to remove the rough dull material and form a clear shiny surface which has iridescent colors toward the tail. (See fig. 56, *a, b*.)

The point of the composite hook is made of pearl shell taken from near the edge of the shell away from the hinge. The point piece is cut out on the flat, so that one side shows the natural inner surface of the shell, and the other shows the black outer surface which is smoothed down but not polished. The point piece is fitted against the front of the shank, and the part which fits against the shank may be termed the point base. The problem is to extend this base to make it long enough to support two lashings and so to render the attachment firm. The Tongarevan point follows the form of the Samoan hook, in which the base is prolonged proximally or on the same

LINES

The introduction of foreign fishing lines has led to the abandoning of purely native material and a lack of clarity as regards technical details has resulted.

The material for fishing lines was restricted to coconut husk fiber, owing to the absence of the more suitable plants used in other parts of Polynesia. The lines were twisted (*miru*) on the bare thigh into two-ply twisted cords, but fairly thick three-ply braid was used to form attachment cords for the large shark hooks. Gudger (7, p. 230), in describing two shark hooks obtained by the Wilkes expedition, states that a long fibrous material was used in addition to semit in the lashings. My informants did not mention anything but semit. Wilkes (31, vol. 4, p. 287), in figuring some hooks from Tongareva, shows one attached to a long line which is wound in longitudinal lengths and then with transverse turns, leaving the longitudinal turns projecting at either end. The point of the attached hook is then evidently stuck in under one of the transverse turns at one end. This corresponds to the Samoan method of winding the *pa ala* line and hook (29, pl. 47, B), except that the middle part is not covered by the transverse turns. In the figure by Wilkes the transverse turns are continuous over the middle of the hank. The method of winding thus weighs against affinity with the Samoan line, but the method depicted is used in Tahiti, from which island the hook probably came.

HOOKS

PARTS OF THE HOOK

The hook is conveniently divided into the shank, the bend, and the point. Beasley (1) and Gudger (7), the most recent writer on Polynesian fish-hooks, refer to the point as the "barb," but as the term "barb" is specifically applied to a projection near the point in trade metal hooks and some forms of Polynesian hooks, its use as a general term to include hooks without the special barb projection is apt to convey an erroneous impression. The barb is a distinct invention added to the point to prevent the hook from working free during the struggles of the hooked fish. Most Polynesian hooks obtained a like result from the extra inward curve of the point toward the shank, and form a marked contrast in shape to hooks of foreign make which are more open. In the open point of the honito hook neither the inward bend nor the barb were desired, as quickness in detaching the hook and retrolling it was important when the fisherman was on a school of bonito. The skilled fisherman could either flick the fish off into the canoe

with a jerk of the rod, or as he brought it in, strike the fish with his hand to jerk the body upward so that it fell off the hook. Neither of these methods of quick detachment could be so readily carried out if the hook had an inward bend or a true barb.

The bend of the hook is either curved or rounded, but in some hooks it forms an angle. It is then convenient to distinguish the two limbs formed as the shank limb and the point limb. In simple hooks (fig. 58) made from one piece of material, the shank, bend, and point are quite clear. In composite hooks made of two pieces the form of the point element affects the terms used. The upper end of the shank is provided with a projection on the outer side or part remote from the point. The projection is triangular, with the lower side at right angles to the shaft and the upper side sloping upwards and inwards, sometimes with a distinct, concave curve. The Tongarevan term for the projection is *reke* (knob), and as it is constant in most types of hook, it may be conveniently termed the shank knob. Its use is to prevent the lashing which binds the snood to the shank from slipping. The bend is termed *kopu* (belly) and the point, *mata* (point).

ONE-PIECE SHELL HOOKS

The two types of baited hook described as native to Tongareva are simple hooks with the shank, bend, and point shaped from one piece of pearl shell. Both types are provided with shank knobs, and the points are without barbs. They may be classified as U shaped and circular.

A U shaped *ruhi* hook (fig. 55, a, b) was drawn by an informant. No actual hook was seen, but a piece of shell in the process of manufacture

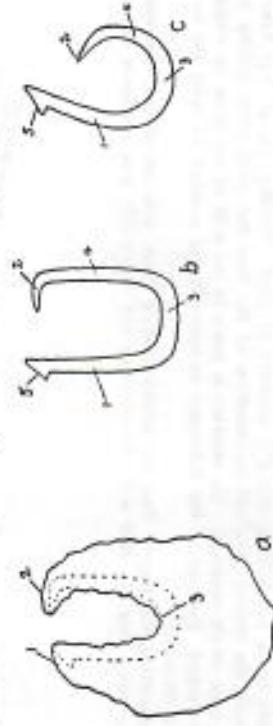


FIGURE 55. One-piece pearl shell hooks: a, U shaped *ruhi* hook in course of manufacture; b, completed U shaped hook; c, circular hook. a, U shaped hook in course of manufacture: 1, part of shell to become shank knob; 2, part to become point; 3, bend; 4, point limb; 5, shank knob. Shell 63 mm. long by 47 mm. wide shaped to oval form; gap cut out at smaller end to form inner curve 20 mm. long by 15 mm. at widest part; dotted lines show shell in completed hook, though part of left gap is broken off and knob might actually be higher. b, c, completed hooks: 1, shank knob; 2, point; 3, bend; 4, point limb; 5, shank knob. Shank knob has same form in both hooks.

was jacked up in the stone circle on Naue. The edges of this piece of shell show curved depressions as if flakes of the material had been pressed off with some stone flake or hard portion of *Tridacna* shell. The depressions have not the clear-cut appearance of perforations made with a hand gimlet, and they vary in size. On completion of the rough shape the hook would have been rubbed down with shark skin or the rough skin from the back of the tail of a skate. The skin rasp was also used to form the correct inner curve of the hook. The hook is used principally in catching the *ruhi* fish, one of the best eating fishes in Tongarevan waters. It was pronounced a *matou si ruhi* (hook for catching ruhi).

The circular hook is used for catching fish less than 9 inches in length, such as the *maras* and the *kokiri*.

No Tongarevan baited hooks with lashings were seen but, judging from similar Rakahangan hooks, they must have been attached to three-ply twisted snoods of semit fibre. The lower thicker end of the snood was unravelled, and each ply separately bound round the shank and knob in a particular technique. A fine two-ply twisted thread of semit was then bound over the snood attachment by making figure-of-eight turns around the shank on one side and alternately above and below the shank knob on the other. The end of the thread was finished off with a number of close transverse turns around the snood ending in half hitches and stoppered with an overhand knot.

A bait string (*napu*) is formed of a fine two-ply twisted semit cord, which is tied with a slip knot below the angle made by the point with the point limb. It is used for tying the bait on to the hook.

COMPOSITE HOOKS

1. The pearl shell bonito hook (*matou uhi*). Whether introduced or not, the bonito hook deserves description, as it is now made locally.

The hook is composite, consisting of a shank and a separate point. (See pl. 8.) The shank is made of strips of shell averaging 18 mm. in width and cut so as to include a part of the thick hinge at one end. Four shanks in Bernice P. Bishop Museum range in length from 113 to 124 mm. The hinge end is termed the head, and the other thinner end, the tail. The nucleus inner surface of the shell forms the front of the hook. The rough outer surface forming the back of the hook is ground down to remove the rough dull material and form a clear shiny surface which has iridescent colors toward the tail. (See fig. 56, a, b.)

The point of the composite hook is made of pearl shell taken from near the edge of the shell away from the hinge. The point piece is cut out on the flat, so that one side shows the natural inner surface of the shell, and the other shows the black outer surface which is smoothed down but not polished. The point piece is fitted against the front of the shank, and the part which fits against the shank may be termed the point base. The problem is to extend this base to make it long enough to support two lashings and so to render the attachment firm. The Tongarevan point follows the form of the Samoan hook, in which the base is prolonged proximally or on the same

side as the functioning point. As the point has to be cleared, the part of the shell between the point and the base has to be hollowed out. The point piece thus carries the technical "head" of the hook as well as the functional point and the base for lashing. For lashing purposes two holes are drilled through the base, which must be deep enough to hold the holes. (See fig. 56, c, d, e.) In three out of four hooks in Bernice P. Bishop Museum the proximal perforations broke through the upper edge, forming grooves. In three hooks the point was everted.

The bonito hook lashing is shown in figures 57-60.

The Tongarevan point is characterized by the proximal prolongation of the base with two holes for lashing and the material of shell. Beasley (1, pl. 14) figures a point with the typical proximal prolongation of the base but with three lashing holes, giving leave as the material. No mention is made in the text of the hook to which the point belonged. Because of the difference in material and number of holes the locality needs confirmation.

Supporting the theory that the bonito trolling hook was introduced, Solomon of Tautua stated that the drill with the crossbar and two cords was unknown in ancient times.

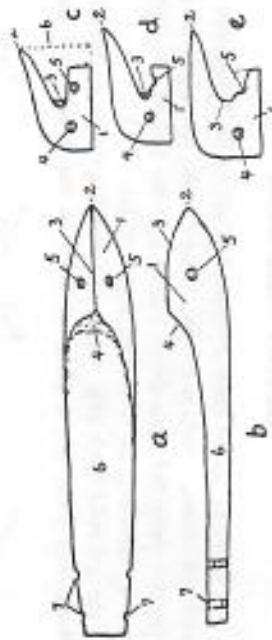


FIGURE 56. Bonito hooks: a, b, shank; c, d, e, points. a, front; b, side of shank; thick hinge part ground on both sides in curve to proximal point; 2, point; 3, median line at meeting of sides ground inward at slant, forming triangular head, maximum thickness about 14 mm.; 4, surface of hinge; 5, transverse hole drilled through horizontally below median ridge at about 18 mm. from point; 6, shank beyond head, gradually diminishes in width to about 12 mm. and in thickness to 4 or 5 mm. at tail end, where it is cut off square or with slight convexity from side to side; 7, two shallow grooves cut vertically on both sides at tail end. Longitudinal natural curve of back and corresponding front concavity apparent. c, d, e, points, side view: 1, base 5 mm. high in clear proximal part, causing proximal hole (5) to break through upper edge, and in c, 23 mm. wide; 2, point, slightly everted (c, d) and straight (e); 3, bend cut out between base and point; 4, distal hole bored through base; 5, proximal hole or hole broken through to upper edge (d, e) because of high placement, and leaving groove (e) effective in lashing; 6, distance between point and shank (c) 23 mm., and corresponding clearance (d, e) between point and shank 17 mm.

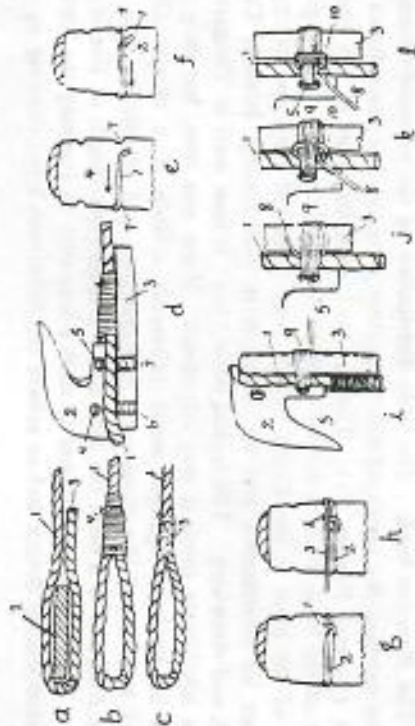


FIGURE 57. Snood loop and lashing of proximal hole of binito hook. *a*, snood made; *b*, two-ply twisted thread commences distally to lash overlap together by burying end of thread under subsequent transverse turns which cross it; transverse turns are continued for length of overlap; end (*c*) is turned back under three loose turns which are subsequently tightened; slack is removed by drawing on end; end is cut off short. *c*, overlapping ends of some loops are spliced (*d*) for distance of about 10 mm. *d*, method probably recent. *e*, side view: point (*e*) is placed in position on tail end of shank (*f*) with back edge projecting a little beyond end of shank; grooves (*g*, *h*) are cut on sides of shank opposite holes (*i*, *j*) in point; loop (*k*) of snood is placed around base of point and loop end bent down under projection formed by protruding back of point base. *l*, back of the shank tail. *m*, with point and snood loop in position, lashing thread (*n*) is laid on back of shank (*o*) between pair of proximal grooves (*p*, *q*); end is bent down at angle and held in position by left thumb while left forefinger keeps point in position on other side of shank; thread is passed transversely to left by right hand to lateral groove (*r*) up over snood loop and through proximal hole of point base. *s*, thread descends on the right side over other limb of snood loop and right groove (*t*) of shank to reappear on back, where second turn (*u*) in passing transversely across to opposite groove crosses obliquely bent end of first turn (*v*). *w*, oblique end (*x*), crossed by the second turn (*y*), is bent over second turn. *z*, third turn (*aa*), after passing through point hole in making transverse turn around shank crosses and doubly fixes end (*ab*); five or six lashing turns are made through the one hole. *ac*, side view. *ad*, six lashing turns (*ae*) pass through hole (*af*) of point (*ag*), over snood (*ah*), and around shank (*ai*). *aj*, thread (*ak*) is brought up on right side and passed from proximal side under lashing (*al*) in space between shank (*am*) and lower part of snood (*an*). *ao*, the thread (*ap*) is brought back over lashing (*aq*) and looped through under its standing part to form overhand knot (*ar*). *as*, two other loops with overhand knots are made and thread (*at*) is continued on through hole (*au*) to other side, where it makes similar set of loops and knots over lashing; thread end is cut and proximal lashing of base is completed.

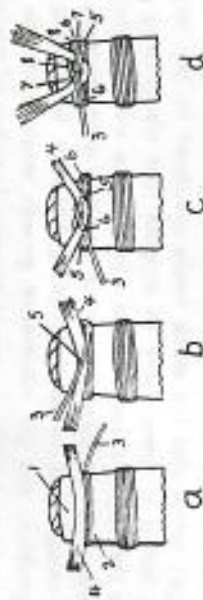


FIGURE 58. Binito hook lashing, distal hole and pig's hair buckle: *a*, lashing thread is fixed on under side of shank (*1*) in exactly same technique as proximal hole, and buckle (*4*) is laid transversely along over lashing on under surface of shank; *b*, the thread (*3*) is brought around on right and crosses buckle (*4*) obliquely (*5*) to the left, on distal side, to continue lashing turn through hole in point base; *c*, thread (*3*) is brought around on right on distal side of buckle (*4*) which is bent forward to approximate limbs of buckle, crosses bend of buckle obliquely to left on way to lateral groove to continue lashing turn—second turn (*6*) over buckle also crosses first turn (*5*) in middle line; *d*, thread is brought around on right proximally to buckle and makes turn (*7*), keeping on far side of the first turn (*5*), passes on through point hole and, coming back on right or distal side of buckle, makes crossing (*8*), keeping to far side of previous turn (*6*) in same direction. Second pair of turns (*7*, *8*) takes limbs of buckle and maintains them in bent position, and thread carries on with finishing turns around lashing on either side as in figure 57, *g-l*.



FIGURE 59. Binito hook, completed lashing of point, snood loop, and buckle: *1*, shank; *2*, head; *3*, point; *4*, snood loop; *5*, snood loop fixed under lashing of point; *6*, first lashing through proximal hole of point; *7*, second lashing through distal hole of point; *8*, buckle fixed on back of shank by second lashing; *9*, hole through head.

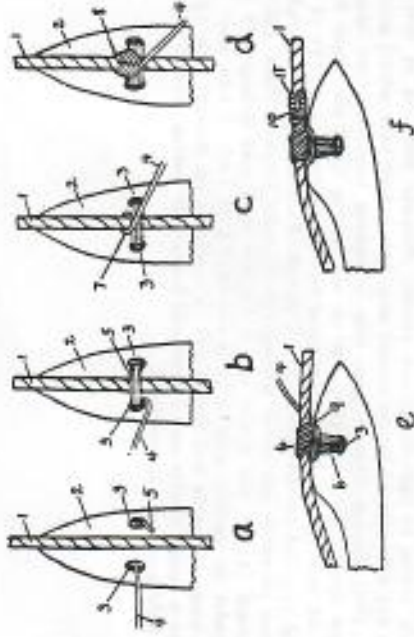


FIGURE 60. Bonito hook, lashing of snood to shank head: a-d, front view, e, f, side view. a, snood (1) rests on median ridge of shank head (2) with transverse head hole (3) showing below snood on either side; lashing thread (4) is passed through hole, and short end (5) on right is bent upward. b, lashing thread is brought over snood (1) from left and down through hole on right, passing over bent short end; short end (5) is bent upward over first turn, and two more turns are made through hole and over snood; short end (5) is thus fixed in position. c, next turn (7) passes from left over snood (1), makes complete turn around it, crosses itself on middle of snood, and passes down on right through hole to prevent snood from slipping off median ridge—three similar turns were made on the hook examined and then straight turn without looping around snood. d, eight more turns with loop around the snood are made, first crossing (8) being distal and subsequent ones following on near side, so as to develop neat ornamental pattern. e, two to four circumferential turns (9) are made by passing thread (4) between snood and head and over both limbs of lashing (6). f, thread is continued on in close spiral for about 8 turns (10) around snood and fixed with a couple of half hitches (11).

2. The *Ruvettus* hook. The wide distribution of the composite wooden hook for catching the castor-oil fish (*Ruvettus pretiosus*) has been shown by Gudger (7) and Beasley (1). Hedley (11) calls attention to the manufacture of the hook from a forked branch, Kennedy (13, pp. 12-27) gives details of the hook in the Ellice Islands, and Nordhoff (19, pp. 221-232) discusses its distribution and its diffusion in the Society Islands, Cook Islands, and elsewhere. The typical hook (*kuu*) is now used in Tongareva, but the inhabitants think it was introduced. None was seen, but they are said to be made of *ngangie* wood (*Pemphis acidula* or a closely allied species) and shaped like those used in Rakahanga and Manihiki.

The *Ruvettus* is a deep sea fish, and a considerable length of line is required. The sinkers are attached in such a way that on reaching the bottom they automatically detach and so relieve the fisherman from drawing up the

heavy sinker in addition to the fish. The Tongarevan method of attaching the sinker to the hook by a forked branch differs from the usual method, the use of the detachable loop. The local names for the parts of the hook and the sinker attachments as described by Nordhoff (18, pp. 42, 43) are shown in figure 61.

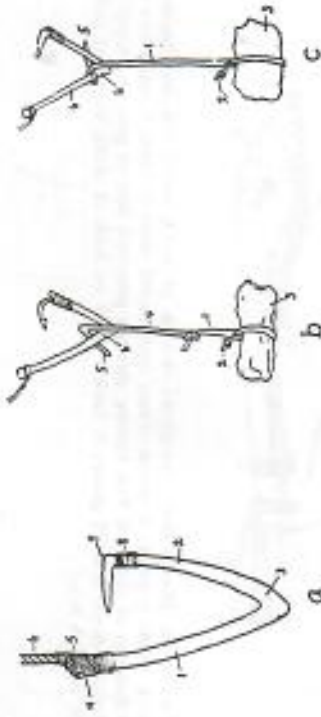


FIGURE 61. Ruvettus hook: a, parts of hook; b, c, sinker attachments from Tongareva and Cook Islands (after Nordhoff). a, parts of hook: 1, shank limb; 2, point limb; 3, bent limb (*kepa*); 4, knob (*rete*) to support lashing; 5, lashing of snood and shank; 6, snood (*maiai*); 7, point (*reinga*); 8, lashing, point limb to vertical end of point. b, Tongarevan attachment: strip of hala (1) is knotted at one end (2), which is passed through split made in strip to form running noose around coral sinker (3); other end is tied to straight end of forked stick (4); fork (5) is hooked over bend of hook (6); baited hook is lowered and, when sinker touches bottom, forked stick falls away from slackened line, and sinker is detached. c, Cook Islands attachment: longer strip of hala (1) in similar method attaches sinker (3), but upper end of strip (1) is passed over hook bend, brought around shank limb, and end (5) is passed under loop; weight of stone presses short end against hook and prevents it from slipping; on release of pressure when sinker touches bottom, loop slackens and frees sinker.

3. Shark hooks. Composite wooden shark hooks are made of *ngangie* wood and differ from *Ruvettus* hooks in that the shank leg and point leg meet at a curve rather than at an angular bend. The separate point, also of *ngangie* wood, is curved so as to carry the point of the hook toward the shank limb.

The wood is hard and tough and does not break easily. Gudger (7; p. 230, 232) infers that the shark hooks examined by him were made of the roots, but it is unnecessary to suppose that the growing roots were trained to the required curve. The *ngangie* is a stunted plant with very crooked branches, and naturally curved branches were selected. The curve could be exaggerated in young growing branches by berarding and tying them in position, and the subsequent growth would make the curve permanent. In New Zealand the young growing branches of straight branched trees such as the *tanekaha* (*Phyllocladus trichomanoides*), were formed into

a loose overhand knot and allowed to grow into a permanent curve for wooden fishhooks.

Two shark hooks collected in Tongareva by the Wilkes Expedition are now in the United States National Museum. If the hook illustrated by Wilkes (31, vol. 4, p. 287) is intended to represent either of the two in the National Museum the artist, according to Gudger (7, pp. 230-231), has not made the bend sharp enough. (See fig. 62, *a*.)



FIGURE 62. Shark hooks collected by Wilkes Expedition: *a*, hook figured by Wilkes, no description, probably meant for hook no. 3674 in National Museum, but bend (1) made too rounded; *b*, hook figured by Hough, National Museum no. 3674; *c*, hook after Gudger (7, p. 230, fig. 19), described as largest hook in National Museum.

Hough (12, pl. 26, no. 1) pictures a large hook, similar to the one represented by Wilkes in the lashing of the snood, and a sharper bend. (See fig. 62, *b*.) In Hough's description the hook is wrongly labelled "Fiji," and Gudger (7, p. 231) states that the same hook was labelled "Tahiti." H. W. Krieger, Curator of Ethnology of the U. S. National Museum, says in correspondence that it is the larger of the two Tongarevan hooks in the Museum, and gives an additional description:

The shank leg (straight line measurement on outside) is 9 inches, the barb leg 4 inches, and the barb (point) measures from lashing tip 2.5 inches. The tip of the barb (point) approaches to 15-16 of an inch of the shank leg. The attached cord of snout is 44 inches in length. It is a flat braid of three-ply twisted fiber of coconut palm which tapers toward the knotted end. At the shank end the cord is separated into its component parts which are again subdivided into two-ply strands lashed about the shank end where they are partly embedded in an encircling groove. Loose strands are used to cover 7 inches of the proximal end of the attachment cord where it is attached to the shank. This ferrule is loosely plaited. The point of attachment of barb (point) to barb leg is ferruled with a two-ply braid of snout like that of the lower end of the attachment cord. The form of the lower end of the hook made by shank, barb leg, and barb (point) is roughly that of an acute triangle with slightly rounded angles.

Gudger also describes the two hooks in detail. As he states (7, p. 231) that the smaller of the two hooks is more like Wilkes' and Hough's figures and states that Hough's figure is taken from the larger hook, some confusion is evident. Gudger states that a long-fibered material was used to seize the lashing in both hooks. The textile-like stipule (*kaha*) from the

base of the coconut leaves was used in Manihiki to protect the lashing and snood, and as this is the only fibrous material besides sennit available in Tongareva the material mentioned by Gudger is probably the same.

A metal hook with two long limbs meeting at an acute angle with the point bent in toward the shank leg is said to have been introduced from the islands to the south.

COMPARISONS

Characteristic of Tongarevan fishing is the short line, the common use of which was rendered possible by the cultivation of diving abilities, and may have been necessitated by the lack of fiber. The hooks used, however, are not peculiar to Tongareva. The wide U shaped pearl shell hook is found in Manihiki, Rakahanga, Pukapuka, the Tuamotus and Tahiti, and the composite wooden shark hook has a wide distribution. The third form of circular hook used with an ordinary length line from a canoe at anchor also has a fair distribution. The use of but two simple pearl shell hooks in Tongareva is in contrast with the greater number of forms in use in other atolls such as Manihiki, Rakahanga, Pukapuka, and the Tuamotus, where pearl shell material was also abundant. The method of driving flying fish is known elsewhere. Kennedy (13, pp. 61-63) describes its use in the Ellice Islands. Handy (8, p. 176) describes the method of driving porpoises in to the reef in the Marquesas.

That diffusion of the *Rarettus* hook into the Society Islands, Tubuai in the Austral Islands, and Anaa in the Tuamotus is comparatively recent has been shown by Nordhoff (19, pp. 224, 225). The contention of the Tongarevans that it is a recent introduction to their islands is also probably correct. In most localities *Rarettus* fishing requires a great length of line. Tongareva lacked suitable material for long lines and, though semit fiber was available, the only line fishing from the surface was from an anchored canoe. Even for this use, the Tongarevan fishing line was comparatively short, the same length as the anchor rope. Nordhoff associates *Rarettus* fishing with cannibalism, which, again, seems to have been absent in Tongareva.

The recency of diffusion of the bonito hook is more doubtful. The chief objection to the age of the bonito hook raised by the Tautuan people was that they had no drill. Though the proximal hole in the point base may be displaced by a groove, the distal hole and the hole through the head both require drills. If the bonito hook came by fairly recent diffusion it did not come from Tahiti, as the second lashing of the point is made over a distal prolongation of the point base toward the tail. The bend of the Tahitian hook is equally formed by the shank and the point, whereas in the

Dr. STEPHEN R. WEINSTEIN and his nursing sister wife Elisabeth ran the medical service on remote Manihiki atoll in the northern Cooks for several months last year. Here he turns in an engaging account of everyday life on Manihiki, where traditional ways survive much more strongly than in southern islands such as Rarotonga.

Adjusting to the pace of life on Manihiki — and loving it

The northern group of the Cook Islands consists of Penrhyn, Rakahanga, Manihiki and Pukapuka, all coral atolls lying about 10°S latitude and joined to the outside world by the irregular visits of the inter-island ships, *Mataora* and *Manuvai* of the Silk & Boyd Line every six to eight weeks, a round trip which takes about two weeks. Only Penrhyn has an airstrip, but it is not served by commercial flights.

My wife Elisabeth and I were stationed in Manihiki for four months in early 1980, she as staff nurse and myself as medical officer, both employed by the Cook Islands Health Department. Elisabeth was not my wife when we arrived, but had become so by the time we left.

Partly because of their isolation, the northern islands preserve the old way of life to a greater extent than Rarotonga and her neighbours in the south.

We were in Rarotonga for about a month before embarking, which was barely long enough to pick up a rudimentary knowledge of Cook Islands Maori, an eastern Polynesian language related to New Zealand Maori, and to Tahitian.

We were also able to gather basic information on the northern atolls from several people from there now living in Rarotonga.

We were to sail on the *Mataora*, a former North Sea freighter. It is hardly a comfortable ship by tourist standards, but serves its purpose of conveying passengers and goods between the islands of the Cook group with occasional trips to Samoa and Fiji.

The loading of supplies took several days, and, when complete, the cargo hatch was covered and a tarpaulin spread over the deck to protect the 'deck passengers' from sun and rain. 'Cabin passengers', such as ourselves, often preferred to sleep on the deck also, instead of in the small stuffy cabins reeking of diesel oil.

It took four days to reach Penrhyn where we had our first glimpse of an atoll as a thin rim of coconut palms suddenly appearing over the horizon. The next thing we knew, we had entered the lagoon through a passage in the reef and tied up at the wharf. There were a few yachts also moored in the lagoon, Penrhyn being the only

island in the northern group with anchorage within the lagoon, the other islands seldom seeing any yachts.

Prayers were said and a small service, conducted by the islands' pastor, who is also the father of the *Mataora*'s skipper, Captain Ben Paranapa, was held on board before anyone disembarked. As we had arrived on a Sunday, no cargo was unloaded until next day.

On Penrhyn, we spent much time in the company of the fisheries officer, Chris Friberg, who had formerly been a skipper on both the inter-island ships and had studied to be a martial arts expert in Korea and Hong Kong.

Two days later, the ship continued to Rakahanga, where passengers and cargo were ferried ashore in rowboats. Rakahanga boasts of one car and an interesting collection of hand-lettered road signs.

Manihiki has long been known for the fine quality of its craft work, particularly for mats woven by the women. The mat shown in this picture was presented to a New Zealand government delegation which visited the island.



The journey from Rakahanga to Manihiki only took three hours, and halfway between we could see both islands, a point of some importance in earlier times when canoes travelled between the two atolls without navigational aids.

Manihiki is an atoll composed of several coral islets and a lagoon about four or six km across. The main settlement of about 200 people is at Tahunu, and across the lagoon is the other village of Tukao. The population is entirely Polynesian, except for four Europeans — Father Philip, the Catholic priest, and Peter Cummings, a former commander in the Royal Australian Navy, who, together with his two sons, operates a farm for cultured pearls in the lagoon. The other islets are uninhabited, but covered with coconut trees. One islet, Porea, has a little brackish water, and is particularly beautiful.

The houses in the villages are of varying design, some older ones thatched with coconut fronds, the newer ones built of brick or fibreboard. The post office is the centre of administration, combining its services with the housing of a police office, radio shack, and the only legal liquor outlet — which is very reasonable! And, compared with Rakahanga, Manihiki has no car but two trucks and a few motorbikes.

The chief administrative officer (CAO) represents the central government and often has a superhuman job to do to keep everyone satisfied. The





CAO on Manihiki is Mr Honu Ben, a native Manihikian, who saw home for the first time in 20 years when he returned from Rarotonga to take the position. We became close friends and he was subsequently best man at our wedding.

The CAO makes daily calls to Rarotonga by radio to handle a variety of affairs ranging from copra and pearl shell prices to the trials of offenders. The radio in the post office uses morse code, and during our stay a new radio-telephone service was begun, which enabled people to speak to their relatives in Rarotonga and New Zealand. In recent years, there has been a large migration, mainly of young people, from Manihiki to these places, reducing the population from around 1000 20 years ago to the present 350.

We soon got down to work, which consisted of seeing patients with minor complaints in the three-bed hospital next to our house. Twice a week, a child health clinic was held, during which mothers brought in their babies for weighing. A few times each week we crossed the lagoon by boat to see patients in the small clinic in the village of Tukao. Often, after finishing work, we would walk around the village, drinking coconuts and talking to the people while we waited for the boat to take us

Drum dances, colourful performances by the men and women of Tukao village on Manihiki.

back to Tahunu. Most complaints were minor — colds, gastro-enteritis and various cuts and sores. Two babies were born during our stay, one at home and one in the hospital. Because of the island's isolation, a minor flu epidemic would break out at intervals of six to eight weeks, coinciding with the ship's visit, arriving with germs and viruses from the other islands. This was usually our busiest time. We also paid an occasional visit to the school to examine the children and sometimes were called to the home of a patient too sick (or merely disinclined) to visit the hospital. On the whole our workload was light, regular hours being from eight until noon on weekdays, with the rest of the time spent fishing, cooking and socialising, which seemed to be the mainstay of atoll life.

In May 1980 we carried out a diabetes survey for the South Pacific Commission and the Southern Memorial Hospital in Melbourne, and had an almost 90% turnout. It was an advantage knowing nearly all the people personally when asking for their co-operation and preparing the survey. The CAO's wife Sister Purutu Ben, also a nurse in Manihiki, was of great

help to Elisabeth and me in this diabetes work, the results of which are to be published in *The New Zealand Medical Journal*.

Traditional Maori medicine still plays an important role in treating illnesses, and we observed several traditional practices: for example, for treating thrush of the mouth, the scraped inside bark of an ironwood tree is applied to the lips; for headaches, seven frangipani flowers are rolled in a banana leaf at low tide and cut in half. Much Maori medicine relies on massage, leaves and coconut oil. We also knew the island's bone setter, the ancient skill of setting broken bones being passed from father to son. He is Ioane Kaitara, who is also considered one of the islands' best fishermen.

Much of the atoll life revolves around fishing, either in the lagoon, or the sea. Atoll dwellers have an endless store of skills and fishing lore. Several different techniques are used for different species of fish. One method is to use a lantern (formerly a burning coconut husk) in a boat at night to attract flying fish which are caught with hand nets as they are drawn towards the light. Also at night fish can easily be speared by torchlight in the lagoon, as they are sleepy and slow to react. One species of fish, the kuperu, is caught by swimmers underwater, using a miniature hook and line with coconut for bait. Various fish can be attracted by different

sounds, such as crayfish which seem to respond to the rubbery sound of biting one's snorkel! The easiest way to catch fish is probably in one of the fish traps, which are walls of coral rock enclosing pools in which fish become trapped at low tide. During our stay, a 90 kg turtle was caught by Tekaki Williams, another renowned fisherman and pearl diver. There are seasonal fish and small sharks in the lagoon which one chases away by hitting the surface of the water with cupped hands. Larger sharks outside the reef are treated with far more respect, however, and fishing trips to the sea are preceded by a short prayer in the boat, just as are voyages to other islands.

Because of the poor soil on the atolls, the sea is the main source of food. Giant clams are collected and made into a delicious stew with coconut milk. Taro, the Polynesian staple food, as well as most fruits, cannot grow in coral soil and the only fruits we had were bananas, pawpaws and breadfruit. Elisabeth quickly became a skilled cook with the 'raw materials' available and we miss many of the island recipes and foods.

We also brought stocks of sugar, flour and rice from Rarotonga, which, together with daily fishing expeditions,

A sleeping shelter on one of the uninhabited islets. Manihiki people use it when they visit the islet to cut copra. — S. Weinstein picture.



considerable gifts of food from the local people, and an occasional visit to one of the small shops for luxuries such as cocoa or cheese twisties, lasted us pretty well. We ate about one tin of beef a week as well, usually on a Sunday when fishing and all other work was prohibited. Though I speared a few small fish nearly every day, it was Elisabeth who scored our largest fish, hooking a 5.5 kg tuna. She also hooked a shark, which we did not eat, although we kept the teeth and jaws.

A great delicacy, which nowadays only lives on the more remote Pacific Islands, is the coconut crab which looks like a lobster, climbs trees and opens the nuts with its heavy claws. Although it lives on land, it returns to the water to lay eggs. It is usually active at night, when it is mostly caught. The meat is delicious, eaten the traditional way, dipped into the rich oily fat in the crab's tail.

Although officially illegal, homebrew is sometimes made by fermenting coconut juice, unlike the southern group where orange or pineapple juice is fermented. Homebrew drinking is accompanied by certain rituals, the usual way of drinking being from a single communal cup passed from hand to hand and drained at a single gulp. We heard the following remark on one occasion: 'Beer is for women, homebrew is for men, and whisky is for Papaa (Europeans)'.

Religion plays a greater role in Manihiki than in urbanised Rarotonga, most people belonging to the Cook Islands Christian Church (CICC), an offshoot from the London Missionary Society whose members brought the gospel to the Cook Islands in the 1860s at about the same time as the blackbirders were kidnapping workers for the Queensland sugar plantations from some of the Northern Cooks.

The head of the CICC in Manihiki is the Rev Timote, and the Catholic Mission is headed by Father Philip, who also has Manihiki's largest library of books, which he kindly let us use. There is also a small congregation of Seventh-day Adventists and a single adherent of the Hare Krishna sect,



who acquired this persuasion while working in New Zealand.

The proper dress for church is broad-brimmed straw hats for the ladies and shirts and long trousers for men. Special white dresses and suits are kept by some people for special holidays such as Easter, when coconut juice takes the place of wine during the service. The Rev Timote invited me to give the sermon one Sunday, which I did, with him interpreting my words into Maori.

There were two funerals during our stay, and on these occasions the whole population gathers together as one family at the home of the deceased, and speeches and hymn-singing alternate throughout the night while coffee and ship's biscuits are served. The burial itself is usually held the following day to forestall decomposition in the hot climate, and is followed by a wake which continues for another two days with various speakers elaborating on the virtues of the deceased. At the end of the wake, a huge feast is held. Gravestones can be very elaborate and in some cases are protected by little corrugated-iron roofs or sheds.

The two main export industries of Manihiki are copra and pearlshell. The coconut groves on the various islets, all with their specific owners, are worked on a rotating basis, with one islet at a time open for coconut gathering. This is designed as a conservation measure, to let the unworked groves regenerate. The island council directs which islets are 'open'. On weekends, we would go with the Ben family across the lagoon to their coconut land

The Cook Islands Christian Church at Tahunu is a focal point of community activities. — S. Weinstein picture.

and help with the gathering. We camped out in a little hut and enjoyed beautiful sunsets over the lagoon and a bright starlit sky at night with the sound of surf pounding the reef behind us.

The conservation of the pearling industry is also under the control of the island council. Pearl diving is restricted to certain times of the year, and only oysters with a span of not less than 18 cm can be taken. Six families have licences, which were granted in Queen Victoria's time, to use diving equipment consisting of ancient hand-cranked compressors and copper diving helmets. The rest gather pearlshell by free-diving. The unofficial depth record is held by Ioane Kaitara, with a depth of 20 fathoms and a duration of five minutes. For the 1980 pearling season, two divers came up from Rarotonga with modern motor-drive compressors that they had been licensed by the government to use. An interesting jurisdictional dispute arose when the island council refused to let them use the machines. The matter was deferred, however, when the opening of the lagoon was postponed because of the flu epidemic which had followed the last ship's visit.

The oysters are of the large black-lipped variety, taken mainly for the shell. Only occasionally is a natural pearl found. On the pearl farm, cultured pearls are made by implanting moulds, after which the oysters are left for a year in

wire-mesh boxes in the lagoon.

'Boat day' is always an eagerly awaited event, with people gathering at the landing waiting for mail, news of relatives, 'fresh foods' and other goods.

One of the highlights of the year was the visit to the northern group of islands by Cook Islands Premier Dr Thomas Davis, and the New Zealand representative, Mr Lindsey Watt. Several weeks prior to the visit, there were nightly rehearsals of drum-dances in the public square behind the post office, and costumes were made. A general clean-up was also carried out in both villages.

The official party's progress by air to Penrhyn and on to Rakahanga by the *Manuava* was eagerly followed over the radio until finally the ship was visible on the north-eastern horizon. Towards sunset the guests finally stepped ashore from the rowboat on to the decorated landing, and were welcomed by schoolchildren and a reception line of Who's Who in Manihiki. Speeches of welcome and dancing at the landing followed and later that night a feast was held in Tahunu with more dancing and speeches. After spending the night at the CAO's official residence the premier's party, in a convoy of boats, crossed the lagoon to Tukao in the morning where another feast was prepared. After the dancing and speechmaking, gifts of woven mats and hats were presented to the guests.

Although the visit to Manihiki only lasted 24 hours, it was the first by a Cook Island premier in over 10 years and was greatly appreciated, even though there wasn't time for him to discuss everything of interest, and to meet everyone.

The village clean-up took the form of a *tutaka*, an institutionalised village inspection which is seldom carried out in the southern Cooks any more. A number of officials, including the CAO, doctor, chairman of the island council and sometimes the priest, with others, walk through every home in the village, technically looking at the state of sanitation. But the event is more an opportunity for every household to display its status symbols and handicrafts.

Most of the homes we walked through were in a state of near-perfect cleanliness and order, with hand-made bedspreads, hats, photos of family members, and an occasional cassette player prominently displayed. Also inspected were gardens, household animals, the cookhouse — which is often a separate building — and toilets, which in Manihiki are built over the lagoon and reached by catwalks on stilts. This has not been known to cause any health problems as the fish quickly consume all waste. The *tutaka* is started and finished with prayers and speeches, concluding with a small feast for the party who did all the walking.

There are a few stately old houses built at the turn of the century by European traders and furnished in 1890's style with what then would have represented enormous wealth on an atoll visited once a year by a small copra schooner.

Among the most popular trade items in those days were iron bedsteads, pedal-operated Singer sewing machines and seachests, which are still found in many homes. The traders left many descendants on the island, one such being George Ellis, whose grandfather left England at the age of 16, had many adventures on ships and islands all over the Pacific, and finally married and settled down in Manihiki. There he taught the people to build wooden long-boats of planks, many of which are still lying about rotting, and one which is still in use. It was the one still in use that was used for a voyage to Rakahanga in May, 1980. The occasion for this voyage was the sudden death of the Catholic priest in Rakahanga, which required Father Philip to go there for the funeral. Two 25-hp outboard motors were hooked on and the boat was skippered by Teokotai Williams, another trader descendant, navigating with an old brass ship's compass in a green box. Permission for the voyage had to be obtained from Rarotonga by radio. After completing their mission, the voyagers returned safely, bringing a few bags of flour and some medicines from Rakahanga. Such voyages were more common in the old days, until the



Manihiki fisherman: Aluminium dinghy, coconut palm oars. — S. Weinstein picture.

government prohibited them, because of so many boats being lost. Some made it to other islands weeks later, but many perished. It was known to the island boatmen that if one failed to reach Rakahanga in a day, the normal sailing time, there was a possibility of reaching Samoa in a week by following the winds and currents. Some survivors of such drift voyages still live in Manihiki. On one such trip, seven men set out from Manihiki, and after getting lost at sea, suffering thirst, hunger and storms, four of them reached the (then) New Hebrides alive a couple of months later.

Elisabeth and I were married on March 21, 1980. I paid \$6 at the post office and an official notice was displayed. Typewritten invitations were sent out to about 100 people, but of course the whole island was welcome to attend. Various families donated a total of eight pigs, many chickens, fish, and all types of other foodstuffs. Ioane speared 10 large crayfish.

The night before the wedding was extremely busy, with baking and cooking going on until well past midnight. The pigs were slaughtered and cleaned down at the landing prior to putting them in the underground earth oven overnight. Sitting with Honu on the verandah of the mission house the next day I waited for Elisabeth. The ceremony was given in Maori by the Rev Timote, the first wedding he had performed for Europeans. Outside the church the Boys Brigade formed a guard of honour, their

brass belt-buckles polished with lime for the occasion. Three volleys from a shotgun were fired and the procession walked back to the residence where the reception was held. After speeches, singing and dancing by the VIPs, the guests filed past and gave their gifts — straw hats, lengths of trade store cloth, two bottles of whisky, and banknotes in envelopes. The money was recycled to the church and also helped pay for the store-bought foods. In the evening, drinks and ukelele music were followed by a dance on the post office verandah. An official announcement of the event was made on the Cook Islands radio in Rarotonga.

Among the most memorable people we met was Mehau George, whose death on May 19, 1981, was reported in September's PIM. At 87 he was the oldest man in Manihiki, a skilled woodcarver and craftsman. He was also the islands' only World War I veteran, Second Maori Battalion, and could still sing all the verses of 'It's a long way to Tipperary'. There was also Charlie Poiri, who claims descent from King Kamehameha I of Hawaii, through one of his ancestors who served on a whaling boat in the last century. Charlie still keeps contact with relatives in Hawaii.

The only visitor to Manihiki apart from the inter-island ship

during our stay was the research vessel *Machias* of Honolulu, on charter to the Cook Islands Government, exploring the seabed for manganese nodules, phosphate and precious corals, all of which they found.

The week before our departure was filled with visits to say farewell to old friends, culminating in a dinner where members of the island council sang traditional songs, more gifts were presented, and a few tears were shed. We also said goodbye to a black kitten, Tom Tom, who had attached himself to us.

The return voyage lasted 10 days, and we enjoyed the company of fellow-passenger Judge Jock McCawley, whose several decades in the islands provided a rich store of yarns. We stopped at Rakahanga to load copra and disembarked into the landing boats by torchlight, after the ship's electricity failed. We spent a few more days in Penrhyn, and saw the old aircraft wrecks from when the island was an American air base in World War II. We also crossed the lagoon to visit Penrhyn's second village, Tetautua.

Every island in the Cooks has one or more members of the Marsters family living on it. This family originated when a British captain, Marsters, settled on Palmerston atoll with his Polynesian wives (three altogether at different times) in the 19th century. The hundred or so people on Palmerston today are all his descendants, bear the same surname and speak their own dialect of English as spoken 100 years ago.

For potential visitors to the northern Cooks, I should mention that the first boatload of tourists was scheduled to arrive on board the slightly more comfortable *Manuvai* shortly after our departure. The plan was that they would be billeted in private homes as there are no hotels, and the people were eagerly looking forward to this arrangement. Their experiences were described by James C. Simmons in PIM May, 1981. From my own time there, despite the discomforts, I would highly recommend the trip.

Hamm
Amic
B442

by Te Kangi Hirou (F.H. Buck)

22
+ plates

90

Bernice P. Bishop Museum—Bulletin 92
April, 1932

The three coconuts, which had been placed on the altar, were removed, and the people marched out of the marae, but seated themselves near its boundary. After further incantations the three coconuts were broken and handed to Lamont and two of his companions with signs that they were to eat them. This concluded the marae ceremony, but the whole concourse moved on to a fresh-water pool, where they splashed water on themselves with a peculiar motion of the arms, like ducks make with their wings. They then joined the women at a clear place near the beach, where the welcoming ceremony with dances and the *pehu* wailing took place. (See p. 75.)

The ceremony performed for Lamont at Omoka (15, p. 175) was similar to that at Mangarongaro except that the *pehu* wailing had been gone through the previous day. From this it must be concluded that the coconuts and the leaf representation of the gods were also used. Lamont remained behind looking at the marae stones while the men were performing their ablutions. As he went toward the beach to do likewise a woman came forward to greet him, not knowing that he had not washed, but when those who followed Lamont called, "hui atua," she fled in horror.

The Motuunga ceremony (15, p. 180) differed in that Lamont had to move the coconuts from place to place and in that the feather representation of the god was used instead of plaited coconut leaves. The feather mop was struck against the back of the other officiating priest instead of against stones.

CEREMONIAL PATTERN

From these accounts by Lamont the following ceremonial pattern may be distinguished:

1. The introductory incantation or *hai* before entering the sacred precincts of the marae.
2. The people were in the front half of the marae, and two officiating priests at the back. This supports the statement of an informant that the *arongamana* (people with authority) occupied the part near the altar (*raukawa*).
3. Coconut offerings took the place of pigs and human sacrifices used in some parts of Polynesia. The casting of pieces of coconut husk with the right hand over the left shoulder by the priests, after the appropriate incantation, was without doubt a propitiatory offering to the gods. The gesture was known in New Zealand as *koropana*. I was told by a middle-aged Maori that while he was having a glass of ale with a practising *tohunga* (*tanla*), the alleged priest, before drinking, dipped his right finger and thumb into the ale and flicked them over his left shoulder. The *tohunga* admitted

that he was giving a share to his familiar spirits in order that they might continue to impart power to him in the treatment of sickness. The gods thus received their recognition in the share of coconuts as symbolized by the pieces of husks, although the useful part was retained for human consumption.

4. The exhibition of the gods on the altar with incantations and appropriate procedure by the chief officiating priest was accompanied by a seizure or physical manifestation, showing that while the priest held the material representation of the god in his hands the spirit of the god had entered into the human medium. The priest spoke incoherently. In some parts of Polynesia the words uttered by the priest in this state were supposed to be the words of the god speaking from within the medium. The emotional state in the Tongarevan priest was evidently worked up voluntarily, no doubt assisted by the atmosphere of the marae ritual. In Mangaia the priest took a drink of strong *kava* beforehand to intensify the emotional condition of possession by the god.

5. The eating of the coconuts, rendered tapu on the marae, conferred status on those who partook of them and formed part of the ceremony of receiving people into the Mangarongaro community. Coconuts were the primary food of the atoll and thus formed the symbolic material used in the ceremony.

6. Ablutions to remove the tapu of the marae were necessary before those who participated in the marae ceremony could become normal and mix again with their fellows. It was because Lamont was still tapu that the women at Omoka fled from him.

THE TURTLE CEREMONY

According to Tupou Isaia, part of the turtle eating ceremony was conducted on the marae. The turtle was cooked in an oven that was situated close to, but outside, the marae precincts. These ovens, marked by broken heated coral, had by successive use in the same place become elevated and formed impressive mounds such as those seen at Hangarei (p. 174) and Motuunga (p. 159). Lamont (15, p. 182) again supplies details from first-hand observation. The turtle eating, at which he was the honored guest, took place at Motuunga. The procedure is outlined as follows:

1. Preliminary incantations. The turtle was turned over on its back on the seashore. A priest repeated some words over it which may be taken to be the preliminary incantation. The chief, Turua, then stepped forward to the edge of the water "and, in a menacing attitude, seemed to denounce someone, throwing up his arms, and vociferating at the top of his voice, as if threatening an imaginary being at sea." Lamont explains the action by

saying that the turtle had a spirit which had been driven out by the priest and was threatened with vengeance by the warrior if it attempted to return. Such an explanation does not seem compatible with the usual Polynesian attitude toward food. In New Zealand, before preserved pigeons were partaken of, a chant was recited in a loud voice to return the life-principle (*mauri*) of the birds to the forests from whence they came and thus to protect the supply of birds from depletion. It therefore seems from analogy with custom in another branch of the Polynesian race that the life-principle of the turtle was being returned to the sea that the supply of turtles might continue undepleted.

2. Marae ceremony. The turtle was conveyed to the marae and, after a few ceremonies, was beheaded and disemboweled. The "few ceremonies" are not described, but it may be assumed that they consisted of appropriate incantations and the subsequent offering of some useless part of the turtle to the gods.

3. Cooking. The cooking took place on an elevation of stones, probably the raised oven outside the Kirihuri marae on Motuunga. Lamont states that the turtle was sacrificed to the gods, but this interpretation is based on a foreign concept of burnt sacrifices. The turtle was cooked for human consumption, as the gods had already received their share in the offering which, it may be assumed from comparison with the coconut ceremony, had been made on the marae.

4. Eating. The turtle cooked in its shell was placed on a mat in the gravelled space which served as the community meeting place. The turtle was cut up into small pieces within the shell.

Lamont and three chiefs sat upon the mat for the turtle eating, while not far away the people formed a large circle around them. The three chiefs selected the most tempting pieces of turtle and tried to feed Lamont, who objected and was allowed to help himself. Noting that the chiefs watched him hungrily, Lamont offered them pieces which were accepted and devoured while the people made flattering comments on his action of sharing with others. Thus encouraged, Lamont extended his generosity by throwing pieces to the wives of two of the chiefs. The women, however, sprang up and fled, shouting "*hui atua*" (*prohibited*). The husbands of the women held Lamont's hands, shaking their heads and repeating the words "*hui atua*."

The turtle was regarded as of great importance and, in some parts of Polynesia, was monopolized as food by the high chiefs. In Tongareva its importance was recognized by the special marae ceremony, which not only rendered it *hui atua* to women but probably restricted its use to the priests and chiefs. When there were large catches the circle of men who received shares was no doubt increased.

HOUSES

KINDS AND USES

The houses (*hare*) now in use in Tongareva differ from the old pattern in that they are made of sawn timber, erected on high piles, and roofed with corrugated iron. No perfect ancient house was seen in either of the two modern villages, but from the rough houses seen in the food plantations and the verbal description obtained, they were evidently built on the same pattern as the common rectangular house of the Cook Islands. They differ in the treatment of the walls and in the names of some of the parts of the framework. The guests of a family were lodged in one of the dwelling houses. Distinguished visitors were housed at the *hare nui* of the local chief, if he had such a building. A large party received at a social center was lodged among different members of the local community. The local people could always crowd together and free some huts for the use of visitors. No great inconvenience was caused, as the only pieces of furniture needed were a few mats for the floor. To mark the occasion a fresh layer of coral gravel was sometimes spread over the floor. Large parties of visitors were not housed but were given a camping ground. If doubt existed as to the visitors' intentions the camping ground would be removed from the local center, or on another island. The rough shelters of coconut leaves were quickly made by the visitors themselves. Lamont (15, p. 211) remarked that while he was at Omoka, "the people of Matunga came over to see me, and encamped along the water's edge, where they remained for some time, having thrown up little temporary huts very quickly."

The clear graveled space before the dwelling houses formed the family meeting places. The *hare nui* of a chief and a clear space at the social center formed the rallying places not only for the members of the community but for the official reception of guests. For religious purposes and the exercise of customs, the stone-inclosed marae was the assembly place.

COMMON DWELLING HOUSE

The ordinary house was small. Many of the house sites measured are 9 feet long by 6 feet wide; some are even smaller. However, as public congregations took place on the marae and people sat out on the graveled open spaces in front of their huts, the small size is accounted for by the use of the huts as bedrooms. The chiefs had larger houses. Lamont noticed the larger houses of the principal chiefs he visited at Omoka, Motu-unga and other islands. Turua's house at Motuunga he describes (15, p. 185) as hav-

onto a mat placed below the slot. A key is held in either hand, both hands working alternately. When as much as possible of the fleshy material is scraped off, the outer hard parts with the adhering fibers are discarded.

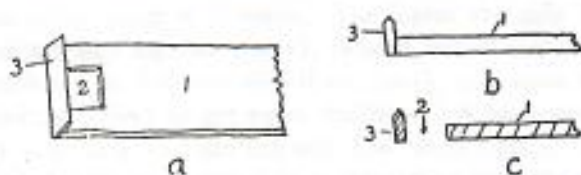


FIGURE 11. Grater (*sahn*) for hala (*Pandanus*) fruit: a, upper surface; b, side view; c, longitudinal mesial section. 1, flat board dubbed out of *tou* timber; 2, square slot at one end of board; 3, piece of *ngangie* wood lashed across end with upper sharpened edge projecting above level of upper surface of board.

Opener for *Tridacna* shell (*no*). A pointed piece of *ngangie* wood is used for opening the *Tridacna* shellfish (*pasua*). To one who knows the exact place and direction of insertion the opening up of the shell is easy. No particular shape for the wood was described.

Many accessory implements are used in connection with coconuts. (See p. 116.)

FOODS

VARIETY

The sources of food on an atoll form a marked contrast to those on the richer high volcanic islands. Most of the staple foods of Polynesia have been introduced at one time or another, but high islands, probably because they were more easily sighted by voyagers, received more visitors and thus shared more extensively in the distribution of introduced foods. The pig, the dog, and the fowl, which reached many islands, did not arrive at Tongareva. Wilkes (31, vol. 4, p. 279-280) states, "A bunch of what were apparently cock's feathers was also noticed. . . . It is believed that they have the domestic fowl among them, from its feathers having been seen as ornaments." The feathers seen did not belong to the domestic fowl, but to some other bird, probably the man-of-war hawk (*Fregata aquila*).

On Tongareva none of the common Polynesian cultivated root plants were present, not even the *puraka* species of taro which grows in Manihiki and Rakahanga. It is difficult, therefore, to understand why Wilkes (31, vol. 4, p. 280) made the statement, "The yam was also observed, but not the taro." Lamont (15, p. 148) speaks of getting a piece of yam from a woman, but definitely states that it was obtained from their wrecked ship. It is probable that the coconut *uto* was mistaken for yam by the Wilkes Expedition, for it is quite certain that the yam, taro, and sweet potato did

not grow in Tongareva. In comparatively recent times the *puraka* has been planted and seems to be thriving. Of the fruit-bearing trees, only the coconut and the *hala* (*Pandanus*) were present, and both were traditionally stated to have been introduced by the ancestor Mahuta. Even the *noue* (*Morinda citrifolia*) which grows wild in Manihiki is absent from Tongareva. For vegetable foods the Tongarevans were restricted to the coconut and the *hala*.

FLESH FOODS

It seems certain that cannibalism did not prevail in Tongareva as it did in some parts of the Cook Islands. Lamont gives no hint of it, and the natives have no record except for a tradition that Tonu killed his wife Sokoau for infidelity, cut up her body, and divided it among his people. The horror surrounding this one act is said to have been memorialized in the marae of refuge known as the Papa-o-Sokoau.

The lagoon and the sea outside the reef, both teeming with fish, provided the main flesh food supply. Fish were caught by a variety of methods. Fish ponds in which mullet were kept and fattened were used. Of the fish the *ruhi* was the most esteemed, and Lamont (15) speaks many times in appreciation of its fat, juice, and flavor. The fish cooked whole in the native oven were placed in *kete* baskets. The remains and smaller broken pieces were kept in the smaller *tainga* baskets and dried for future use.

The most important shell fish was the *Tridacna* (*pasua*). Large quantities are obtained in the lagoon, especially near the numerous isolated coral heads in the lagoon. Women usually collected them by swimming out to the coral heads with baskets and pieces of wood to act as floats for the baskets and diving for them to the sandy bottom. The shell was opened with a pointed stick of *ngangie* wood (*no*), and the extracted flesh was placed in the basket. Large quantities of *Tridacna* still in the shell were brought back to the dwelling houses, as the huge heaps of shells to be seen on all the islands testify. Besides being eaten fresh, cooked and uncooked, the cooked *pasua* were also threaded on strips of material and hung up to dry to form a reserve ration. They became very hard but were softened by re-cooking.

The pearl oyster grows in the lagoon, but does not seem to have been utilized as food to the same extent as the *Tridacna*.

The turtle (*honu*) was obtained and cooked in its shell, from which it was cut up and served. It figured in ceremonial feasts, when it was cooked in special ovens on particular sites associated with some of the maraes. Turtles are still caught, but the ceremonial feasts have been long abandoned.

Porpoises (*paraoa*) are also taken as food, but the old method of driving schools ashore is no longer used.

SWEEPING

The coconut leaf sweep (*rau*) receives its name from the leaves (*rau*) of the coconut from which it is made. The leaves are split (*sasae*); and the half leaves are tied together (*sere*), twisted round and round to make the leaflets stick out in different directions (*viri*), and some of them may be braided together (*hiri*) to get extra thickness. A long sweep is drawn around (*taki*) so as to inclose the fish and drive them ashore. As the curve decreases the slack ends are doubled in to strengthen and thicken the sweep. The sweep is used by day and by night.

DRIVING

The drive (*aroaro*) method of fishing consists of driving shoals of flying fish or porpoises onto the reef, or turtles into the shallow water. When a shoal of flying fish is seen outside the reef canoes paddle to the outer side of them, stretch out in a semicircle, and drive them in toward the reef. Paddles are beaten against the canoes, and stones are thrown at the fish to urge them toward the reef. Escape back to the sea is blocked by the line of canoes and by swimmers, or, where canoes are not available, by swimmers only. Such methods have been abandoned, but Lamont (15, pp. 217-218) gives a good description of a drive:

On the third day we sat chatting in the usual quiet way, when a shout at a distance set the whole household in commotion. As Opaka started excitedly to his feet, I asked him, in his own language, what was the matter. "Eia ha?" said I. "No, te maroro," he replied; and, without waiting to give me further explanation, he seized a "toto," or bag-net, from the roof, and darted along the beach, calling the rest to follow. Fully as excited as himself, and shouting at the top of their voices, "Maroro! maroro!" each seized a mat-basket of some kind and rushed wildly off in the same direction. I followed them as quickly as the rough ocean shingle, with its burning stones, would permit. With their long hair streaming, and their eyes gleaming with excitement, I saw them diving into the hollow curve of the breakers that raised their white heads aloft, soon to appear again some distance off beyond the force of the waves. Men, women, and children alike fearlessly plunged beneath the foam, seemingly as much at home as on land. The multitudes in the sea, at first scattered over a considerable extent, now began to concentrate towards a point, not only keeping up an incessant noise with the voice, but jumping halfway out of the water, and, as they descended, striking their elbows to their sides, and clapping their hands, producing a report like a pistol-shot. I now observed shoals of flying-fish skimming the water in terror in every direction, often rising beyond the nets of the circle of men, who raised their arms to catch them, and often escaping in their flight the baskets of the outer guard of women and children. When the circle was sufficiently contracted to concentrate the fish in a mass, the men dived amongst them with their nets, which, soon becoming too heavy for them to support, were emptied into the baskets of the women behind, who proceeded with them ashore, riding behind the crest of a breaker that would dash an ordinary swimmer headlong upon the rocks, and returned again after they had emptied them. In about half an hour the shoal was all dispersed or caught, and each family had a bountiful supply of flying-fish, or "maroro."

The *toto* hand net and baskets of the *tupono* type are used to scoop up the fish.

Porpoises are driven into the shallow channels on the reef where men seize them and drag them up out of the water. Much ceremony is observed to ensure success; women are not allowed out of the houses, and children are instructed not to cry, as that would render the operations unsuccessful. Handy (9, p. 176) records a similar method in the Marquesas.

Turtles in the lagoon are driven into shallow water by men in canoes. Men jump overboard and dive down to keep the turtles swimming in the right direction and to prevent their doubling back into deep water. During the drive the men make as much noise as possible by shouting and beating the water with their paddles. As they reach shallow water the noise subsides and the turtles rest on the bottom. Men dive down and, seizing the front flappers from behind, lift up the front of the shells and force the turtles to swim up to the surface.

While examining the marae at Vaiari, we saw a rowboat that had forced a turtle in toward the lagoon reef, but the turtle had stuck on the bottom in fairly deep water and refused to go further in. As the crew of the boat failed to reach the turtle because of the depth, Tupou Isaia of our crew took a hand. In his first straight dive he could just touch the turtle. He came up and noted a high rock on the bottom with a lower one near the turtle. He dived down to the high rock, kicked off from it to the lower rock, and with another kick off from the lower rock he reached the turtle, got his hands in position on the front of the shell, and brought the turtle to the surface. He calmly appropriated the turtle as the reward of superior endurance.

Another form of fish driving is termed *titoko*. Before fish are driven into a channel, loose rocks are placed on stationary rocks and reef projections that are under water. As the fish are driven in, the rocks are kicked off with the soles of the feet by the drivers as they pass. The rocks, as they fall to the bottom, frighten the fish and cause them to go forward (*hia soro ki mua*). When driven to a confined space, the fish are scooped up with a hand net (*ka asu ki te toto*).

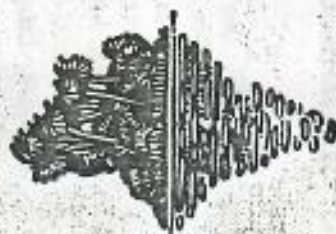
A method of driving the *sikutoto* fish is termed *toro sikutoto*. Thirty or forty men armed with pieces of coconut leaf a span in length and termed *usu* work around in a semicircle and, by beating on the water, drive the fish into the shallow water. The hand net is used to scoop them up.

SPEARING

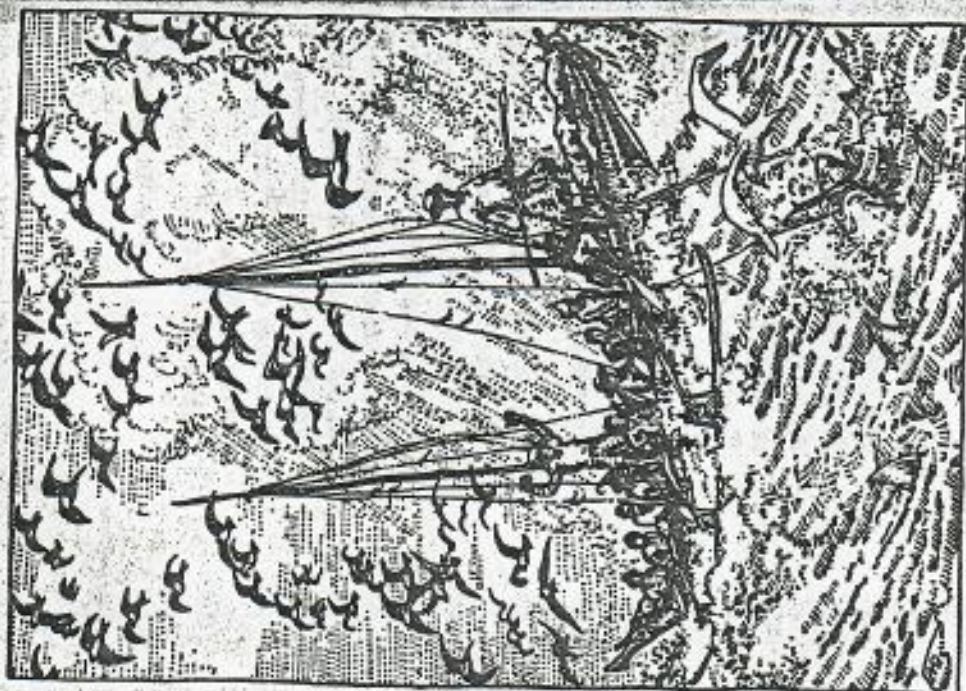
Lamont (15, p. 278) saw the people spearing fish in the deep passage between Hakasusa and Vaiari, and he states that it was an exercise at which

The Book of
PUKA-PUKA

By
ROBERT DEAN FRISBIE



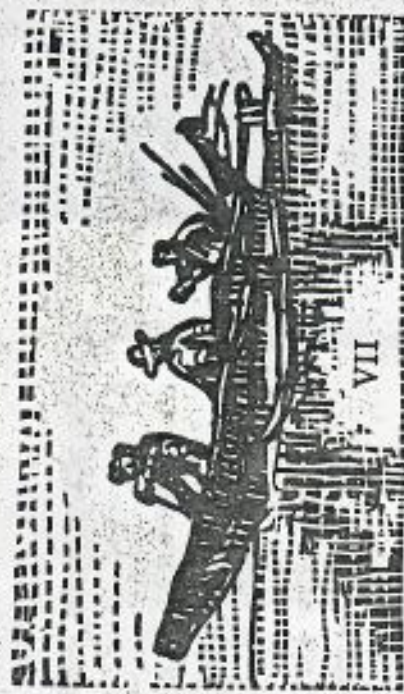
Illustrated by
MAHLON BLAINE
MUTUAL PUBLISHING
COMPANY · Honolulu



Liaki pae, pae i raro ko te tauanga!
Na pukea e te pou tini-tini,
Na wai ki te vave o te tangata.
Ko te ika lele na te wui ropu,
Na kapi i runga, na kapi i raro.
Tautau na wui kaokao.
Ekaia na toka te kai tangi.
Tuki! Pate!
Pate mai runga!
Vavaji ake!

The young men have caught a great turtle,
 The warriors, the men of our village!
 They hold him secure in their strong hands
 While I wield the knife that will kill him.
 Oh, he is fat from his back to his belly!
 Oh, he is fat from his head to his tail!
 We of the village are hungry.
 Baste him one! Whack him!
 Batter his back!
 Cleave him in two!

—From "Mako Onu" (warlike-sauter's chant.)



Mr. and Mrs. Turtle

THE day was breathlessly hot, Ura, chief of police, steamed and sweated as he lolled from one door of his coral-lime house to the other in a vain attempt to intercept the ghost of a breeze. At length he abandoned the hope of finding comfort indoors, and sent his numerous children in search of Ears, Husks, and Everything.

In the course of time the three policemen appeared, and having consulted with their chief, they went off to their respective villages to cry the law of Ura: every man, woman, and child was to go to the outer beach for a grand community turtle-hunt.

I was sitting on the front balcony above the trading-station when Husks announced the coming event at Central Village. Men and women rose from their morning slumber to stagger out into the blazing sunlight. They blinked stupidly, rolled their tongues in their cheeks, scratched their heads, and still half asleep, turned to cross the islet to the outer reef.

The Book of Puka-Puka

Hitching up my *pareu* and hanging a pair of water goggles around my neck, I followed:

Community fishing is a common occurrence on Puka-Puka. Periodically, one of the villages rouses itself and issues a challenge to the other two to join in a fishing competition for rock grouper, snappers, bonito, albacore, flying-fish, turtle, or whatever kind of fish happens to be plentiful at the time. When the day's fishing is over, each participant takes his catch to the churchyard, where it is counted and scored for his village. The village scoring the largest combined catch is entitled to do a little song and dance, usually very wicked, in which many disparaging allusions are made concerning the members of the losing villages. Then the fish are divided equally among all the men, women and children of the island. Every one hugely enjoys these competitions, even saturnine old William, who roars out curses and cynical remarks with greater gusto than usual. Then the people go home to cook their fish, none too fragrant after a day in the full blaze of the Puka-Puka sun.

Ura, being chief of police, could not, of course, lower his dignity by opening any trifling competition such as a grouper-fishing where there would not be the slightest risk of any one being killed or maimed for life. With him it must be torchlight netting along the treacherous sunken *Arai* reef, or best of all because most dangerous, turtle-hunting. Although little Ura could not possibly bring in a turtle, he could at least send out his neighbors to hazard their lives, and personally accept the credit for a big catch.

Mr. and Mrs. Turtle

Benny overtook me before I reached the reef. He was carrying a piece of light native wood about four feet long and six inches wide. It was for me, he explained, to be used as a head-rest while at sea, so that if I wanted to I could take my usual siesta.

On reaching the outer reef I was startled at the sight of the gigantic combers roaring along the serrations and knife-edges of coral, but Benny was not in the least alarmed. He flung my board beyond the breakers and without waiting for a lull ran confidently out to the spot where an immense comber was just curling to fall. In another instant he would have been crushed to death on the coral had he not plunged headlong into the foam. I lost sight of him for half a minute, but presently he bobbed up beyond the breakers, smiling, and as happy as a porpoise.

I knew how he had done it, having seen the same thing done many times before, but I had never had the courage to attempt it myself. Benny had merely hurried out between breakers to a point where the undertow would carry him to sea, although the foam above him was rushing shoreward. After swimming with the undertow until nearly out of breath, he had brought himself to the surface with a few strong strokes.

While hesitating, I heard a cackling voice cry: "Come on, Ropati-Cowboy!" It was old Mama. She hobbled industriously past, her breath coming short and raspingly. As unconcernedly as Benny she made her way across the reef, her grass skirt but partially hiding her fleshless limbs, and her shoulder bones protruding as sharply as juts of coral underfoot.

The Book of Puka-Puka

"Lord!" I wondered, "will Little Sea ever be like that?"

Just then, with an indecorous flutter of grass skirts, old Mama flopped into a billow of foam and a moment later reappeared far beyond the break of the surf.

I hesitated no longer, for I thought I saw Little Sea and her cousin Desire out beyond Benny, and I wondered whether they were laughing at me. I rushed out, threw myself into the next comber with suicidal abandon, and dived until my hands touched the coral. Then, to my astonishment—for I expected only to make myself ridiculous—I found that I was being carried rapidly seaward. The foam thinned, disappeared, and, as I was wearing my water goggles, I could pilot myself through the fantastic forests of coral. There were mountains that seemed to be standing upside down, canyons wider at the base than at the top, dark caves from which slimy things stared, coral trees whose roots were spread out in the water while their boughs were embedded deep in the sea, bottomless abysses, and colors such as we poor humans who live on land never dream of. A huge fish finned lazily only a few feet away, and a shark eyed me as he swam gravely past.

On crossing a crevice in the coral I saw the head of a conger-eel, his cold bloodless eyes watching me as though deliberating whether or not to attempt such a large morsel. His fang-toothed mouth was quite large enough to have taken my leg. I had heard of men being seized by giant keptocephali and held beneath the surface until they drowned. Panic seized

Mr. and Mrs. Turtle

me and I swam frantically for the surface. Then of a sudden my fears vanished, for there was Benny at my side, grinning reassuringly. He had come down to see to it that nothing happened to the boss of his store. My confidence returned at once; I felt that I could have returned and kicked that conger-eel out of his hole.

"Ah!" said Benny with one of his usual "ifs" when we had reached the surface, "if you had followed Mama you would have seen something! There was a whooper of a shark here just now."

The long swells and the wide hollows between them were dotted with heads, for most of the inhabitants of Puka-Puka had come out. Little Ura, with a gorgeous red and yellow *pareu* about his loins, was chattering away, ordering the young men of his village to catch many turtles for the honor of the sometimes



The Book of Puka-Puka

deacon of the church. Mama was by no means the only grandama present, for the octogenarians had turned out *en masse* from their huts and lean-tos and were paddling about, diving and splashing as unconcernedly as though they really belonged in the sea rather than on land. Some of them were buoyed up with pieces of wood such as mine, and they were so completely at home in the water that they actually dozed off for a few minutes from time to time, resting on their little supports.

On the other islands, Penrhyn and Manihiki for example, there would have been much concern about sharks, but at Puka-Puka no one pays the slightest attention to them. It is claimed that no one of the island has ever been attacked by a shark, and I know from experience that they treat these monsters with complete indifference.

Benny and I swam leisurely along the reef. With our water goggles adjusted we gazed at the fishes displaying their polychromatic scales to the sea world, as, with true Puka-Pukan languor, they fanned from coral to coral. As the current carried us along, I saw, in a fissure in the sloping bottom, a great *patuki*, his body partially hidden, but his immense fanged jaws in full view. The brute was not over eight feet long, but his mouth was large enough to swallow two men at once. He was mostly head, his body tapering to a cone. It made me decidedly uncomfortable to think that, if he caught a man, he would have to digest half of him before the other half could enter his stomach, much like a frog dining on a sparrow. And if he caught

Mr. and Mrs. Turtle

him feet first, and the man's head reached above the surface—well, it would be anything but a pleasant sort of death.

Benny too saw the monster. "That is the only fish the Puka-Pukans fear," he said. "Look at his mouth! Big enough to swallow a man!"

With a painful attempt at nonchalance I replied: "Yes, but his body is not big enough to hold half a man, so we have nothing to fear."

Just then the *patuki* wriggled out of his hole and opening his jaws in a blood-curdling manner, displayed a saber-toothed mouth and a blood-red gullet.

Benny was unawed. "That's right," he said. "I never thought of that. There is nothing to fear."

With that he turned head downward with a duck-like flop, swam close to the monster, and gave him a contemptuous kick. The *patuki* closed his jaws with a snap and returned to his hole at once.

Benny's face was beaming when his head broke water. "Now I know that you were right when you said he was harmless!"

"And supposing I had been mistaken? What then?"

His face became grave at once. "I never thought of that!" he said. "If you had been mistaken he would have eaten me, wouldn't he?"

"Of course."

"You white men always think of these things; but they never occur to us Puka-Pukans. Anyway, now I have kicked one, I shall never be as afraid of *patuki* as I was before." He felt quite heroic when I explained to him the nature of his risk.

The Book of Puka-Puka

He then suggested that we swim a mile or two out to sea and hunt for a giant turtle. As is commonly known, these green turtles found in tropic seas live for a thousand years and weigh three or four hundred pounds. They have jaws capable of snapping off a man's arm with the ease of a shark bisecting a jelly-fish. But it is not commonly known, I believe, that the tails—of the males only—are their most deadly weapons.

Benny explained this to me as we swam leisurely seaward. The male's tail is much longer than the female's, and he has the habit of hooking it around anything that touches it, holding it in a vicelike grip, and sounding. So, when a man is grappling one of the giant Chelonia, if he allows his arm or leg to touch the tail, he is instantly caught, the tail hooking the limb and pinning it against the shell. Thereupon he loses his hold on the turtle's flipper while vainly trying to free himself, and is dragged beneath the surface to drown. For this reason the man who, alone, brings in a male turtle is looked upon as a *Tosa* (a superman) by the people of the atolls.

A mile from shore we rested for a little while, propped up on my wooden support. The water was like polished steel, and now we were far enough from the reef to be in the midst of the great undulations of the Pacific. When we sank into the long troughs of the island would be lost to view below the oily backs of the rollers, and then it required but little imagination to believe one's self hundreds of miles from land. But the next undulation would raise us, showing the

Mr. and Mrs. Turtle

island ablaze in the sunlight, an emerald of dazzling beauty resting lightly on the bosom of the sea. Benny was explaining the methods of catching the giant turtle.

"The easiest way is the most dangerous. You grasp the turtle by the skin at the nape of his neck, and then steer him ashore, riding on his back. This is seldom done with the male turtle, for your legs come too close to his tail. If we find a female turtle to-day you can ride her in this manner, but if it is a male, leave him to me. We hold the papa turtle by getting the right arm under his left front flipper; then, reaching up, we can catch hold of the front edge of his upper shell. This too is dangerous, because during the struggle the hands may come within reach of the turtle's mouth. That is how King Pirato's father was killed: the turtle grabbed him, carried him down, and drowned him. In either of these ways, once you have gotten a safe hold, the turtle cannot sound, and, since he is very clumsy, you can easily guide him by jerking him to one side or the other. Now, Ropati, you take the mama turtle and I will take her husband. Ura will be surprised when he sees us coming in."

"But hadn't we better find the turtles first?"

"There they are," said Benny. "I saw them a long time ago, but being a white man, you are not supposed to notice such things."

Following his gaze, I saw what appeared to be two coconuts floating a hundred yards or so away.

"Grab her like this," said Benny, taking me by the scruff of the neck, "and steer her this way." He jerked

The Book of Puka-Puka

me from side to side in a most unceremonious manner. "Swim close behind and take the one I leave. We can surprise them, because they are in the midst of their love-making and are blind to everything else."

We swam to within twenty feet of them, adjusted our water goggles, and dived, Benny first, I following. They made a motion to part, when, in a flash, Benny twisted his arm around the larger turtle's left flipper. Instantly I lost them in a cloud of foam. I swam past, too excited to think of fear. The female was sounding, but her movements were so slow that I soon caught up with her. Following Benny's directions, I caught her by the nape, wound my legs around her shell, and pulled upward. She responded immediately, flapping to the surface in a panic, and just in time, too, for my lungs were bursting for want of air.

By the time I had overcome my excitement sufficiently to be aware of what I was doing I found my pelagic Pegasus swimming mightily for the coast of South America, many thousands of miles away. I had lost my board, and at the moment I could see neither Benny nor the island, as they were behind me; and here was I in the middle of the Pacific aboard a brute I was afraid either to turn loose or to stay on. I was helpless and was about to loosen my hold, when I heard Benny yelling Puka-Pukan curses behind me. He was telling me to turn the creature landward. For the moment I had forgotten his instructions about guiding; now, putting them in practice, my fiery turtle turned like a well-broken mare. A moment later, ris-

Mr. and Mrs. Turtle

ing to the top of a swell, I saw the island before me, and Benny, all submerged but his head, driving his papa turtle toward the reef.

The male turtle was swifter than the female, reaching the reef in about thirty minutes, while my Chelonia needed a good three-quarters of an hour, so Benny had his safely turned over before I arrived. I was glad, for I enjoyed the glory of coming in alone, and when, about two hundred yards from the reef, I met Little Sea and Desire—pretty little water nymphs—I lost six points in my course while gazing at them.

"*Aué!* Have you got a turtle?" cried Little Sea. I was as offhand about it as possible, saying that old Mama had been pestering me for turtle steak, so I had to go out and get her some.

"*Aué!* The white man's got a big turtle!" little Desire screamed, and the words were as welcome to me as honey to a bear. They swam beside me, one on either side, and no returning Roman conqueror could have ridden the high horse with more vainglory than I rode my lowly Mrs. Turtle. As we approached the reef, however, I had grave doubts as to how my triumph would end. I now knew how to get out to sea but had not the faintest notion of how to weather the surf in getting ashore. But with Little Sea and Desire present I did not hesitate. Without a thought of the combats I drove straight on, willing to meet instant death rather than to be shamed before them.

It turned out to be both easy and exciting. A great sea lifted us high and, crashing down with a deafening roar, carried us swiftly along on light foam as

The Book of Puka-Puka

soft as eiderdown. As we were swept across the reef the turtle's plastron shell protected me from the coral. Little Sea and Desire had no need for protection; they were as much at home in the surf as a pair of periwinkles.

Sitting on his turtle, with many flourishes and more lies, Benny told the people of Puka-Puka how I had bravely grasped my ferocious brute, and how I had insisted on bringing in the male one, only he would not allow it. He added many marvelous details, in the true native fashion, for unless it is bragging about themselves, there is nothing in which Puka-Pukans



Mr. and Mrs. Turtle

delight more than in telling of the prowess of their friends.

It is the law of the island that turtle and sail-fish belong to the entire population; so, if a man catches either of these creatures it is delivered to the head men of the villages and divided equally among all the population. When only one turtle is caught and shared among five hundred and fifty-odd inhabitants, the in-



The Book of Puka-Puka

dividual portions, one might think, would be small. But they are larger than the uninitiated would suspect, for of an average green turtle's three hundred pounds not ten are wasted. The Puka-Pukans eat the entire shell, the flippers, head, and tail. They consider the carapace and plastron shells the most delicate parts, so, when the turtle has been eaten, there is hardly enough refuse to fill a hat. On other islands half the turtle is thrown away, and I remember Viggo saying that although a turtle is a huge creature, there is very little meat on him.

The meat is red and tastes, to me, like a cross between beef and crab meat. The fat is green and is good for soup stock. In the female turtle are thousands and thousands of eggs, minute clusters, many of them no larger than pinheads, which will not hatch for ten, twenty, perhaps a hundred years! I believe I have seen as many as twenty thousand eggs in a single female, and I should not have been surprised to learn that there were twice that number. As a female lays only from four to five hundred eggs a year, one can easily calculate how long it will be before the smallest eggs are laid: fifty years, perhaps. Think of a pregnancy of fifty years! There are dozens of these clusters of a hundred or more minute eggs, and from that they range upward to fully developed ones the size of a hen's egg. The smaller eggs are a rare delicacy, but with me half the pleasure of eating them is lost because of the thought of the thousands of embryonic lives I am destroying through the murderous grind of my molars.

Mr. and Mrs. Turtle

Eight turtles were caught that day, only one of them by the people of Ura's village. The chief of police was mortified beyond words. He returned to his splendid coral-lime house, wrapped his head in a bundle of dirty rags, picaded sick, and refused to be seen for three days. But on the fourth day he emerged, resplendent in blue trousers and red silk shirt, and, summoning his policemen, held a grand session of court to fine the villagers for straying pigs. All the pigs on Puka-Puka stray all the time, and as every one owns pigs Ura had no difficulty in choosing his victims. Thus, Leeward Village, which had shamed him by catching more turtles than his own settlement, was summoned *en masse* and each man fined a shilling. So Ura's dignity was reestablished. But the fines were a small matter, for at Puka-Puka no one ever pays them.

While speaking of turtle-hunting, I will describe a much commoner way of catching the giant Chelonia.

I had been seriously ill from ptomaine-poisoning and decided to take a two weeks' vacation on **Frigate Bird Islet**. It is contrary to the local taboo for any one to visit Ko (or Frigate Bird) except during the copramaking seasons, when the entire population moves to the various islets; but as I was a forger and had been very *hapikikipiki*, the fathers of Leeward Village generously permitted me to go to their islet. Furthermore, it was November, the season when the turtles come ashore to lay their eggs, and I had agreed to lie in wait for one.

The Book of Puka-Puka

Taking old William and Benny with me, I was soon camped in a little hut on the west point of Frigate Bird, in a grove of tall puka-trees where the wind moans with a pleasing dolorousness and a dozen species of sea-birds squawk discordantly from their perches in the branches. It is also a favorite nesting-place of the island doves (*rufe*), birds about the size of a bantam hen. Their cooing is in pleasing contrast to the sounds made by the other birds—a music as lonely sounding as the moaning of the wind through the puka-trees.

We had not been half an hour on Frigate Bird before William rushed back, his hat-brim askew, his arms flapping wildly. He had found a turtle's track only a short distance from the hut. It must have been a huge turtle, for its path was a good three feet wide.

When I had seen the furrow she had left behind her, I wondered that there is a turtle left alive in the sea; for the natives of all the islands know that the female lays her eggs every ten or twelve days four or five times during the months of November and December. When a track is found they have only to keep watch at the place during the tenth, eleventh, or twelfth night thereafter, at high tide, and they will catch the turtle when she returns to lay another batch of eggs. Each batch is laid within a hundred yards or so of the preceding one.

I remember reading somewhere that a turtle is very clever in hiding the spot where she lays her eggs, but this is nonsense. From the shallows to the shore brush she leaves a track as plain as an armored tank's,

Mr. and Mrs. Turtle

and the place where she deposits the eggs is hollowed out much like a hog-wallow, the sand being heaped a foot or more high over the eggs. After laying, she wobbles straight back to the reef, leaving another trail so deep and plain that one might stumble in it if one had failed to see it.

I have also read that she returns when the eggs hatch and eats many of her young. I have never observed or heard of such a thing on Puka-Puka. Here the eggs usually hatch in the daytime, and a green or a tortoise-shell turtle is never known to come ashore in the daytime, although occasionally they come at three or four in the morning, not returning until day-break. When the eggs hatch, the first baby turtle digs a round hole to the surface and wobbles clumsily out, followed by a second, and a third, and so on, in single file. On reaching the surface they follow in single file to the shallows and dive in. Then the tragedy begins, for there is no morsel daintier than a baby turtle, and every fish seems to be waiting for them. Of the hundred that leave the beach, not more than fifty reach the reef, and in crossing it eight or ten more are gobbled up by spotted eels. Then, as soon as they are through the breakers, the big fish beyond swirl into them and swallow them to the last turtle.

How a baby turtle manages to escape its enemies during the first few months of life is a mystery to me. I have seen them hatch only once, and on that occasion, I am sure, not a turtle survived. The Pukans say that often all of them are eaten before they reach the reef. But a turtle lives for hundreds of

The Book of Puka-Puka

years, and each year the female lays from four to six hundred eggs, so that in the two hundred and fifty thousand eggs she will lay in five hundred years a few young turtles escape to carry on the species.

William and Benny and I dug out one hundred and six round white eggs that day. They were not particularly palatable but quite good enough for three hungry men on Frigate Bird Islet. Benny decided that they had been laid two days before, so that we might expect Mrs. Turtle to return eight days later. Then we would lie in wait and catch her by turning her over on her back. Afterward we would make four signal fires on the north side of the islet, which, according to the code, would inform the villagers on the main islet that a turtle had been caught.

The eight days passed as I should like the rest of my life to pass. I paddled about in the lagoon with my water goggles on, slept in the shade on the beach, or sat on a coral mushroom fishing. Each day I grew stronger until I arrived at the stage of health when one derives the keenest delight from the mere fact of being alive.

On the eighth night we walked the beach during high tide, but when it had ebbed we returned to our little hut in the puka-grove and went to sleep. Benny explained that turtles seldom crossed the reef at low tide, but that this was not an absolute rule.

An hour later I awoke as completely refreshed as though I had enjoyed a long and dreamless night's sleep. William and Benny were snoring at the other end of the hut, and an owl's shearwater squawked a

Mr. and Mrs. Turtle

discordant love song to the moon, now an hour or more past the meridian.

I arose and crept out of the mosquito-net, thinking that Mrs. Turtle might have come ashore despite the low tide. Turning down the beach, I had not walked a hundred yards before I came to a fresh track plowed from the shallows to the shore brush. I stopped abruptly, for a moment unable to believe that this strange reptile from the mysterious sea had come ashore and was now actually in the brush only a few yards away. But on such a night anything seemed possible—anything but the commonplace.

The first ripples of the incoming tide were lapping over the reef and now a few inches of water lay over the coral between the reef and the shore. The water lay steely calm half-way out and the shadows of the coral stood forth with beautiful clearness. A tiny wall of water not more than a foot high swept shoreward, jet black save for the flashing flecks of spray that rose and subsided as the water rippled over the shallows. The patch of calm water dwindled until the wave broke with a faint hiss on the beach. A moment later the backwash was on its way out to the reef and soon the shallows were calm again, though now a few inches deeper than before.

Sitting in the sand near Mrs. Turtle's track, I peered into the shadows of the shore brush. Once I thought I saw her moving, but it was only the foliage stirred by the breeze. Several times I heard the crackle of breaking twigs as she broke through the brush.

She was quiet for a few moments, and then I heard

The Book of Puka-Puka

a sharp scraping noise, followed by the patter of sand against the brush foliage. I rose, crept close, and turned my flashlight in that direction. At my feet, so close that I could have touched her, was a huge green turtle, weighing at least three hundred pounds. She turned her head to stare at me with cold fishy eyes and then, with a deliberate, almost haughty motion, turned again to her work without paying me the least further attention.

Moving behind her, I sat down and placed my flashlight on the ground so that the light was fully on her. I expected her to move away, but she did not, and the natives have since told me that when a turtle has once started to dig the pit for her eggs, nothing can frighten her away. They say that her eggs must fall and she will go on with her work until her task is accomplished.

There was something solemn, almost religious, about that midnight labor, beset with danger, to prepare a nest for her young. I watched with a feeling akin to awe, as though eavesdropping on some esoteric rite. Did she know that death awaited her only a few feet away—that she would never cross the reef again to plunge into the cool sanctuary of the sea? If there was any terror in her reptilian brain she failed to show it. More likely she was the stoic she appeared to be, an inveterate fatalist whose hundreds of years of experience had placed her above the vicissitudes of life, or even of death itself. This light now turned upon her was merely another of those inexplicable phenomena which happen on that strange place, dry

Mr. and Mrs. Turtle

land. As I watched her I turned over all sorts of queer thoughts such as will come into a man's mind in the wee hours of a moonlight night on the remote beach of an uninhabited islet.

She dug her pit with her hind flippers, using the right and the left one alternately. With one flipper she would reach to a spot directly under her tail, scrape away about a handful of sand and gravel, and, cupping the bottom of her flipper, bring the sand to the surface and deposit it near the pit. Immediately the other flipper would be swung into the hole, while with the first she would brush away the sand she had brought to the surface. This was done by scraping the flipper vigorously across the ground, and it was that sound I had heard before coming up to her.

It was interesting to observe that, although one flipper was shorter than the other, when the hole became too deep for her to reach bottom with the short one, she still went through all the motions of scraping, cupping the flipper, and brushing the ground where the sand would have been. This somewhat lessened my opinion of Mrs. Turtle's common sense.

When the pit was as deep as she could make it—about twenty inches—she dropped in her eggs (one hundred and fourteen, as it later proved), filling the pit to within three or four inches of the surface. Then, working both her hind flippers at once, she scraped sand into the pit, patting it down firmly and pushing it under her plastron shell until she had a mound over the eggs about a foot high. Then for the first time she

put her great powerful front flippers to work. Reaching out, she scraped them across the ground so vigorously that a shower of twigs and gravel went flying into the air. This was done, I suppose, to conceal the spot where she had laid her eggs, an entirely futile attempt. Half the shower was rained upon me with such force that I jumped to my feet. Deciding that I had seen enough of Mrs. Turtle's private affairs, I moved a few yards away to sit on the beach near her track. For ten minutes longer I heard her flinging the sand about; then she was silent.

I must have waited a full hour longer, for the moon had dropped close to Arai Reef, and I could see the foam and spray where the combers broke over the sunken coral. Venus had risen and in another hour dawn would break behind the puka-trees. I flashed my light twice into the brush, only to see Mrs. Turtle lying still, resting after her labor. Presently my head sank on my chest, and I dozed off for a few minutes.

I was aroused by a peculiar noise. It ceased the moment I looked up. There was Mrs. Turtle, perfectly still, not more than ten feet from me. I was directly in her path; all that I had to do was to walk up to her, get a firm grip on her carapace shell above the tail, and turn her over—but there was plenty of time for that.

I watched her for fully ten minutes; then all at once she breathed. It was a raucous respiration, sounding startlingly loud in the still night air. Perhaps it was the long exposure under the moon's full light that

made me act as I did. At any rate, it occurred to me that Mrs. Turtle was an exceedingly human sort of creature, so I decided to have a little confidential chat with her.

I explained the great mistake she had made in coming to a populous island to lay her eggs. "In your hundreds of years," I said, "you should have learned that only the loneliest sandbanks are safe for you, and that your greatest danger is from an encounter with man."

"And now, madam," I went on with a little flourish, "see what your lack of forethought has brought you to. To-morrow you will be split in two—*Yavaji ake*, as the Puka-Pukans say—and eaten to the last corner of your shell. You will have ceased to exist. For many hundreds of years you have flopped across the reefs of lonely atolls, plowed up the beaches, and laid your hundred eggs; for centuries you have paddled with dignified deliberation about the seven seas, dining on the choicest turtle grass, and contemplating the starry firmament through long tropic nights. All these centuries you have escaped being made into soup for aldermen's dinners; you have escaped the spears and ropes of savages; and, most amazing of all, at about the time William the Conqueror crossed the English Channel, when you hatched out on some remote and moonlit tropic beach, you escaped your enemies in the sea and by some freak of chance managed to grow to maturity, safe from all sea creatures, only now to be unceremoniously flopped over by a mere South Sea trader."

"Outside the reef old Papa Turtle is waiting for

The Book of Puka-Puka

you. When he rises to breathe he gazes shoreward, wondering what is keeping you so late. But he shall never see you again. He will wait beyond the reef for a few days, and then, perhaps, he will paddle off in search of another mate. To-morrow your body, from the tip of your nose to the end of your tail, will be ground between the jaws of five hundred hungry savages. What a forlorn end to a life of adventure such as yours!"

Again Mrs. Turtle breathed hoarsely, and this time she struck her flipper on the sand with a loud slap as though annoyed that I should keep her waiting. I rose and stepping behind her grasped her shell. I made a feeble attempt to turn her over, but as she was very heavy I did not try again, for I was willing to believe that she was too heavy for me. She waddled slowly down the beach, while I stood where I was, watching her. When she had almost reached the water I cried, "And now, madam, I will give you three pieces of advice: Drive deeply and at once whenever you see a ship, boat, or canoe. Never go ashore at an island where you see fires at night. And above all, avoid man, your greatest enemy."

Old Mrs. Turtle wobbled on without so much as a glance back, flopped gracelessly into the water, and disappeared. Dawn was at hand as I walked back to the puka-grove; Benny and old William were still asleep.

Neither of them would speak respectfully to me all that day. They soon discovered the turtle tracks and my own as well. They knew what had happened, but

Mr. and Mrs. Turtle

they were unable to account for my strange behavior. And when we returned to the main islet the following day and people heard the story, I was in disgrace. William cursed horribly in four languages, and Benny emitted such a splutter of "ifs" that he nearly choked in the process. For all that, I am glad I acted as I did; and if Mrs. Turtle is capable of emotion, I am sure that she is glad too.



to the latter method of disposal. Gill is, I think, speaking of both Mangaia and Rarotonga when he says that it was usual to bury with the dead body some article of value—a stone adze or a white shell used in dancing beside a man, and a cloth mallet beside a woman—and these articles were never touched afterwards by the living¹. Whatever was laid on the corpse was buried with it, and no further notice was taken of it, but whatever was placed by the side, without touching it, was repaid². Gill also says that the blue beads given by Cook to a native were specially valued and were buried, as a great mark of distinction, with a woman³. In Rarotonga, when a man of rank was buried, his adze, hafted and ready for use, was put into his right hand, the stone part resting on his shoulder, while by his side were laid his staff and his drinking-cup for his use in the spirit-world⁴. Gill also says that in Rarotonga they buried with a woman of rank the cloth mallet and utensils she was accustomed to use⁵.

I draw attention to the reference to the distinction made between objects that had been laid on the corpse and buried and those that had been placed by it without touching it. Placing things so as not to touch the body might or might not conceivably, according to Polynesian beliefs, make them taboo; but placing them on the body would, I imagine, certainly do so. The articles placed by the side of the corpse, without touching it, and which had to be "repaid," would be gifts by friends, apparently towards general expenses, in return and exchange for which the family of the deceased had to give to the donors something of equal value⁶. Probably the valuable things that were buried, and had perhaps been put on the corpse, were intended for the use of the dead man's soul. The placing of the adze in the dead man's hand, and of his staff and drinking-cup beside him, is significant, or at least suggestive, of a belief that these things would be used by his soul in the spirit-world as stated by Gill.

Food for the dead

In Mangaia, on the disposal of a corpse, the mourners chose five old coconuts which were opened one after another and the water poured out on the ground; the nuts were then wrapped

¹ Gill, *L.S.J.* p. 75.

² Gill, *S.L.P.* p. 174.

³ Gill, *L.S.J.* pp. 77 sq.

⁴ *Ibid.* p. 78.

⁵ Gill, *Jottings*, p. 87.

⁶ *Ibid.*

in leaves and native cloth, and thrown towards the grave¹; there is a recorded case of the funeral of a girl, whose friends came one by one at brief intervals, after the corpse had been let down into the burial chasm, and opened coconuts and made other food offerings². When a corpse was let down with cords into the burial chasm of Auraka, the nuts and other food were thrown down upon it one after another, the people each time calling the name of the departed, and saying, "Here is thy food; eat it"; and when the fifth nut and accompanying *raroai* or pudding were thrown down, the mourners would cry, "Farewell! we come back no more to thee!" This custom of feeding the dead forms the main subject of a "death talk" called "Koroa's lament for his son Kourapapa"³; and it is stated that the belief was that the soul ate the "essence" (*ata*) of the food. The custom of giving these food offerings to the dead had its origin, according to Mangaian beliefs, in the temporary return to earth of *Veetini* (the first man to die a natural death). He told his rejoicing parents that he had been permitted to revisit the upper world for the purpose, among other things, of showing mortals how to make offerings of food to the dead⁴; the event is the subject of an ancient song⁵. We shall see, when considering the evidence as to souls after death, that Rarotongan souls had to be provided with food to be presented by them to *Tiki*, in order to be allowed to enter his house in *Avariki*, which was the Rarotongan paradise.

Removal of sins

According to a story of the island of Aitutaki, told by Large, Iro, the voyager of whom there were many traditions in Polynesia, committed the offence of not sending to Puna, the chief of the island, a turtle which the people of Puna had caught but which had come into Iro's possession, and only sending him a small portion, which was carried to him by Iro's son Tautu, who in offering it said that he would return and fetch the rest of the turtle for him. Puna's priests, however, told him not to taste the portion brought him, saying that the rest of the turtle had been eaten by Iro; so Puna was very angry and killed Tautu, cutting off his head. Afterwards Tautu's soul re-entered the head and went to Puna and asked him for what offence he

¹ Gill, *Myths*, p. 187.

² Gill, *S.L.P.* p. 120.

³ *Ibid.* p. 183.

⁴ Gill, *Myths*, p. 187.

⁵ *Ibid.* p. 187.

399pp.

by R. W. Williamson
1933

Fac. Br. 2600

Religious and Cosmic Beliefs
of Central Polynesia

had-killed Tautu. Puna's priests, by his direction, explained the matter to Tautu's soul, the explanation beginning with a reference to the greatness of Tautu's sin, and after referring to some other matters, concluding with the following words:

There are two gods of this bright world, the Sun and the Moon.
The sins of the East and the sins of the South bind them together,
Put them in the canoe, and take them to Vavau.
There are the gods Tane-roa, Ti and Akarimua.

Then Tautu's soul answered that the sin had been blotted out, having been blown through the coconut, built into the canoe, and scooped with the fishing-net, and again asked what was the sin for which Tautu had been killed; to which other priests of Puna replied that the sin was that of Iro in eating the rest of the turtle, to which again Tautu's soul answered denying that Iro had done so, and saying that the remains were intact. Puna then directed others of his priests to explain to Tautu's soul what the sin was, and their reply to this was, "We do not know, and we are not clear that he has committed any sin." Tautu's soul then warned Puna that his own head would be cut off by Iro, after which it "left and became extinguished".

The turtle is in many parts of Polynesia a sacred animal which, when found, should be taken to the head chief, and in some cases, at all events, it seems to have been regarded as a sin against the gods to omit to do this. Puna was evidently supposed to have considered that Iro had committed the offence of killing the turtle and eating all of it, except the portion which had been sent by the hand of Tautu to himself, and that Tautu had been involved in this crime; but afterwards Puna's priests, understanding that Iro had not eaten the rest of the turtle, were unable to say that any sin had been committed.

If we compare what seem to have been, or may have been, the conceptions of Samoa, the Society Islands, and Aitutaki respectively, we find features of similarity and difference, to which I will draw attention.

(1) The Samoan evidence refers to illnesses and disasters generally—not, apparently, only to those of the dead man—and the latter was asked to take them with him, and let the survivors live; but it does not mention sins; and the intention was that these illnesses and disasters should cease to trouble the survivors. In the Society Islands the god was asked that the dead

¹ *J.P.S.* vol. xvii, pp. 134-599.

man's sins should be deposited in the hole, that the anger of the god should be appeased, and that the sins should not attach themselves to the survivors; and the dead man was asked to bury his disease with him in the grave, and admonished to let the guilt remain with him. In Aitutaki the evidence only refers to a tradition, and not to a subsisting practice; but we may believe that the ideas disclosed by the tradition would be in accord with prevailing conceptions, and, perhaps, customs. In this case the idea was, apparently, that the sin supposed to have been committed by the dead man should be taken in the canoe to Vavau, where the three gods lived; but there is no reference to any benefit or security which this would give to living persons.

(2) In Samoa there was an appeal to the dead man, that he would go with a good will, and without vexation against the survivors. In the Society Islands the dead man's soul was called upon to be satisfied in the world of spirits, not to inflict his disease on other people, and not to look towards or return to and distress the survivors. In the Aitutaki account there is no reference to any appeal to the soul.

(3) In the Society Islands the idea evidently was that war or sickness arose in consequence of sins committed; so these sins and the sickness [or impulse for war?] were sent out to sea in a model of a canoe. In Aitutaki the sins were supposed to be taken away in a canoe.

(4) In Samoa there were the references to disaster in the west, happiness in the east, and misery in the south. In Aitutaki the sins of the east and the sins of the south were referred to. I can offer no explanation of this, though the conception of happiness in the east and disaster in the west might possibly be connected with some idea of birth and death; but this would not explain the matter. The importance of the evidence is that it helps to indicate a similarity between the beliefs of Samoa and Aitutaki; and this similarity gives us some further justification for supposing what, as I have suggested in my comments on the Society Island evidence, seems probable, namely, that though sins are not actually mentioned in the Samoan statement, they were the cause of which the sickness and calamities that are mentioned were the result.

Different though these accounts from the different islands are, there are elements of similarity between them which make me think it probable that the beliefs to which they point were based upon conceptions, the underlying idea of which was that

Hamm
Am 701
B442

by Te Rangi Hiroa (P.H. Buck)

225p
+ plates

90

Bernice P. Bishop Museum—Bulletin 92
April, 1932

The three coconuts, which had been placed on the altar, were removed, and the people marched out of the marae, but seated themselves near its boundary. After further incantations the three coconuts were broken and handed to Lamont and two of his companions with signs that they were to eat them. This concluded the marae ceremony, but the whole concourse moved on to a fresh-water pool, where they splashed water on themselves with a peculiar motion of the arms, like ducks make with their wings. They then joined the women at a clear place near the beach, where the welcoming ceremony with dances and the *pehu* wailing took place. (See p. 75.)

The ceremony performed for Lamont at Omoka (15, p. 175) was similar to that at Mangarongaro except that the *pehu* wailing had been gone through the previous day. From this it must be concluded that the coconuts and the leaf representation of the gods were also used. Lamont remained behind looking at the marae stones while the men were performing their ablutions. As he went toward the beach to do likewise a woman came forward to greet him, not knowing that he had not washed, but when those who followed Lamont called, "hui atua," she fled in horror.

The Motuunga ceremony (15, p. 180) differed in that Lamont had to move the coconuts from place to place and in that the feather representation of the god was used instead of plaited coconut leaves. The feather mop was struck against the back of the other officiating priest instead of against stones.

CEREMONIAL PATTERN

From these accounts by Lamont the following ceremonial pattern may be distinguished:

1. The introductory incantation or *hai* before entering the sacred precincts of the marae.
2. The people were in the front half of the marae, and two officiating priests at the back. This supports the statement of an informant that the *arongamana* (people with authority) occupied the part near the altar (*raukawa*).
3. Coconut offerings took the place of pigs and human sacrifices used in some parts of Polynesia. The casting of pieces of coconut husk with the right hand over the left shoulder by the priests, after the appropriate incantation, was without doubt a propitiatory offering to the gods. The gesture was known in New Zealand as *koropana*. I was told by a middle-aged Maori that while he was having a glass of ale with a practising *tohunga* (*taula*), the alleged priest, before drinking, dipped his right finger and thumb into the ale and flicked them over his left shoulder. The *tohunga* admitted

checkout of Need- p. 300
+ 159 & 174

that he was giving a share to his familiar spirits in order that they might continue to impart power to him in the treatment of sickness. The gods thus received their recognition in the share of coconuts as symbolized by the pieces of husks, although the useful part was retained for human consumption.

4. The exhibition of the gods on the altar with incantations and appropriate procedure by the chief officiating priest was accompanied by a seizure or physical manifestation, showing that while the priest held the material representation of the god in his hands the spirit of the god had entered into the human medium. The priest spoke incoherently. In some parts of Polynesia the words uttered by the priest in this state were supposed to be the words of the god speaking from within the medium. The emotional state in the Tongarevan priest was evidently worked up voluntarily, no doubt assisted by the atmosphere of the marae ritual. In Mangaia the priest took a drink of strong *kava* beforehand to intensify the emotional condition of possession by the god.

5. The eating of the coconuts, rendered tapu on the marae, conferred status on those who partook of them and formed part of the ceremony of receiving people into the Mangarongaro community. Coconuts were the primary food of the atoll and thus formed the symbolic material used in the ceremony.

6. Ablutions to remove the tapu of the marae were necessary before those who participated in the marae ceremony could become normal and mix again with their fellows. It was because Lamont was still tapu that the women at Omoka fled from him.

THE TURTLE CEREMONY

According to Tupou Isaia, part of the turtle eating ceremony was conducted on the marae. The turtle was cooked in an oven that was situated close to, but outside, the marae precincts. These ovens, marked by broken heated coral, had by successive use in the same place become elevated and formed impressive mounds such as those seen at Hangarei (p. 174) and Motuunga (p. 159). Lamont (15, p. 182) again supplies details from first-hand observation. The turtle eating, at which he was the honored guest, took place at Motuunga. The procedure is outlined as follows:

1. Preliminary incantations. The turtle was turned over on its back on the seashore. A priest repeated some words over it which may be taken to be the preliminary incantation. The chief, Turua, then stepped forward to the edge of the water "and, in a menacing attitude, seemed to denounce someone, throwing up his arms, and vociferating at the top of his voice, as if threatening an imaginary being at sea." Lamont explains the action by

saying that the turtle had a spirit which had been driven out by the priest and was threatened with vengeance by the warrior if it attempted to return. Such an explanation does not seem compatible with the usual Polynesian attitude toward food. In New Zealand, before preserved pigeons were partaken of, a chant was recited in a loud voice to return the life-principle (*mauri*) of the birds to the forests from whence they came and thus to protect the supply of birds from depletion. It therefore seems from analogy with custom in another branch of the Polynesian race that the life-principle of the turtle was being returned to the sea that the supply of turtles might continue undepleted.

2. Marae ceremony. The turtle was conveyed to the marae and, after a few ceremonies, was beheaded and disemboweled. The "few ceremonies" are not described, but it may be assumed that they consisted of appropriate incantations and the subsequent offering of some useless part of the turtle to the gods.

3. Cooking. The cooking took place on an elevation of stones, probably the raised oven outside the Kirihuri marae on Motuunga. Lamont states that the turtle was sacrificed to the gods, but this interpretation is based on a foreign concept of burnt sacrifices. The turtle was cooked for human consumption, as the gods had already received their share in the offering which, it may be assumed from comparison with the coconut ceremony, had been made on the marae.

4. Eating. The turtle cooked in its shell was placed on a mat in the gravelled space which served as the community meeting place. The turtle was cut up into small pieces within the shell.

Lamont and three chiefs sat upon the mat for the turtle eating, while not far away the people formed a large circle around them. The three chiefs selected the most tempting pieces of turtle and tried to feed Lamont, who objected and was allowed to help himself. Noting that the chiefs watched him hungrily, Lamont offered them pieces which were accepted and devoured while the people made flattering comments on his action of sharing with others. Thus encouraged, Lamont extended his generosity by throwing pieces to the wives of two of the chiefs. The women, however, sprang up and fled, shouting "hui atua" (prohibited). The husbands of the women held Lamont's hands, shaking their heads and repeating the words "hui atua."

The turtle was regarded as of great importance and, in some parts of Polynesia, was monopolized as food by the high chiefs. In Tongareva its importance was recognized by the special marae ceremony, which not only rendered it hui atua to women but probably restricted its use to the priests and chiefs. When there were large catches the circle of men who received shares was no doubt increased.

HOUSES

KINDS AND USES

The houses (*hare*) now in use in Tongareva differ from the old pattern in that they are made of sawn timber, erected on high piles, and roofed with corrugated iron. No perfect ancient house was seen in either of the two modern villages, but from the rough houses seen in the food plantations and the verbal description obtained, they were evidently built on the same pattern as the common rectangular house of the Cook Islands. They differ in the treatment of the walls and in the names of some of the parts of the framework. The guests of a family were lodged in one of the dwelling houses. Distinguished visitors were housed at the *hare nui* of the local chief, if he had such a building. A large party received at a social center was lodged among different members of the local community. The local people could always crowd together and free some huts for the use of visitors. No great inconvenience was caused, as the only pieces of furniture needed were a few mats for the floor. To mark the occasion a fresh layer of coral gravel was sometimes spread over the floor. Large parties of visitors were not housed but were given a camping ground. If doubt existed as to the visitors' intentions the camping ground would be removed from the local center, or on another island. The rough shelters of coconut leaves were quickly made by the visitors themselves. Lamont (15, p. 211) remarked that while he was at Omoka, "the people of Matunga came over to see me, and encamped along the water's edge, where they remained for some time, having thrown up little temporary huts very quickly."

The clear graveled space before the dwelling houses formed the family meeting places. The *hare nui* of a chief and a clear space at the social center formed the rallying places not only for the members of the community but for the official reception of guests. For religious purposes and the exercise of customs, the stone-inclosed marae was the assembly place.

COMMON DWELLING HOUSE

The ordinary house was small. Many of the house sites measured are 9 feet long by 6 feet wide; some are even smaller. However, as public congregations took place on the marae and people sat out on the graveled open spaces in front of their huts, the small size is accounted for by the use of the huts as bedrooms. The chiefs had larger houses. Lamont noticed the larger houses of the principal chiefs he visited at Omoka, Motu-unga and other islands. Turua's house at Motuunga he describes (15, p. 185) as hav-

onto a mat placed below the slot. A key is held in either hand, both hands working alternately. When as much as possible of the fleshy material is scraped off, the outer hard parts with the adhering fibers are discarded.

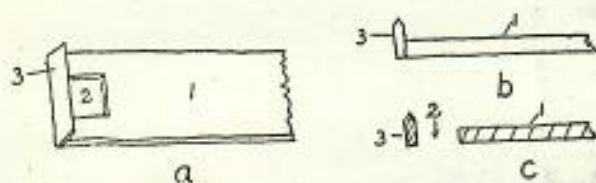


FIGURE 11. Grater (*sahu*) for hala (*Pandanus*) fruit: a, upper surface; b, side view; c, longitudinal mesial section. 1, flat board dubbed out of *tou* timber; 2, square slot at one end of board; 3, piece of *ngangie* wood lashed across end with upper sharpened edge projecting above level of upper surface of board.

Opener for *Tridacna* shell (*no*). A pointed piece of *ngangie* wood is used for opening the *Tridacna* shellfish (*pasua*). To one who knows the exact place and direction of insertion the opening up of the shell is easy. No particular shape for the wood was described.

Many accessory implements are used in connection with coconuts. (See p. 116.)

FOODS

VARIETY

The sources of food on an atoll form a marked contrast to those on the richer high volcanic islands. Most of the staple foods of Polynesia have been introduced at one time or another, but high islands, probably because they were more easily sighted by voyagers, received more visitors and thus shared more extensively in the distribution of introduced foods. The pig, the dog, and the fowl, which reached many islands, did not arrive at Tongareva. Wilkes (31, vol. 4, p. 279-280) states, "A bunch of what were apparently cock's feathers was also noticed. . . . It is believed that they have the domestic fowl among them, from its feathers having been seen as ornaments." The feathers seen did not belong to the domestic fowl, but to some other bird, probably the man-of-war hawk (*Fregata aquila*).

On Tongareva none of the common Polynesian cultivated root plants were present, not even the *puraka* species of taro which grows in Manihiki and Rakahanga. It is difficult, therefore, to understand why Wilkes (31, vol. 4, p. 280) made the statement, "The yam was also observed, but not the taro." Lamont (15, p. 148) speaks of getting a piece of yam from a woman, but definitely states that it was obtained from their wrecked ship. It is probable that the coconut *uto* was mistaken for yam by the Wilkes Expedition, for it is quite certain that the yam, taro, and sweet potato did

not grow in Tongareva. In comparatively recent times the *puraka* has been planted and seems to be thriving. Of the fruit-bearing trees, only the *coco-nut* and the *hala* (*Pandanus*) were present, and both were traditionally stated to have been introduced by the ancestor Mahuta. Even the *none* (*Morinda citrifolia*) which grows wild in Manihiki is absent from Tongareva. For vegetable foods the Tongarevans were restricted to the coconut and the *hala*.

FLESH FOODS

It seems certain that cannibalism did not prevail in Tongareva as it did in some parts of the Cook Islands. Lamont gives no hint of it, and the natives have no record except for a tradition that *Tonu* killed his wife *Sokoau* for infidelity, cut up her body, and divided it among his people. The horror surrounding this one act is said to have been memorialized in the marae of refuge known as the *Papa-o-Sokoau*.

The lagoon and the sea outside the reef, both teeming with fish, provided the main flesh food supply. Fish were caught by a variety of methods. Fish ponds in which mullet were kept and fattened were used. Of the fish the *rubi* was the most esteemed, and Lamont (15) speaks many times in appreciation of its fat, juice, and flavor. The fish cooked whole in the native oven were placed in *kete* baskets. The remains and smaller broken pieces were kept in the smaller *tainga* baskets and dried for future use.

The most important shell fish was the *Tridacna* (*pasua*). Large quantities are obtained in the lagoon, especially near the numerous isolated coral heads in the lagoon. Women usually collected them by swimming out to the coral heads with baskets and pieces of wood to act as floats for the baskets and diving for them to the sandy bottom. The shell was opened with a pointed stick of *ngangie* wood (*no*), and the extracted flesh was placed in the basket. Large quantities of *Tridacna* still in the shell were brought back to the dwelling houses, as the huge heaps of shells to be seen on all the islands testify. Besides being eaten fresh, cooked and uncooked, the cooked *pasua* were also threaded on strips of material and hung up to dry to form a reserve ration. They became very hard but were softened by re-cooking.

The pearl oyster grows in the lagoon, but does not seem to have been utilized as food to the same extent as the *Tridacna*.

The turtle (*honu*) was obtained and cooked in its shell, from which it was cut up and served. It figured in ceremonial feasts, when it was cooked in special ovens on particular sites associated with some of the maraes. Turtles are still caught, but the ceremonial feasts have been long abandoned.

Porpoises (*paraoa*) are also taken as food, but the old method of driving schools ashore is no longer used.

SWEEPING

The coconut leaf sweep (*rau*) receives its name from the leaves (*rau*) of the coconut from which it is made. The leaves are split (*sasae*); and the half leaves are tied together (*sere*), twisted round and round to make the leaflets stick out in different directions (*viri*), and some of them may be braided together (*hiri*) to get extra thickness. A long sweep is drawn around (*tabi*) so as to inclose the fish and drive them ashore. As the curve decreases the slack ends are doubled in to strengthen and thicken the sweep. The sweep is used by day and by night.

DRIVING

The drive (*aroaro*) method of fishing consists of driving shoals of flying fish or porpoises onto the reef, or turtles into the shallow water. When a shoal of flying fish is seen outside the reef canoes paddle to the outer side of them, stretch out in a semicircle, and drive them in toward the reef. Paddles are beaten against the canoes, and stones are thrown at the fish to urge them toward the reef. Escape back to the sea is blocked by the line of canoes and by swimmers, or, where canoes are not available, by swimmers only. Such methods have been abandoned, but Lamont (15, pp. 217-218) gives a good description of a drive:

On the third day we sat chatting in the usual quiet way, when a shout at a distance set the whole household in commotion. As Opaka started excitedly to his feet, I asked him, in his own language, what was the matter. "Eia ha?" said I. "No, te maroro," he replied; and, without waiting to give me further explanation, he seized a "toto," or bag-net, from the roof, and darted along the beach, calling the rest to follow. Fully as excited as himself, and shouting at the top of their voices, "Maroro! maroro!" each seized a mat-basket of some kind and rushed wildly off in the same direction. I followed them as quickly as the rough ocean shingle, with its burning stones, would permit. With their long hair streaming, and their eyes gleaming with excitement, I saw them diving into the hollow curve of the breakers that raised their white heads aloft, soon to appear again some distance off beyond the force of the waves. Men, women, and children alike fearlessly plunged beneath the foam, seemingly as much at home as on land. The multitudes in the sea, at first scattered over a considerable extent, now began to concentrate towards a point, not only keeping up an incessant noise with the voice, but jumping halfway out of the water, and, as they descended, striking their elbows to their sides, and clapping their hands, producing a report like a pistol-shot. I now observed shoals of flying-fish skimming the water in terror in every direction, often rising beyond the nets of the circle of men, who raised their arms to catch them, and often escaping in their flight the baskets of the outer guard of women and children. When the circle was sufficiently contracted to concentrate the fish in a mass, the men dived amongst them with their nets, which, soon becoming too heavy for them to support, were emptied into the baskets of the women behind, who proceeded with them ashore, riding behind the crest of a breaker that would dash an ordinary swimmer headlong upon the rocks, and returned again after they had emptied them. In about half an hour the shoal was all dispersed or caught, and each family had a bountiful supply of flying-fish, or "maroro."

The *toto* hand net and baskets of the *tupono* type are used to scoop up the fish.

Porpoises are driven into the shallow channels on the reef where men seize them and drag them up out of the water. Much ceremony is observed to ensure success; women are not allowed out of the houses, and children are instructed not to cry, as that would render the operations unsuccessful. Handy (9, p. 176) records a similar method in the Marquesas.

Turtles in the lagoon are driven into shallow water by men in canoes. Men jump overboard and dive down to keep the turtles swimming in the right direction and to prevent their doubling back into deep water. During the drive the men make as much noise as possible by shouting and beating the water with their paddles. As they reach shallow water the noise subsides and the turtles rest on the bottom. Men dive down and, seizing the front flappers from behind, lift up the front of the shells and force the turtles to swim up to the surface.

While examining the marae at Vaiari, we saw a rowboat that had forced a turtle in toward the lagoon reef, but the turtle had stuck on the bottom in fairly deep water and refused to go further in. As the crew of the boat failed to reach the turtle because of the depth, Tupou Isaia of our crew took a hand. In his first straight dive he could just touch the turtle. He came up and noted a high rock on the bottom with a lower one near the turtle. He dived down to the high rock, kicked off from it to the lower rock, and with another kick off from the lower rock he reached the turtle, got his hands in position on the front of the shell, and brought the turtle to the surface. He calmly appropriated the turtle as the reward of superior endurance.

Another form of fish driving is termed *titoko*. Before fish are driven into a channel, loose rocks are placed on stationary rocks and reef projections that are under water. As the fish are driven in, the rocks are kicked off with the soles of the feet by the drivers as they pass. The rocks, as they fall to the bottom, frighten the fish and cause them to go forward (*hia soro ki mua*). When driven to a confined space, the fish are scooped up with a hand net (*ka asu ki te toto*).

A method of driving the *sikutoto* fish is termed *toro sikutoto*. Thirty or forty men armed with pieces of coconut leaf a span in length and termed *usu* work around in a semicircle and, by beating on the water, drive the fish into the shallow water. The hand net is used to scoop them up.

SPEARING

Lamont (15, p. 278) saw the people spearing fish in the deep passage between Hakasusa and Vaiari, and he states that it was an exercise at which