

ATOLL RESEARCH BULLETIN

No. 20

Health Report on Kapingamarangi

- Part I A Health Survey of Kapingamarangi, 1950
Part II A Parasitologic Survey of Kapingamarangi, 1950
Part III Blood Groups of the Kapingas, November 1950

by Ralph E. Miller

Issued by

THE PACIFIC SCIENCE BOARD

National Academy of Sciences--National Research Council

Washington, D. C.

Health Report on Kapingamarangi

by
Ralph E. Miller
Hitchcock Clinic
Hanover, New Hampshire

INTRODUCTION

This report covers field work carried out from June to December 1950 and is a study of the health beliefs and practices of the atoll dwellers of Kapingamarangi. The research was carried out by the author as a special project under the SIM (Scientific Investigation of Micronesia) program of the Pacific Science Board of the National Research Council. Generous support was given to this project by the Office of Naval Research, the Pacific Science Board, the Office of Island Governments, Office of the Chief of Naval Operations, Department of the Navy and by the Civil Administration Units in the Trust Territory. The results of the survey are submitted in three parts, consisting of the Health Survey of Kapingamarangi as Part I, A Parasitologic Survey of Kapingamarangi as Part II, and Blood Groups of the Kapingas as Part III.

The author was completely dependent upon the leader of the expedition, Dr. Kenneth P. Emory, for background material, orientation and interpreting, without which the attempt to survey would have been fruitless.

PART I

A HEALTH SURVEY OF KAPINGAMARANGI, 1950

General Description of the Atoll

Kapingamarangi atoll is situated just north of the equator at 155°30' degrees east longitude. It is a typical "low atoll" with the islands scattered closely along the eastern arc of the oval coral reef. There is one deep opening through the reef on the southwest where a narrow, tortuous passage will admit only small craft with ease.

The south easterly trade winds provide a nearly constant cooling breeze. In contrast to the islands to the north, rainfall is not abundant. Nearly every year sees a period of water scarcity when coconuts are used as the standard beverage. Dug wells are used for wash water. The occasional rainy periods provide enough water to store, for the greater part of the year, in cisterns above ground. Typical trade wind showers permit verdant plant growth. The annual rainfall is reported as 80 inches.

Temperature varies slightly, the coldest periods being during the rare overcast periods of rainy days when the temperature reaches 75° degrees. The warmest days occur when the low tide permits the exposed reef eastward of the islands to be heated by the midday sun. Islands close to the eastern reef edge are noticeably cooler than those separated by a wider band of reef from the cooling overwater breeze.

The tides rise once in the twenty-four hour period to about 3 feet above mean low and once during the period to 2 feet above mean low. The extreme low follows the extreme high. Only the extreme low tide permits exposure of the reef for a long enough period to permit noticeable temperature change inland. The usual daily temperature is 80° at night and 90° in the day, reaching the maximum at noon. Deviation from this daily cycle is very rare, and one day is so like another that no thought need be given to "dressing for the weather" or for the time of day.

Tidal current is, with rare exceptions, from easterly to westerly between the islands, that is, from ocean to lagoon along the island portion of the reef. There is a reversal for a short period of each tide through the pass. The current varies in strength with the time of tide and the wind velocity and very rarely with wind direction. The almost constant surf from the east has to be interrupted to cause a reversal of the current flowing by the islands. Violent storms are rare, the only one within memory being one of three days in 1947 when the wind was from the west during the entire storm.

The soil of the islets is a thin layer of coral gravel and sand mixed with leaf mold on a base of conglomerate slab of the raised reef type. The average level is about ten feet above mean sea level. In areas where large excavations have been made for taro swamps, coral rock and sand from

the excavations are piled to a height of twenty feet, in several areas producing, with their overgrowth of breadfruit trees and pandanus, park-like vistas along the pathways of the ridges.

The activities of the population are centered at Touhou which is an entirely residential island. There, buildings are closely placed leaving space only for the working areas about the houses shaded by the trees which provide also food, fuel and fiber. Werua, the other essentially residential island in the total of 32, is more rural with broad areas of taro and woodland. The other island adjacent to Touhou, Taringa, is essentially rural, its forty houses well separated by woodland. Some islands are of the nature of country estates of the families living on the central islands. Such is Hare to the south, and, to a lesser extent Ringtoru to the north. To these, visits are made at frequent intervals to cultivate taro, collect coconuts or timber and on special occasions such as childbirth or funeral or cutting out of canoes, whole families move to the island for the day or days, returning with canoe-loads of produce.

There is constant traffic between the central islands on the dry reef at low tide and wading or swimming at other times.

Plant Life

Taro and puraka are cultivated extensively, and the food trees, coconut, breadfruit and pandanus are tended with care. These trees provide timber as do the HAU (wild hibiscus), RAKAU MHE (Cordia subcordata) and WORO WORO (Premna obtusifolia).

These plants, shrubs and trees play their customary part in the economy of this atoll and a large part of the daily occupation of the men, women and children consists of culturing, harvesting and preparing for food, shelter, clothing and equipment, the various parts of this abundant plant growth. There are allowed to grow uncultivated, grasses, shrubs and trees, some of the products of which are used for casual ornamentation. Wherever these plants encroach on those essential for the economy, the encroacher is sacrificed. Some introduced shrubs are used principally as ornamentals, though they are given additional space because of their bloom or because the leaf provides a convenient dish cover.

Animal Life

Animal life is not abundant. The oceanic rat is a pest on the outer islands but is kept under control on Touhou by the introduced cat. Cats are numerous and largely uncontrolled. They constitute a menace to rest and a hazard to supplies and light equipment which can be destroyed in the numerous cat fights. There is active husbandry of pigs but their number is decreasing because there is insufficient forage on the outer islands and too much care is required to keep them in water and food. The pig must be

considered as a luxury. It serves no purpose as scavenger. There is no garbage. It must be fed on food supplies that would serve for men. Taringa and Werua islets provide some space and are close enough to permit feeding and watering. Here the pigs are kept tethered or in small stone sties and separated from the dwelling area. The children are fond of little pigs as pets and keep them tethered to a shrub or tree adjacent to the house despite rules prohibiting pigs in the dwelling area. Small, apparently harmless lizards are numerous.

Sea Life

Sea life is abundant and varied. Fishing is one of the principal activities of the men and provides, beside the chief protein food, relaxation, exercise and play for the men and youths. It also constitutes a considerable hazard because of the jagged coral and the poisonous and well armed animal life of the reef and lagoon floor. Long immersion and exposure to sun also produce casualties on each of the group-fishing expeditions.

Bird Life

Birds are represented by the usual island varieties in small numbers. There are terns, herons, curlew, and frigate birds. A starling, reputedly introduced by the Germans, [possibly Micronesian starling?--ed.], is a nuisance and destroys a considerable quantity of breadfruit. Chickens are kept on all the frequently visited islands except Touhou. They are cared for much as are the pigs, as a luxury. Eggs are not used as food but allowed to hatch.

Insect Life

Insect life is made obvious by the house fly, or as it is called locally the "breadfruit fly". Mosquitoes, ants and cockroaches are also numerous. Mosquitoes interfere with sleep on the outer islands. The ants destroy wooden buildings and the cockroaches destroy clothing. The spiders and small scorpions are not known to cause casualties. No ticks or chiggers are seen.

The People

The islands are inhabited by about 500 typical Polynesians including a small element of recently added Micronesian stock. The atoll lies off the trade routes and has been visited infrequently and that in recent years (since 1870). For centuries these people lived a stone age culture and are in the very early stages of adaptation to modern tools, equipment, clothing and concepts of disease. The shell adze is replaced by the steel adze. The steel knife is used by all. Cotton fabric has replaced the native

pandanus sail and HAU cloth. The cloth kilt has replaced the HAU kilt for daily wear and whenever available for special occasions trousers and shirts are worn by the men and long dresses by the women. A few men have shoes which are worn for dress occasions. Use of clothing of temperate climate type and of the cloth sail have prompted the importation of a few sewing machines (German period).

Sheet metal strips are used instead of thatch on a few roofs and for rainwater catch areas adjacent to concrete cisterns. Fish lines and nets are largely imported twine, though the largest nets are made from coconut fiber and cannot be duplicated by imported material. The metal fishhook has entirely replaced the shell and wooden variety and every fisherman prefers the glass and wood or glass and plastic diving goggles to the less efficient coconut oil-slick surface.

Nearly every household has at least one metal cooking utensil and there are a few eating implements.

Despite the modern importations, at times advantageous and at times of questionable value, the culture is essentially that of an isolated, primitive people. The daily routine of the women is the dawn bath and toilet in the tidecurrent, the opening of the ground-oven for morning food, forenoon gathering and preparation of food from plant and tree or cultivating of taro, the afternoon cooking and cleaning of fish, the late afternoon bath at the time clothes are washed, the evening meal after the family is reunited from trips to outer islands or fishing. Such routine is kept from monotony by mat weaving and basket making at odd moments or by groups of families working at preserving foods for out of season use. The trips to outlying islands on special occasions provide an element of recreation. There is this element in most of the daily tasks. None is carried to the point of fatigue and the spirit of play is seen in every occupation.

Men are concerned with building houses, canoes and shelters and with making the gear and equipment for such building and for fishing. The work is done usually in groups where there is mild competition of skill and exchange of tasks resulting in much fun and little fatigue. There are masters of each skill who take their acknowledged places as leaders.

Recreation, as such, is chiefly the play of children and, on Sundays, since work has become tabu by decree of the church, card playing by all age groups.

As might be expected in such a placid environment which is rarely unkind, there is little to cause nervous strain. An occasional crying child gives evidence of the frustrations of infancy. Rarely are these frustrations evident beyond infancy, and then are seen in the rare maladjusted household. A few of the populace have fear of disease and a few are over-concerned about their personal health evidenced by disproportionate apprehension about mild symptoms. Most, however, are happy, completely adjusted, with little thought for the future beyond a food supply.

The family units of this society are tied together by church meetings and by the frequent meetings for carrying on government affairs by the men. These serve to accept or reject publicly the proposals that have been discussed and usually settled in the daily informal meetings in the men's house and other work shops. Public announcements are as likely to be made at church gatherings as at the government meetings, and with equal weight.

This environment appears especially kind to children. They have few restrictions. For their first few years they are unhampered by clothing of any kind. Family discipline is so mild and casual as to appear like neglect. The children are as at home in the water as on land. They handle canoes with ease at an early age and a load of five captained by a ten year old is a not uncommon sight. The strongest, and apparently most effective admonition is a loud "sh-h-h!"

Youth is as unhampered. Boys or girls are seen in separate groups during the day but after sunset especially on moonlight nights canoe loads of mixed parties are off to outer islands or singing and dancing on the beach. There is apparently complete freedom of sex play and no stigma attached to premarital pregnancy or childbirth. An unknown father is in no way a handicap for such offspring. They are adopted and have the status of the mother. A single marriage partner is the rule but exceptions are noted and the household of a sterile marriage may be blessed by the offspring of a mutually acceptable partner to replace temporarily the unfruitful one.

The people are governed by a chief who has two assistant chiefs, one for Touhou islet and one for Werua islet. The ancient priesthood has been partly replaced by the Christian church. The position of magician or medicine man was one of importance with grave responsibilities and considerable authority. There is no one quite comparable in the present organization.

The administrative officers, school teacher and a medical aide receive salaries from the United States Civil Administration.

Order is maintained without visible restraints. Public opinion is all powerful, occasionally overruled by the chief, but at the risk of his chiefship.

The men and women take their positions of adult responsibility only after organizing a household of their own including at least one child, their own or adopted. The position is of full responsibility even then only if the work of the adults is considered as contributing to group welfare. Youths of both sexes are not compelled or even urged to work. The male takes full advantage of this, and for a certain period, comparable to the high school and early college age, the boys are set apart from this otherwise industrious society. They loaf, sing, dance, are pampered by their mothers, are well fed and wear the gaudiest SERU the family can afford. They are even organized against work and exert their own public opinion against the occasionally ambitious youth. This period passes, and generally, without harm. A few carry the attitude on into their own adult household.

The girls early learn their task of being the burden bearers, and in youth do most of the household work, including care of younger children.

Sanitation

The sanitation of Kapingamarangi is of the natural type due to tide, sun, wind and rain. Man has altered his environment slightly, in part advantageously and in part with some hazards to health. When the alteration has favored health that aspect of the change has been a by-product and not the direct result of an attempt at more healthful conditions. There has not been, and is not now, any comprehension of the spread of disease from man to man or from animal to man.

Personal cleanliness is notable but not universal and there is a strong suspicion that its prevalence is induced by the desire to avoid attracting flies. The sea is ever present and easily accessible. Bathing in it is a daily activity of practically everyone. Pools on the reef reach 100 degrees F. in the midday sun and are a favorite bathing place. Prolonged soaking of clothing in the tide current is a favorite cleansing method and the nearest they ever come to sterilization.

Within the family circle personal contact is intimate and frequent. It starts before the first breath of life as the delivered infant has its mouth and nose aspirated by the application of the attendant's mouth and tongue. The infant is cared for by every member of the family, young and old. Some infant food is prechewed. All are served at the family table by the only common eating implement, the hands. Though food is ideally aseptic when removed from the ground oven in its tight containers, thereafter it is handled without regard for sanitation, unless it is to be kept for a later meal. It has been learned that food left intact in its wrapping after cooking will not spoil as rapidly as opened food, and that re-cooking will prevent spoiling for many hours, but this experience has not been transferred to the use of heat to clean clothes, mats, sheets or blankets, towels or wound dressings.

Handkerchiefs are an affectation. Fingers are the acceptable substitute. Spitting is common, a gesture of slight nervousness.

Disposal.

The common toilet is the reef, covered or uncovered by sea. At times children consider that the general direction of the designated spot on the reef satisfies the convention, and many an adult contaminates areas of the reef close to a play area for children, a sand beach of which will be smeared by the drift of the next high tide. Even the effluvia of the several over-water (except during low tide) toilets is swept ashore either directly or by the swift current about the end of the islands into the lagoon. This is

preserved from severe contamination in the backeddy of the lagoon shore by dilution and speeding of the biologic cycle by the abundant sea life.

Refuse disposal areas are those requiring fill because of erosion or because mulch is desired for planting. The value of compost is known and banana and coconut plantings are made on compost pits in which vegetable refuse has been accumulating for months. The grounds generally are kept quite free from refuse. There is a daily morning "policing" of grounds when women and children pick up all fallen leaves and such refuse as the men and boys have thrown down anywhere. The houses do not accumulate refuse. All the cooking is done in or near the cook house, which is usually several feet, at least from the dwelling. Preparing of food and eating is generally out of doors. The times when indoor eating is necessary are rare. Under these circumstances scraps and bones are thrown out through the open sides of the house. Feet are washed before entrance onto matting portions of the floors.

There are weekly cleanup days and, periodically, days for burning stumps and refuse heaps along the high tide mark. A common type of refuse that appears difficult to control is ripe breadfruit falling at the peak of the season. Chewed pandanus keys are discarded without discretion.

The lagoon is the repository of all refuse except that put in compost pits for later tree planting. It is apparent that anything thrown or drifted into the lagoon is considered completely and finally disposed of. Baskets of miscellaneous refuse are dumped into the lagoon among groups of swimmers. People living along the lagoon shore wade into the water and use this universal toilet without regard for wind or tide. The currents of the back eddy that is fairly constant at each end of the islands form a sort of cess pool used for evening bathing by all and for fishing by small boys. The lagoon shore is a scene of constant activity, clothes washing, preparing coconut husk fiber for rope making, bathing, swimming, cleaning fish, loading and unloading canoes. All refuse remains where dropped in this shallow shore area until the next tide brings about a redistribution and dilution. Despite the dilution this remains a constantly contaminated area through which the populace (and visitors, until a pier was completed recently) wade or swim without a thought that it is any less pure than the open sea or rapidly flowing current between the islets. The same situation prevails at the common landing areas of the outer islands.

Residences and traffic are much more widely scattered at Werua and Taringa and their waterfronts are noticeably cleaner.

Food

The staples of the diet are taro, PURAKA, and coconut with fish as an almost constant accompaniment as are breadfruit and pandanus in season. The three variables, fish, breadfruit and pandanus are preserved (dried) in times of plenty but the supplies are insufficient to sustain the population for very long without the staple components. Breadfruit trees of three varieties are now well established and this item of food is approaching

the constancy of taro and coconuts. The varieties vary in maturing times and in duration of season but all are affected by drought. The oldest grown here and known as the Kapingamarangi variety matures in two months and bears for three months. The Nukuoro variety bears for a month then matures a new crop in one month. These two varieties of fruit contain large seeds which are edible when cooked. The third variety brought in from Ponape has been established too short a time to be certain of its season here, however it is different from the other two, maturing either two or three crops a year. This variety is without edible seeds, and does not lend itself to preservation by drying as do the other two.

Pigs, chickens, bananas and papayas are produced in too small quantity to contribute much to the diet and are considered as luxuries.

In times of drought taro, PURAKA, and coconut and fish may be the only supplies that persist and the coconuts are fewer and smaller. The taro is much smaller during these dry periods. The PURAKA does much better in the dry times and tends to overgrow the taro.

One famine has been recorded (1915 to 1917) when there was no rain for two years. Over fifty people died and the famine was aggravated by imposed rules restricting coconuts to copra production, denying their use for food. There were insufficient canoes during this same period reducing the amount of fish available.

Diet

Taro is cooked in coconut cream or grated coconut. This form of food accounts for the greater part of the use of coconuts as food. The soft pulp of drinking nuts is eaten but recognized as having little food value so far as sustaining activity is concerned. Pandanus is eaten, either raw or boiled, by chewing the soft part of the key. Flour is made for storage by pulverising baked pandanus pulp cakes. The flour is later eaten mixed with water as a porridge.

Fish is usually baked in leaf wrappings but some is eaten raw during its preparation and cleaning or may be served raw. The raw liver is relished by fishermen, and the liver allowed to remain within some varieties for cooking. The visible fat of fish and eels is a choice item of diet. Much variety is achieved in the diet, and possible additions of food value, by varying the leaf wrappings. Such additions are the only condiments beside the generally used coconut cream. No salt is used in cooking or during the meal. Salt is now used for preserving fish when the slices receive a slight coating of salt preliminary to drying in the sun.

Strong evidence of the adequacy of the diet is the condition of the residents who are robust, energetic, active, industrious and happy. No instance of malnutrition or obvious vitamin lack was noted. Their own studied analysis of what these people need to survive the most difficult times yields the answer that fish hooks and twine for the finer nets would see them through, because all other essentials of life are present or can be secured if they can maintain a sufficient supply of food fish.

The abundant varied food supply compensates for some items of the diet which have limited direct food value such as the fiber component of coconut husk (young nuts) and pandanus. During the pandanus season the faeces of children and some adults consist of a mass of such fiber. In any season when there is a decrease of standard items the husk of young coconuts is consumed in quantity for its slight sugar content. Both sources of fiber yield a fecal mass of such size and consistency as to be alarming. It may be that one of the unheralded virtues of the coconut alleviates the possible hazard of fecal impaction. The unaltered oil of the raw (and perhaps cooked) coconut is found in nearly all faeces specimens and in quantity in many. The oil is apparently a relatively bland lubricant. However this oil consists of a lost element of considerable amount from the theoretical quantity of available caloric content of the coconut. In quantity, the cooked oil is a cathartic of some violence. The pandanus oil is likewise found unaltered in the faeces. The assimilability of both these oils requires investigation, if not already studied.

Another food item used in quantity at certain times and as a small component of the diet throughout the breadfruit season is breadfruit seeds. Each fruit of the two seed-containing varieties contains from 10 to 30 seeds varying from 1 cm. to 1.5 cm. in diameter. Removal of the thin soft shell yields a kernel with the flavor of boiled chestnuts. The food value of this seed must be considerable. It takes the place of fish or meat in the dietary during fish shortage and immediately following the peak of the breadfruit season when the large quantity of seeds removed from the fruits prepared for drying are stored for a short time and then consumed in quantity as boiled or roasted nuts.

Rice is used at feasts. It has not been adopted as a staple of diet because of cost and availability of other food. In times of scarcity it is welcomed. Many families have a pot used especially for boiling rice. The leaders recognize that rice cannot replace items of the regular diet without interfering with the stability of supply. Coffee and sugar are luxuries, available to a few.

Water Supply

Formerly the water supply was from dug wells in the villages of Touhou and Werua and on the margins of the taro swamps. The water level in these wells rises and falls with the tide. The water is brackish in the village wells, precipitating much of the soap before suds are obtained. The concrete cisterns and metal strip catch areas, introduced by the Japanese, provide storage for months of use. This rain water is augmented by a store in metal drums filled from the same catch areas and from natural catchments such as coconut trees.

The wells are still the source of wash water except in times of abundance of rain water. It is stated that yearly there is some time when rainwater is scarce and, periodically, about once a generation, a prolonged drought. A survey of the cisterns indicates there is sufficient capacity to last two months. (See chart I).

Chart I

TOTAL NUMBER OF TANKS	27
TOTAL CAPACITY cubic feet	4800
USABLE TANKS	21
USABLE CAPACITY cubic feet	3700
TOTAL CATCH AREA USED	3800
Four large tanks CAPACITY	1500
Four large tanks CATCH AREA	1300

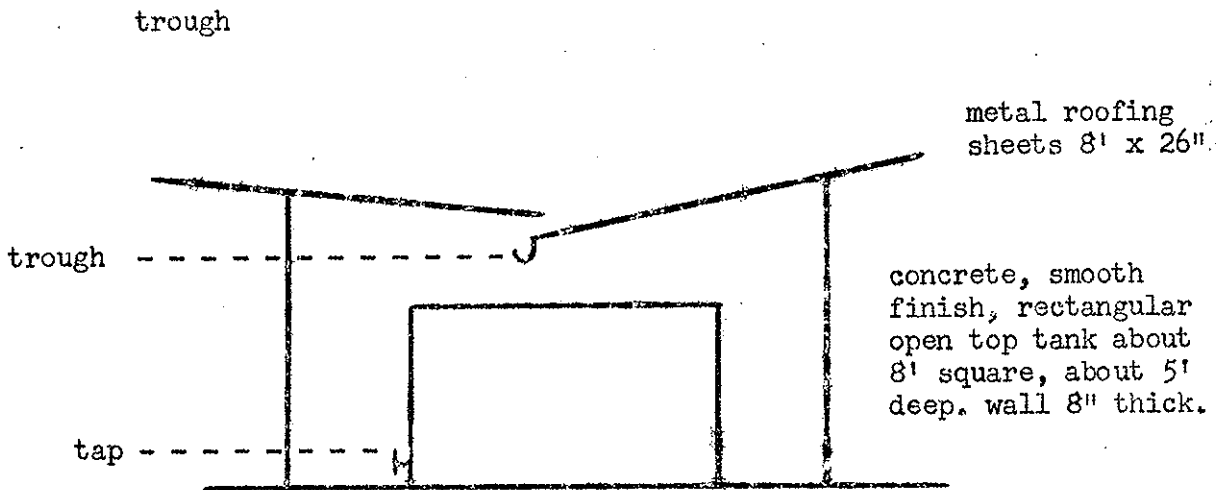


Diagram I.

PREFERRED TANK AND CATCH AREA

The tanks are not now used to capacity, rarely lasting more than a month. Their proper use would require some over-all supervision concerning catch areas, periodic cleaning and rotation of use. Several tanks are so managed now and indicate the value by yielding a water supply after other tanks are dry. Upon several inspections about half the tanks were found in good condition of cleanliness and repair. Cleaning is made necessary by the daily fall of leaves from the breadfruit trees and by the inflow carrying partly decayed leaves into the tank from the catchment areas. Roofing of the tanks and frequent removal of leaves from the catchment areas is helpful, but is not a constant practice. One factor in the incomplete use of tanks is the scarcity of the roofing strips used for the catchment areas.

A contributing factor to the neglect of the tanks is the luxury nature of this water supply. The wells never fail. In dry spells the women carry water from the wells for washing and coconuts are used for drinking in extreme drought. When the nuts are scarce even the well water may be drunk. The water from the taro pit wells is quite sweet. In extreme dry spells the tanks are dry long before the plant life suffers from lack of rain. The tanks are an aid to the economy of time and effort and probably contribute to the health of the populace but they are not an essential. They are highly prized for prestige, alone. Tanks most recently built are larger than the early tanks and appear to be more easily managed.

The water tanks serve as breeding places for mosquitoes. This is controlled by de-roofing the tanks and letting sunlight in. The larger tanks are not easily uncovered and probably copper screening might be a better solution to the mosquito problem.

Tanks on the outer islands have fallen into disuse because of the amount of care required to keep the water from them useable. Water stored in the concrete tanks was still of good quality after two months. Their position above ground and the high sides make them unlikely to contamination by children.

The contamination of the wells is chiefly from surface drainage, most abundant at the central well on Touhou where bathing and clothes washing is a daily practice quite close to the well. This central well supplies the wash water for the entire village whenever cisterns are at a low level. There is traffic throughout the day about the well. The children play with small buckets in imitation of the water carriers. Loose sand and gravel gradually reduce the water depth, and require periodic removal, at which times the rock wall is repaired and brought to ground level. This use of the well is probably no hazard to health, but habits of use are transferred to other wells used for drinking water. The use of concrete is known in the construction of the tanks. Its use to make raised rims would eliminate much of the present gross contamination.

The periodicity of the rainfall which controls the state of the food-supplying trees is now the only very serious problem in water supply.

Shelter

The traditional shelter and clothing of the Kapingas are admirably adapted to the climate. In contrast, the adoption of foreign clothes habits and foreign building material has proved unhealthful. Shoes, worn part of the time because constant wear is impossible, introduce the hazard of softened natural foot covering which is incapable of withstanding the wear and tear of coral. Constricting temperate climate clothing is uncomfortable and prevents proper body cooling. The laundry methods in use are not suitable for the care of such clothing, adding much time to that required for repair.

The few board houses roofed with metal strips are hot, dark, dirty and harbor cockroaches, ants, mosquitoes and flies. The open sided pandanus thatch roofed, coral gravel floored house is so far superior that only the strongest urge for prestige and the possession of abundant funds have accomplished a change from the traditional house. There is an indication that as soon as the termites have destroyed the few present board buildings no more will be built. Reversal to a normal type of clothing for the climate is less likely because of the well established church requirement that clothes be worn by all who have them.

Health

Trauma and communicable disease are the two principle causes of casualties. Long adaptation to the environment is evident in resistance to the effects of sun and sea and coral gravel. The keratinized layer of the sole of the foot is usually 5 mm thick, which permits running and walking on the coarse sharp gravel of the islands and reef. Feet and legs, however, are a frequent site of injury in the form of abrasions and lacerations. Puncture wounds are common and there are occasional fractures. Many of the abrasions become subcutaneous abscesses which are well circumscribed. The same type injury in the non-immune new-comer leads to a diffuse inflammation with lymphangitis and lymphnode enlargement.

The inhabitants are subject to sunburn, and they, as any pale-skinned new-comer, must become readapted if unexposed to the sun for long periods. A chronic conjunctivitis localized to the exposed areas of the conjunctiva is prevalent. It occurs most often in fishermen who do not wear hats or who cannot because of the type of fishing such as netting on the reef during which the fishermen are submerged frequently. Others who spend hours in the sun, develop the same type lesion to a milder degree. In the fishermen the cornea adjacent to the pinguecula acquires a pannus which with repeated injury becomes opaque. In its mildest form this lesion is a congestion of the conjunctiva limited to the exposed areas, and most intense at the pinguecula. Repeated long exposure to sun aggravates this. Some of the fishermen have attributed the affection to the use of swimming goggles. However it occurs in the women who may paddle in the bright sun for a few hours, but who do not use swimming goggles. The symptoms are like those of "snow blindness" with a feeling of "sand in the eyes".

Drowning is infrequent considering the amount of time spent in the water from infancy to old age. There have been three deaths from drowning in the past 3 years: One child fell from a tree into a taro swamp, smothering in the mud. Another waded out too far on the reef. A fisherman drowned in the swift current of the pass.

The injuries due to sea fauna are fish bites, puncture wounds and lacerations from fish spines, lacerations from crab and lobster spines and claws, and punctures from sea-urchin spines. All these are not different from similar lacerations and punctures received from metal instruments. If the wound remains uncleansed it responds with the same type of suppuration as that seen in abrasions from coral or other injuries. The wounds heal rapidly and without suppuration if thoroughly cleansed by some such method as soaking in a mild antiseptic solution, if superficial or by opening and cleansing if deep.

It is stated that several types of poisonous spines are encountered such as the cone snails, a dark-colored sea-urchin, and a fish camouflaged to resemble the rock bottom. "Jelly fish" are numerous and their tentacles produce a transient itching and vesiculation. A yellow coral with fine branches produces the same type of lesion.

The daily use of open fires leads to burns, usually of infants.

Falling coconuts and fronds are a potential source of injury thoroughly understood by the inhabitants who keep the ageing fronds cut from the palms on Touhou and Werua where also the nuts are harvested young for drinking before they reach the falling stage.

Stone bruises are common. They are large and longlasting. The keratin layer protects, but prevents the drainage of the hematoma of a stone bruise which may disable for months. When the stonebruise is finally exposed by wearing off the keratin covering, a rough crevassed region is left which might be mistaken for serious diseases by the uninitiated.

Fish hooks and knives are widely used and produce their usual casualties.

Communicable Disease

The lack of any accurate concept of the spread of disease, and the personal habits of this compact population, bring about a rapid spread of such diseases as acute upper respiratory tract infections, acute epidemic conjunctivitis, skin infections, and yaws. A display of this type spread followed the cowpox vaccinations of June, 1950. For the following month accidental vaccinations occurred in several families in which some of the members had escaped vaccination at the physicians visit. Many of the vaccinated showed wide distribution of large vaccinia lesions.

For a month or two following the visit of a boat there are epidemic sore throats, colds and intestinal infections characterized by diarrhoea. These epidemics are like those occurring in any isolated community when the isolation is broken by visitors introducing a new respiratory tract and

intestinal flora. The boat that brings back the student group for summer holiday from Ponape is the bearer of the greatest single burden of infection. Intestinal parasites, respiratory infections, pink eye and, reportedly, gonorrhoea are the principal offenders.

Hands, mouths, clothing, sleeping mats within the family soon come to bear the same flora and fauna. Dishes are gradually coming into greater use to replace the disposable type such as breadfruit leaf plates, coconut leaf plates, coconut leaf platters or coconut shell bowls. The dishes provide an excellent medium for exchanging acute infection because of the cold water washing technique, but even hot water methods might be presumed superfluous so long as the common eating method with fingers dipped into the same bowl persists. The spread of disease in this group is much like that in an individual; the entire surviving population becomes immune shortly after the introduction of a new agent of infectious disease.

Isolation of infected individuals is an impossibility at present. The exposure of a newborn infant to the group bacteria is an example of how little comprehension of bacterial disease exists. All newborn infants are subjected to mouth to mouth transfer of infectious agents of many female relatives, friends and assistants at the birth. An infant cry is a signal for repetition of the transfer. The death records indicate little mortality from this practice, but the morbidity is high. Thrush fungus is prevalent, as are coughs and colds in the newborn group. It would be difficult to ascribe a more likely source for the infection of a four months old infant who died of *tuberculous meningitis, than this mouth to mouth transfer.

About one fifth of the populace has fungus infection of the skin. Four types are identified clinically, from which fungi were demonstrated in potassium hydroxide preparations. These are Tinea imbricata, Tinea versicolor, and Tinea cruris. Tinea favosa is uncommon. Conditions are ideal for the continuance of fungus infections and for their transfer. There is an indication of decreasing incidence in recent years since soap and rainwater have been more regularly available.

Tuberculosis is not common. Occasional cases of cough with emaciation have occurred, and such patients have been isolated in a house set aside for this purpose. "Isolation" as practical here means little more than a change of scene for the usual bacterial transfers. Patients isolated at the infirmary for acute infections were visited regularly by family and friends. Spouse slept with spouse and friend with friend on the narrow infirmary cot. The usual eating habits are practiced under isolation as at home. At funeral ceremonies the deceased is kissed good-bye by all regardless of the cause of death. Under the circumstances, if tuberculosis were common it should be more evident. Only one case of probable tuberculosis was seen in five months, that of a four months old infant dying of tuberculous meningitis. Of the many coughs treated at the infirmary none was found with physical signs of tuberculosis. No emaciated sick people with cough were seen.

Arthritis is uncommon. Two patients were seen with symptoms and signs characteristic of mild infectious arthritis. The women complain of pain in the sacroiliac region radiating down the leg. These patients gave a history of some type of unusual activity prior to the attack. Such work

* Clinical diagnosis

as pounding pandanus leaves or mashing breadfruit or pandanus pulp with a heavy pounder is done periodically with little preparation for the strenuous exercise of muscles required. The young women pride themselves on ability to carry heavy loads, and occasionally complain of the same symptoms.

Psychologically the people appear well adjusted to their situation of isolation. Many of the older people recognize the advantages of climate, location and food supply. These have returned after visits abroad to spend their remaining days here without regret. Youth wants to get away. Many of them return with appreciation that the contrast with other places is in favor of Kapingamarangi. Ninety Kapingamarangi people have migrated to Ponape (village of Porokiet). The reason given by some, and this is agreed to by the leaders at Kapinga, is that the atoll will support only a limited number, and that 500 is too large a population.

No severe psychoses were seen. Certain young women are noted for hysterical attacks attributed to seeing ghosts. There is some concern for personal health usually manifested by calling for medical aid for slight aches and pains. This apprehension appears to be based upon the concept that pain is the only symptom of disease. This is further emphasized by the patient's failure to call for help until other symptoms and signs are well advanced when pain develops. This is not out of proportion to the degree of education concerning disease processes. One case of presenile dementia was seen.

No cancer was seen, either in skin where it would be obvious, or as signs of internal disease. Epidermal inclusion cysts (wens) are common and two lipomas were seen. No basal cell epitheliomas were seen.

Sterility of women is a common complaint. There are 101 married couples, 29 of which have no children. The cause of this was not learned. The reputed frequency of gonorrhoea might explain this and the frequent occurrence of unions with but one child. However, the only signs or symptoms called to my attention despite my frequent requests to treat any cases of gonorrhoea was one case of recurrent Bartholinitis and one case of acute epididymitis.

Parasitism

Specific evidence of disease due to parasites is lacking. Faeces from 275 people were examined for intestinal parasites and 100 found to carry at least one parasite, an incidence of 36.4%. Hookworm 21.9%, and pinworm found in 4 of 20 NIH preparations represent the common intestinal parasites. Protozoa were rare. Blood parasites were not found in 20 thick and 20 thin preparations stained with Giemsa stain. Even though no direct evidence of disease from these parasites was found, such a burden of parasites is a hazard. Twenty-four carried both hookworm and whipworm, both parasites producing blood loss. If this population were investigated for anemia, abnormality might be demonstrated due to these parasites. Lice are common.

Anomalies

Anomalies are infrequent. One boy with a mild degree of pigeon breast is apparently not handicapped and has no other obvious anomaly. One small pit in the pinna of an ear was classed as a remnant of a branchial cleft because it had been present from birth. Two children with apparent endocrine dyscrasia were seen. An 8 year old boy with Simmon's disease, and an 18 year old girl without secondary female sex characteristics. The usual age for development of secondary sex characteristics of the female is 12.

Of a debatably anomalous nature was one case of hydrocephalus, a boy aged 4 with fontanells open and head circumference increased. In the same category are two cases of mild spastic paraplegia.

Mutilation

A mild form of mutilation of ear lobes was discontinued when church replaced priesthood. Women still pierce the ear for ear rings. Youths scarify their arms in commemoration of early sex experiences, usually with a glowing cigarette.

Medical Care

In 1947 an infirmary was built on Touhou. This is a native type house of post and thatch construction, separated into two rooms by a partition. The infirmary is equipped with utensils, simple instruments, two beds with mattresses, three small tables, instrument stand, shelves, examining table, benches and a chair.

The medical aid, Samuel (June to August) relieved by Masao (August to November) works under the remote supervision of the staff of the Ponape hospital from which supplies are replenished periodically. Beginning in August 1950 the periods were increased from two months to three months. The medical aid makes inspections and, through the assistant chiefs secures the burial of refuse heaps, burning of trash and the cleaning of water tanks, isolation of pigs and spraying to reduce the flies. The persistence and success of the fly spraying program is largely due to the enthusiasm of the assistant chiefs. The flies are convincingly fewer on Touhou and Werua where the spraying is done than on the outer islands. There is no comparable program to reduce the ant or cockroach population.

The medical aid acts as the people's physician, prescribing, while they last, the simple and harmless remedies which, under the circumstances can be the only ones supplied in quantity. These remedies are given on the basis of a symptom: A cough received medication A, a headache receives medication B and a stomachache receives medication C. A patient with all three symptoms gets the three remedies. Abrasions and lacerations are cleaned and bandaged in a manner commensurate with several months training on the basis of complete ignorance of the concepts of infection and asepsis.

The aid enjoys some prerogatives of the former medicine man without the latter's social position of respect due to age and training. This situation leads to certain mild conflicts, as between the assistant chiefs and the medical aid. The assistant chiefs are highly respected executive officers of the chief. One is the son of the former chief. The medical aid is not now looked upon as having attained a mature position of responsibility.

It is a favorable commentary on the sound policy of the basic program that even with these handicaps, the people are benefitting from the infirmary and its personnel. There is almost daily use of the facilities for wound dressing. The gauze and bandage material provided is still preferred for head dress and arm band decoration and may be replaced by a home bandage. Many prospective patients treat their own wounds at home with unsterile bandage or HAU leaf covering until, in some instances, abscesses develop. Others come for treatment of very slight abrasions, indicating a possible appreciation that early treatment may prevent later trouble. All cases of severe injury are brought to the infirmary.

The infirmary is serving a need. It is a symbol to the people that there is an outside interest in their welfare and it serves as a meeting place from which sanitation and health knowledge can be spread as soon as the planned personnel is available. A government poster, a translation for which was prepared by Masao the temporary aid, has been displayed prominently in infirmary, church and school. It deals with flies, mosquitoes, rubbish and disease and has received much attention and comment. The enthusiasm for the health program is spreading but still remains largely with the leaders. Serious illness is still treated by long established primitive methods.

Medical Lore and Practices

The gods of the Kapingas are deified ancestors of their atoll home who inhabit the sea outside the reef. These gods are the benefactors of the people and are all powerful.

The ancient priesthood acted as intermediaries with these tribal gods, requesting their aid to ward off afflictions or assist in special projects.

The spirits of the recently dead reside in the lagoon and return to wander about their former home on land. Some of these ghosts are mischievous or have grudges against specific living enemies.

Medical practice for the treatment of disease was traditionally in the hands of practitioners or magicians, who had power passed on from their ancestors. The power consisted of methods of control of the ghosts of the lagoon and of formulae for specific remedies. Any obscure illness is attributed to seeing these ghosts, the sight of certain spirits producing particular illnesses.

One of the commoner ghost-caused diseases is a condition of young women called HOTOPE (fits). It is a temporary apparent disorientation of the attacked patient who may run into the sea if not restrained. The attack starts suddenly with a series of loud, shrill screams resembling those of a suddenly hurt child. The cries follow a stereotyped pattern immediately recognized as being those of the individual attacked. Some have advocated as treatment a lack of restraint; the patient runs into the sea (on the smooth part of the reef) and recovers immediately.

A disease characterized by menorrhagia is attributed to seeing two ghosts.

A practitioner maintained his position by the success or failure of his exorcising and his herbal remedies. Herbal remedies were, and still are, used for common afflictions. Some former remedies have been discarded in favor of some imported from Nukuoro (probably once the home of the Kapingas). These remedies are carefully written and indexed in a note book prepared by Alfred Patterson who was trained in the ancient practices. He recorded them while visiting Nukuoro. Their antiquity is not known. Some differ little in principle from remedies devised by any one desiring a purge, relief from pain or irritation or for hemostasis. The complexity of some formulae hints of their possible origin in secretly compounded magic. It is stated that the remedies must be made and used in a certain way to be effective. This is the reason given for keeping the formulae carefully guarded.

One series of remedies, totalling 12 were in a separate category called sacred. These are all mixtures of the juices of plants, for external and for internal use. They are described completely in the appended list. One internal and one external remedy are described here as examples.

A. A remedy for headache.

- a. Three yellow leaves of PUKA (Pisonia grandis)
Three green leaves of PUKA
Three leaflets of TUA KIMOA (Vigna marina)
- b. A husk of coconut that has been soaking in the sea to rot, is soaked in fresh water for a day.
- c. A hole about a foot deep is dug in the ground and this lined with a leaf of NGAUNGAU (Alocasia macrorrhiza) ("ape" in Hawaiian).

After pounding the leaves in a bowl, a coconut cloth is used as a strainer and the juice squeezed into this hole.

- d. The water is wrung from the coconut husk and added to the juice in the "ape" leaf.

The patient lies on his back immersing his head in the mixture allowing just nose and mouth above the fluid. The treatment is given for an hour or less for three successive days if necessary. If the patient has not recovered after three days of rest from treatment another series of three is given.

B. A remedy for bloody diarrhoea and fever.

A stem of fruit of WARANGA (Pipturus argenteus).
6 fruits of the HUATORO (Triumfetta procumbens); and a 3-inch square of outer layer of coconut trunk.

These are pounded in a bowl and the juice squeezed through a cloth into a small immature coconut about half full of its juice. The mixture is heated and drunk for the first dose and repeated cold for two more doses.

A second category of remedies is used because of well demonstrated ability of the remedy to produce a certain effect. One of these, WARE WARE is used as a home remedy for any one not feeling well enough to be up and about his work. A mature coconut is opened with strokes of the sharp edge of a knife blade leaving about 1/3 of the shell as a cover. The juice is saved, the meat shredded with a scraper including all of the thin brown coating of the meat. The shredded meat and juice are replaced and the covered nut cooked in the ground oven. The mixture is drunk hot and produces a moderate purging.

An absorbent dressing is made from the hairy portion of the "Bird nest" fern (Asplenium nidus).

Round flat leaves, such as the HAU (wild hibiscus) (Hibiscus tiliaceus) are applied either directly or by use of a gum, to abrasions and lacerations to keep the flies away.

Coconut water from the young nut is given new-born infants pending a supply of milk from the mother. This water produces a purging, thought desirable by the Kapingas, sometimes sufficient to produce a bloody mucous fecal mass. Microscopic examination of such material shows many macrophages filled with the coconut oil droplets.

Obstetrical care

Obstetrics is entirely the field of older women, some of whom have earned a place comparable to that of midwife by attending many births. From the onset of pregnancy the prospective mother is set apart and advised by the older women. During the first month of pregnancy she does not work but carries on her usual tasks thereafter because it is thought she will be unable to carry on labor properly otherwise. Sexual intercourse is tabu throughout pregnancy and thereafter for one year. There is a strong belief in prenatal influence, and many tabus concerning what the mother should look at and avoid seeing. A first pregnancy and delivery are accompanied by much ceremony omitted from subsequent ones. Traditionally at the onset of labor the obstetrical party retreated to a remote island. Now many deliveries take place in a neighbor's or friend's house within the village.

There are apparently two schools of thought concerning the desirability of early bearing down. Some urge the mother to exert herself throughout labor, others insist it does no good until the third stage of labor which is recognized by the bursting of the amniotic sac and the resultant flow of watery fluid. Long cloths are tied about the epigastrium and pulled tight to assist the expulsion, frequently in the early stages of labor. The mother is provided with a rope tied to the upper part of a house post against which her feet rest while she pulls. Primipara were found exhausted in the early hours of labor with the infant head still above the pelvic brim. There is apparently agreement of all the older women that once the amniotic sac has ruptured the delivery must be speeded because the child will inhale blood. One severe perineal tear was seen which may well have been due to a hurried third stage. There is comparable urgency to speed the placenta and membranes, even to exerting traction on the membranes, if there is delay, to the point of tearing them free. Traction on the cord is avoided. The delivery bed is an old mat of pandanus. The mother is draped to keep the flies away.

The infant is received in the hands of the midwife who immediately cleanses the mouth and nose of the infant by sucking them free of mucous. The tongue of the midwife is inserted into the infant's mouth to search out any foreign material. This process is repeated especially if the infant cries. It is thought such cleansing must be done to permit the first breath and that it must be repeated to insure that it is a complete cleansing process.

Formerly the cord was cut about three inches from the umbilicus with a sharp sea shell and left untied. Only rare hemorrhage occurred. Now cords are tied with thread. The infant is immediately washed with fresh coconut cream.

Any indication of a concept of asepsis is lacking. The use of clean cloths is a gesture in that direction and the cleanliness of the cloth is of the cold water variety. A bath in the ocean is attempted by some immediately prior to delivery. The mouth to mouth aspiration is repeated by relatives and friends of the family. The first solid food of the infant, given pending the mother's milk supply, is prechewed.

The placenta is washed, wrapped in a cloth and buried in the channel between the islands. The cord stump is allowed to drop off and is then placed, if from a female, in the base of the leaves of a lily plant, and if from a male, in the fold of the leaves of a young coconut tree.

The mother is urged to take food throughout labor and immediately after delivery, even though exhaustion may cause its immediate vomiting. One sixteen year old primipara was delivered while chewing a pandanus key. Maternal rest following delivery is looked upon as a sign of weakness, and an effort is made to avoid the stigma. The mother sits up shortly after delivery. She travels to the ocean for a bath as soon as she can walk, and is usually visiting neighbors within three days. A journey from an outlying island is undertaken the day after delivery. Some of the women are in a state of exhaustion, but apparently no concessions are made for a prolonged or difficult labor. A tea made from any one of several varieties of plant is routinely taken by the mother shortly after delivery.

The medical aid and the medicine man professed ignorance of all obstetrical practices.

There is room for the application of a few simple remedies in delivery and the puerperium. Two instances of omphalitis in the newborn were seen. Thrush fungus was severe in four mouths of newborns. Suppurative skin infections were seen in four. One infant had bronchopneumonia.

None of the infants died, and infant mortality is said to be low. One is compelled to great caution in advising any change of procedure in the face of such a mortality rate and absence of alternatives. The mouth to mouth practice which violates the principle of isolation of an infant from new bacterial flora goes all the way in the opposite direction and brings to the infant almost all the bacteria it is going to meet. The abandonment of a practice which achieves a difficult task, that of removing mucous from the upper respiratory tract, might be harmful, especially when we consider that the same result is attempted commonly in medical practice by wiping out the mouth with sterile gauze and aspirating with a sterile catheter.

I believe the people are quite anxious to accept innovations in their obstetrical practice, but both equipment and personnel must be available before any improvement is possible. The medical aid might be able to introduce an alcohol cord dressing and a perineal pad soaked in some antiseptic solution such as is commonly available at infirmaries.

Two puerperal deaths have occurred in the past two years during which time there have been 45 births. The cause of the deaths is not known. There were 3 infant deaths in the same period.

There is shown in Table 1 a record of seven weeks infirmary visits as an indication of the conditions diagnosed and treated there. In addition house calls were made during the five months of residence for the following probable conditions.

Auricular fibrillation with failing circulation	M. 90.
Bronchopneumonia	F. 74.
Ruptured ectopic pregnancy	F. 21.
Early pregnancy	F. 20.
Miscarriage of macerated foetus, 4 Mo.	F. 21.
Recurrent abscess Bartholin's Gland	F. 15.
Acute epididymitis	M. 18.
Chronic arthritis, hypertrophic.	M. 60.
Tuberculous meningitis, death.	F. 4 Mo.
Coronary occlusion, death.	F. 81.
Bleeding umbilical cord (poor tie)	F. 1 d.
Suppurative omphalitis	F. 2 wks.
Bronchopneumonia	F. 6 d.
Hysteria, (Marital problem)	M. 24.
Hysteria,	F. 21.
Fever of unknown cause	F. 24.
Exhaustion 2d. post partum	F. 30.
Dystocia - Delayed Rupture of Membranes	F. 30.

TABLE I

TABLE OF CONDITIONS FOR WHICH 161 PATIENTS MADE 563 VISITS
TO THE INFIRMARY
FROM SEPTEMBER 21 TO NOVEMBER 11, 1950.

Lacerations and abrasions	27
Acute epidemic conjunctivitis	20
Tooth extraction for caries	17
Upper respiratory tract infection	14
Tinea	13
Cough	10
Infected lacerations and abrasions	7
Suppurative gingivitis	6
Headache	6
Stomachache	5
Abscess, unexplained	4
Acute otitis media	4
Vague and mild symptoms	4
Tooth ache, caries (no extraction)	4
Back strain	4
Yaws, possible	4
Yaws, probable	2
Thrush stomatitis	4
Abscess jaw, due to dental caries	3
Unexplained fever	3
Seborrhoeic dermatitis	3
Burns, accidental	2
Acute conjunctivitis (sun exposure)	2
Chronic infectious arthritis?	2
Menorrhagia	2
Amenorrhoea	2
Fracture (arm, fall due to epilepsy)	1
Chronic suppurative otitis media	1
Peptic ulcer ??	1
Diarrhoea	M _o 4 _o
Suppurative lymphadenitis (head lice)	M _o 3 _o

Summarized, these lists indicate no great variation from the conditions prevalent in any small community where the population is subject to a great deal of trauma in daily activities and where the personal sanitation is not on a high level.

One month's visits at the infirmary are recorded as 286 visits by 122 patients. The commonest complaint was cough and sore throat of which condition there were 38. Trauma, principally as lacerations and abrasions, was second with 19 instances, 6 infected. Teeth and gums were the cause of numerous complaints. There were 18 patients with tooth ache from carious teeth and five with very severe gingivitis. The natural history of tooth decay is displayed prominently in all adult mouths. Many gold and silver crowns and fillings are also seen (Japanese period, Ponape). Gingivitis is prevalent after 20 years of age, and appears to offer a fertile field for health

improvement by education concerning well established methods of mouth hygiene. Tooth brushing with coconut husk fiber is practiced by some. The forty teeth extracted for caries with pain represent a very small part of the teeth requiring care.

TABLE 2
THE AGE DISTRIBUTION OF THE RESIDENTS OF KAPINGAMARANGI
NOVEMBER 1, 1950

AGE	M	F	TOTAL
Under 1	3	9	12
1	10	10	20
2	5	5	10
3	5	10	15
4	4	6	10
5-9	28	31	59
10-14	24	26	50
15-19	28	24	52
20-24	16	33	49
25-29	14	16	30
30-34	14	13	27
35-44	25	25	50
45-54	23	18	41
55-64	14	21	35
65-74	8	12	20
75-84	1		1
85-	1		1
	<u>223</u>	<u>259</u>	<u>482</u>

There are no exact data concerning births and deaths prior to 1947. No diagnoses of cause of death are available.

The Bernice P. Bishop Museum has kept a file of births and deaths since 1946.

YEAR	BIRTHS		TOTAL	DEATHS TOTAL
	M	F		
1947			11	7
1948	7	5	12	11
1949	10	10	20	9
1950	3	10	13 (To Nov.1)	5

Epidemiology

The prominent etiologic factors of the diseases prevalent at Kapin-gamarangi are of considerable epidemiological interest. The commonest chronic disease is "ring worm" due to four varieties of Tinea. The control of these skin diseases is now frustrated by the household and personal sanitation of

the patients. Cleanliness of the hot water and soap variety is probably the basic factor necessary for progress in medication for these diseases. The families free from fungus infection are those best equipped for cleanliness. One advantage in a large constant supply of rain water on Touhou would be the proper use of soap permitted by soft water baths, now indulged in during showers and when soap is available. Clothing also requires sterilization by boiling water, at least, and there is abundant fuel to permit proper laundering. Education to the effect that heat would be less destructive than the severe pounding now administered to clothes would yield a return in both economy and health.

Parasitism is also affected by a lack of proper use of soap and water. Head lice, pin worm and whipworm and possibly hookworm as spread here are subject to some control through care of the family clothing and mats. The usual methods of spread of whipworm and hookworm appear not to be the most important factors in this community. The regularly recurring importation of certain parasites, including hookworm, appears to be a prominent feature subject to control by treating the carriers at the source of infection (principally Ponape). Disposal of excreta, though subject to improvement, is questionably a cause of spread of hookworm here where there is a low incidence in those who have not been away from the island, and where there is a family grouping of the carriers. The slight spread of hookworm is likely of the direct type which here spreads whipworm.

Circumstances that reduce the probability of spread of hookworm by the usual method of contamination of muddy soil are here the absence of general soil pollution and the absence of mud secured by spreading coarse coral gravel on all working areas and a coarse sand on the main thoroughfares. Rainfall, though in annual quantity sufficient (80 in.) to permit hookworm spread is so intermittent that the soil, even in the few ungravelled areas is dry for months at a time. The few small areas kept wet by laundering and bathing with well water are a possible region of spread of hook worm in the usual manner. A spot map shows no increased incidence in the immediate vicinity of these areas.

The high incidence of whipworm and low incidence of Ascaris point to some special conditions to account for the deviation from the rule that whipworm and Ascaris are parallel infections. To favor the low incidence is the isolation of pigs from each other and from the habitation. This isolation is not complete enough to account entirely for the low incidence. The sty areas are well drained and dry for months at a time.* The watering utensils are Tridacna shells, dry most of the time. There is no contamination of the sty areas by humans. The latest pig stock was imported prior to 1941. The pigs are kept tethered or singly in small rock pens. Ascaris may be absent from the pigs. None was found in ten pig faeces specimens and adjacent soil. Such Ascaris as is brought in from foreign countries by humans would find little opportunity for survival under the prevailing circumstances. It is quite likely that little Ascaris is imported because the traveling population is above the age commonly acquiring Ascaris.

* Ascaris requires 30 days in moist soil to become infective.

The high incidence of acute infections due to visiting boats and returning travellers is a serious economic load for this community. The only apparent help lies in combatting with medical care the acute stages to avoid serious complications. The problem is that of any isolated community which must (preferably gradually) acquire immunity to the world's burden of bacterial and viral flora if it is to survive without return to its state of isolation.

The isolation which permitted Kapingamarangi to remain unvisited by whites until 1871 also accounts for the avoidance of the devastating epidemics which so seriously reduced the population of other atolls. There have been seven epidemics, all following the visit of boats. The first, like all the others attacked the entire population, but caused only a few deaths. The chief characteristic of this first epidemic was that it caused listlessness and death in a few days.

The second occurred between 1900 and 1910 and is described as a wasting disease with cough.

The third was synchronous with similar epidemics in Ponape and Nukuoro between 1910 and 1920 and characterized by severe headache.

Neither the fourth or fifth caused any deaths and they had the characteristic manifestations of whooping cough and of mumps. No orchitis occurred with the mumps.

The sixth was a bloody diarrhoea dated as during the Japanese times. Only a few people died.

About 1940 a severe sore throat followed by a fine red skin eruption and peeling of the skin caused the deaths of a few children and no adults. This was probably scarlet fever.

There has been a time when tuberculosis was more prevalent than now, and chronic skin diseases have decreased. The German expedition of 1910 described the populace as nearly all affected by skin disease.

The impression gained is that this very susceptible group of people has weathered many epidemics with much less loss of life than reported in other isolated groups, and that there never has been an epidemic that killed large numbers. The largest number dying in any epidemic is probably ten or twelve. The largest number of names with dates of death that could be elicited was a group of 6 occurring in the 1922-24 period.

The worst death-dealing condition was starvation in the famine of 1915-1919 when 60 people died in Kapingamarangi and 40 Kapingas removed to Ponape in very poor condition died there. It is a reasonable conjecture that the deaths would not have occurred had not the local governor prohibited the use of coconuts for food and restricted fishing, by requiring men to work at copra production.

Immunization against small pox by vaccination showed this group in June 1950 to be entirely non-immune, substantiating the absence of any history of an epidemic of that disease. No epidemics are reported characteristic of

diphtheria, chicken pox or measles. A large proportion of the population has been immunized against diphtheria (June, 1950). The other two diseases must be considered as potential serious hazards, and their importation avoided.

The most fertile field for the application of preventive measures of the early treatment type is that of trauma. Probably no more than a third of the cases of mild trauma are seen at the infirmary in an early stage.

Judging from the number of home made bandages adorning arms, legs, fingers and toes, home treatment still predominates. This is emphasized by the number of cuts and scratches seen in a state of suppuration. Some of the bandages cover the scarification practiced by youth to commemorate their early sex experiences. These wounds are usually sterile, the favorite mark being a cigarette burn on the arm.

Thorough cleansing and covering of wounds is made more urgent by flies which are immediately attracted by any open wound.

High infant morbidity of acute infections of skin and respiratory tract is associated with long established practices some of which must persist until proper substitutes are available such as good obstetrical practice. Much, however, can be achieved by hot water and soap cleaning of clothes used for the infant and its bed. As simple as such devices appear their use requires the changing of long held concepts and despite an evidenced willingness to learn, reasons for change are difficult to grasp. Some idea of the difficulties are suggested by the finding that a medical aid, after two years of education in basic sciences required instruction in washing hands, cleaning instruments and the handling of sterile material.

Three maternal deaths in the past three years can be understood after observing the obstetrical practices in which, apparently, acquired immunity to tribal bacterial flora replaces asepsis.

Three common insect vectors, flies, mosquitoes and lice are here in sufficient numbers to cause epidemics should the proper disease factor be introduced. Flies now spread wound infection, and the control of this lies in the care of wounds rather than any hope that flies will be eliminated. The mosquitoes are controllable on the principal residential island and are now kept reduced by exposing water tanks to sunlight and by the elimination of all natural casual water containers such as coconut shells. (No anophelens).

Lice are subject to greater control than now evidenced. In some families the children's heads are kept clipped, mats are sunned frequently, and kept clean. Adults wash frequently with soap. These families have no obvious lice. The small boys are the most conspicuous bearers of head lice. By well established custom the habits of youth are uncontrolled in this society. Gradual education to the liberal use of soap and hot water and hair clippers is possible in this intelligent group. It might be carried on through the medical establishment cooperating with the school.

Rat control is apparently quite satisfactorily maintained by the cats which are no great burden on the food supply because they scavenge all refuse.

Summary

Five months observation, from mid-June to mid-November, 1950, of the health conditions of Kapingamarangi reveals a high degree of adaptation of the people to a salubrious environment. There is a high incidence of trauma and of infectious disease of mild varieties. There is demonstrated the usual reactions of an isolated group to commerce with foreign groups. These reactions emphasize the inadequacy of certain long established practices to meet the new environmental change.

There is indicated some progress toward readaptation to the imposed changes. Under intelligent leadership, education about modern concepts of disease and disease control is establishing the base for improvements of personal hygiene, first aid, and general sanitation.

A better rain water supply would improve the opportunity for better personal and family hygiene. Elimination of the dry reef as a toilet, and restriction of area used would appear to offer less opportunity for spread of disease.

The daily clean up could be extended to the beach areas with a reduction of fly breeding areas.

The present direct ocean disposal system is adequate only with a continued small population.

Appendix A

Medical remedies

1. For pain in the head and hot breath.

- a. Leaf buds of the WORO-WORO, Premna obtusifolia are pounded until soft. The pulp is inclosed in a small piece of cloth and a drop or two of the juice squeezed into the nostrils while inhaling. This treatment is used three times a day for two days if necessary, and, after a three day interval may be repeated for two more days only.

2. For headache.

- a. Three yellow leaves of PUKA, Pisonia grandis
Three green leaves of PUKA
Three leaflets of TUA KIMOA, Vigna marina
- b. A husk of coconut that has been soaking in the sea to rot is soaked in fresh water for a day.
- c. A hole about a foot deep is dug in the ground and lined with a leaf of NGAU NGAU, Alocasia macrorrhiza.
- d. The water is squeezed from the coconut husk into the leaf lined hole and the juice of the pounded plant leaves added.
- e. The patient lies on his back, immersing his head in the mixture for an hour at a time for three days. The treatment may be repeated after three days interval.

3. A post partem medication.

- a. Six small plants of NAU, Scaevola frutescens are pounded and the juice squeezed into a very young coconut.
- b. All of this is drunk, and a similar mixture each day for three days.

4. For a fall from a tree.

- a. Dark grass plants, roots and all.
- b. Leaves of T'HIA, Clerodendrum inerme.
Enough of a. and b. to make a handful is crushed in a wooden bowl 16" long with
- c. three pieces each about 6" long of the growing leaf tip of HALA HALEO (N)*

* (N) indicates a Nukuoran name

- d. The grated meat of a mature coconut (brown husk) is added to a, b, and c.
 - e. Three batches of the above are made and the juice placed in a tarpaulin-lined trench big enough to hold the victim and several buckets of water.
 - f. The patient remains immersed with only nose and mouth exposed until he has a shaking chill.
5. For prolonged menstruation.
- Three sections of the base of TARA TARA, Crinum asiaticum, are pounded and the juice squeezed into water.
The patient sits in the water once a day for three days.
The treatment is omitted for three days and repeated if necessary.
6. Omitted because of its similarity to No. 3.
7. A remedy for bloody diarrhoea and fever.
- a. A stem of fruit of WARANGA, Pipturus argenteus.
 - b. Six fruits of the HUATORO, (N) RAMUTAKE, Triumfetta procumbens.
 - c. A three inch square of the outer layer of coconut trunk. These are pounded in a bowl and the juice squeezed through a cloth into a small immature coconut about half full of its juice. The mixture is heated and drunk for the first dose and repeated cold for two more doses.
8. For hot breath.
- a. Six small pandanus plants.
 - b. Three sprouting leaves of the RAKAUTOROTORO, Polypodium scolopendria.
A coconut shell that has been rotting in the lagoon for a long time is used as a container for sea water. The plants and leaves are crushed and placed in a piece of coconut cloth. This is dipped as a sponge into the sea water and the patient given a sponge bath daily for three days. This is omitted for three days and repeated if necessary.
9. Omitted
10. For pain in the stomach (abdomen).
- a. Three yellow and three green leaves of T'TOKOTOKONGO, Messerschmidia argentea, (beach heliotrope).
The leaves are pounded and the juice strained into coconut water. This is taken daily for from three to six days.

11. For cough.

A piece of bark of T'TOKO'TOKONGO, Messerschmidia argentea, and three yellow and three green leaves and three fruit bracts and three leaf buds of the same plant are pounded, the juice squeezed into coconut water and the mixture taken for cough.

12. For chest pain.

TAKAHARU, Allophylus timorensis is used in a manner similar to 11.

13. For a dressing over wet lesions the feathery mass from the center of the "bird nest fern" RAU KATAHA, Asplenium nidus is used.

14. A poultice for boils.

a. Dark grass

b. Three leaves of TUA KIMOA, Vigna marina.

c. The meat of a mature coconut in the green husk stage, grated. The pounded leaves and the grated nut meat are mixed and used as a poultice.

15. To bring boils to a head.

a. Three roots of pandanus.

b. Three roots of KANIU, Ochrosia oppositifolia.

Crush and put in coconut cloth, dip into coconut cream and salt water mixture and rub about the boil towards its center. Repeat for three days.

16. For an itching, scaling eruption.

a. Leaves of RAUTARIA, Terminalia samoensis.

Pound the leaves and sop around the area to stop the itching.

Remedies for puncture by the spine of the NOHU, (rock fish) which is said to cause severe swelling and pain.

1. Catch a NOHU and put the gall bladder juice on the injured spot. This must be done immediately.

2. a. Warm coconut cream in TUKIMA shell.

b. Young fruit of NONU, Morinda citrifolia, with flowers still on the fruit.

c. Two to four rootlets of coconut.

The fruit and rootlets are pounded and the juice strained into the coconut cream.

Place foot in mixture daily until healed.

A remedy for gonorrrhea.

A plant of RAMU TAKE, Triumfetta is stripped of its bark, the stem and leaves pounded and the juice squeezed into water. Each morning a half coconut shell of sea water is drunk. The penis is soaked for one half hour in the plant juice mixture, daily for three days.

REMEDIES in GENERAL USE

1. NONU, Morinda citrifolia flower buds are eaten by women wishing to wean a nursing infant. The milk becomes bitter and the child refuses to nurse.
2. A leaf of HAU, Hibiscus tiliaceus is a favorite cover for any open superficial wound.
3. NGIE, Pemphis acidula bark pounded and squeezed into water. The bitter liquid is taken daily for three days.
4. RAKAU HUNU KIRI, Cassia alata leaves are rubbed on chronic skin infections such as Tinea imbricata.
5. A thread is used to tie the base of warts and similar growths to cause them to drop off.
6. The vapors from steaming concoctions of various leaves are used against various affections of the head.

A cathartic.

The flesh of a sea-urchin with black and white spines is aged for a day, then mixed with some raw and some cooked coconut cream. The mixture is drunk and the limbs and body massaged toward the stomach.

A widely used cathartic, called WARE WARE. A young coconut in the late drinking stage is husked and the top third of the shell removed with the sharp edge of the knife so as to leave a tight cover. The meat and a considerable amount of the brown inner lining of the shell is seraped, and mixed with the juice, the covered shell placed in the ground oven. The whole amount is drunk hot.

A charm against spirits.

Two green coconut leaflets are placed shiny sides together. They are snapped by separating the hands rapidly and then knotted, at first with an overhand knot including both leaflets at junction of distal and middle thirds, and then an overhand knot tied with one leaflet adjacent and just distal to the first knot. This is pinned on the wall near the sick person.

PART II

A PARASITOLOGIC SURVEY OF KAPINGAMARANGI, 1950

Previous reports of parasitism in the East Carolines indicate intestinal parasites as almost universal, and few other parasites found in significant numbers. The isolated position and certain customs of Kapingamarangi relative to sanitation appeared to offer an opportunity for an exception to the rule.

Fecal contamination of the residential islands has been contrary to custom for many generations. The most heavily populated areas are free from mud even in heavy rains because coarse coral gravel is spread as a cover of used areas to prevent muddy surfaces. Thus two of the contributing causes of spread of hookworm and of Ascaris are curtailed.

During July and August of 1950, 283 faeces specimens were brought to the field laboratory in leaf covered coconut shell containers. Samples were removed to tight plastic vials and the remainder of the original specimen discarded (ocean). From the vial sample, iron hematoxylin stained slides were prepared, direct saline suspensions were examined, and zinc sulphate sedimentation-flotation preparations were made by hand centrifuge. Routinely, flotation specimens were examined and thirty-six sediments were examined to rule out operculate eggs, though none were expected.

Originally plans were made for the faeces parasite survey only, however time became available to make a reconnaissance of other parasites. Twenty N. I. H. preparations were made for pin worm. The unexpected absence of Ascaris required explanation, and ten specimens of pig faeces and adjacent soil were examined by saline flotation.

One patient was seen with chills and fever, and similar attacks were said to have occurred in men who had visited Rabaul. Twenty thick and twenty thin blood films were searched for malarial parasites and filarial larvae.

Inspection of patients coming to the infirmary was made for ectoparasites. Mosquitoes and larvae were collected for identification. It was reported by the authorities here that only one kind of mosquito was present before the Japanese came, a day biting variety, and that the Japanese brought the night biting variety.

A study was made of conditions which might affect parasitism and the observations included in "A Health Survey of Kapingamarangi."

The population is arranged in the following age groups.

AGE	M	F	TOTAL
under 1	3	10	13
1	10	10	20
2	5	5	10
3	5	10	15

AGE	M	F	TOTAL
4	4	6	10
5-9	28	31	59
10-14	24	26	50
15-19	28	24	52
20-24	16	33	49
25-29	14	16	30
30-34	14	13	27
35-44	25	25	50
45-54	23	18	41
55-64	14	21	35
65-74	8	12	20
75-84	1	0	1
85	1	0	1
Total	223	260	483

Results of Faeces Survey

From 275 subjects, 283 faeces specimens were examined and 100 subjects found to carry one or more parasites, 36.4%. There were two common parasites, hook worm and whip worm.

TABLE 3

OVA OF PARASITES FOUND IN FAECES

PARASITE	IN MALES	IN FEMALES	TOTAL	% OF GROUP PARASITIZED
WHIPWORM	35	25	60	21.9
HOOKWORM	41	17	58	21.7
E. COLI	4	3	7	
ENDOLIMAX	3	0	3	1.1
IODAMOEBIA	3	0	3	1.1
TRICHOMONAS	2	0	2	.73
GIARDIA	1	0	1	.34
ASCARIS	0	1	1	.34

TOTAL (multiple infections counted as 1) 36.4%

In view of the conditions which would tend to prevent hookworm spread, the history of the carriers was investigated. Table 4 indicates a higher incidence in those who have travelled to other atolls such as Ponape where hookworm incidence is known to be high.

TABLE 4

TOTAL GROUP	275	
TOTAL WITHOUT HOOKWORM	214	80%
NUMBER WHO HAVE BEEN AWAY	164	
WITH HOOKWORM " " "	48	29%
NUMBER NOT AWAY	111	
NOT AWAY WITH HOOKWORM	11	10%

Although this distribution does not prove that the hookworm was acquired abroad, the fact that 80% of the entire group did not show hookworm would indicate the presence of factors limiting its spread in an entirely barefoot population and despite the importation of new carriers at fairly frequent intervals.

A spot map of Touhou Island indicates a high incidence of more than one infection in the same household.

The low incidence of intestinal protozoa in a population living as intimately as this one is worthy of note. The reason is not obvious. The low incidence in Ponape, the most visited foreign port is a factor. The frequent bathing permitted by access to the sea is probably another, which also contributes to keep the parasitization by all types to such a relatively low figure.

The only ectoparasite found is the body louse which must be present in nearly every household, if not all. All small boys with long hair have numerous louse egg cases (nits) attached to their hair.

Pin worm ova were found in 4 of 20 NIH, preparations from the anal region of young children. This establishes their presence, but no conclusion can be drawn concerning the incidence.

The absence of malarial parasites and filarial larvae was anticipated. No anophelene mosquitoes were seen although every opportunity to identify anophelenes was used. There are at least two species of mosquito, a day and a night biting variety. Specimens collected await identification. Complete malaria reconnaissance was not undertaken.

Treatment

The list appended shows those known to have whipworm at the time of the medical field trip from Ponape, August 1950 when medicines were brought for treatment of hookworm. The results of the hookworm treatment are not known because supplies to repeat the tests were exhausted. There is demonstrated in the same table the well known ineffectiveness of oil of chenopodium against whipworm. The oil was used in March, 1950 as part of a mass treatment for supposed Ascariis infection. Thirty-four of the fifty bearers of whipworm are known to have been treated. A complete list of those treated in March, 1950 is not available. One hundred residents were treated, and medicine left for 100 more which was not used. Therefore, at least 175 of those whose faeces were surveyed had had no recent treatment for ascariasis.

Conclusions

There are two common intestinal parasites in the residents of Kapingamarangi, hookworm and whipworm.

The hookworm is probably imported from other islands, especially by the student group returning from Ponape.

Importation of hookworm could be most easily curtailed by treating the group returning from Ponape, before they leave.

Control of the spread of the common intestinal parasites and of ectoparasites lies in the field of general health education concerning personal and family hygiene.

APPENDIX

NAME	HOCKWORM	WHIPWORM	ISLAND	REFERENCE NUMBER	DATE LAST AWAY	DATE LAST TREATMENT	SODIUM SULPHATE	TETRACHLOR ETHYLENE	MAG. SULF.
HAKATOPE	Yes	Yes	W	261	Ponape 1939	3-50	Yes	Yes	Yes
DEHAWAI	Yes		W	264	Ponape 1936	3-50	Yes	Yes	Yes
TANGAMI		Yes	T	268	No	3-50	"	"	"
TARIPURET	Yes		W	271	Ponape 1935	3-50		one egg	
TAKITAK		Yes	W	272	Ponape 1935	3-50	"	"	"
KEREN		Yes	T	277	Truk 4-30	3-50			
ANTIPATI	Yes		W	284	Ponape 1931	3-50	"	"	"
TIOU	Yes		T	285	No	3-50	"	"	"
ARIPETI	Yes	Yes	T	286	Ponape 1946	3-50			
TANIEL	Yes		T	287	Ponape 9-49	3-50	"	"	"
DAUMIRI		Yes	T	291	Ponape 1937	3-50	"	"	"
ANION		Yes	W	292	No	3-50	"	"	"
WASAI	Yes		W	293	No	3-50	"	"	"
TIMOUET	Yes		W	294	Ponape 1935	3-50	"	"	"
SIMATI	Yes	Yes	T	295	Ponape 1949	3-50	"	"	"
NIMISIO	Yes	Yes	T	296	No	3-50	"	"	"
YESIKE	Yes	Yes	T	300	Now in Ponape				
TIRONGORONGO	Yes		T	301	Ponape 1939	3-50	"	"	"

NAME	HOOKWORM	WHIPWORM	ISLAND	REFERENCE NUMBER	DATE LAST AWAY	DATE LAST TREATMENT	SODIUM SULPHATE	TETRACHLOR ETHYLENE	MAG. SULF.
KIKINE		Yes		307	No	3-50	Yes	Yes	Yes
PUREIKI	Yes		T	312		8-23/50	"	"	"
LUI SI	Yes		W	316	Ponape 1947	3-50	"	"	"
MATINIA	Yes		T	319	No	3-50	"	"	"
KOULUA		Yes	T	320	Ponape June-50	3-50	"	"	"
TAITOS		Yes	T	323	Now in Ponape				
PELENES		Yes	T	326	No	3-50	"	"	"
TIMOTI	Yes	Yes	W	328	Ponape 1946	3-50	"	"	"
JARI	Yes		W	333	No	3-50	"	"	"
DIENEMANU		Yes	T	339	No	3-50	"	"	"
DILAUE		Yes	T	358	Truk 4-1931	3-50	"	"	"
LIETA		Yes	T	359	No	3-50	"	"	"
ISE	Yes		T	361	Ponape 12-1949	3-50	"	"	"
LIAA	Yes		T	362	Ponape 1939	3-50	"	"	"
HEKENOHO	Yes		T	365	Nukuor 1949	3-50	"	"	"
TOKORAI	Yes	Yes	W	216	Ponape 1949	3-50	"	"	"
SEMETI	Yes		T	221	Ponape 1949	3-50	"	"	"
LUI	Yes	Yes	T	222	Ponape 1949	3-50	"	"	"
RAIMON	Yes	Yes	T	224	Ponape 1945	No	"	"	"
KASTOR	Yes		T	225	Ponape 1939	3-50	"	"	"

NAME	39-		ISLAND	REFERENCE NUMBER	DATE LAST AWAY	DATE LAST TREATMENT	SODIUM SULPHATE	TETRACHLOR ETHYLENE	MAG. SULF.
	HOOKWORM	WHIPWORM							
KIMURA	Yes	Yes	T	228	Ponape 1946	3-50	Yes	Yes	Yes
LUCAS	Yes	Yes	T	229	Truk 1948	3-50	"	"	"
KATARINA		Yes	T	231	Ponape 1948	3-50	"	"	"
MASUKO	?		T	232					
MISERI	Yes	Yes	T	233	Ponape 1945	3-50	"	"	"
RISE	Yes	Yes	T	235	Ponape June 1949	3-50	"	"	"
TAWHERA	Yes			241	Now in Ponape				
RIMI	Yes		T	257	Ponape 1930	3-50	"	"	"
JOHANIS	Yes		W	367	Ponape 8-1944	3-50	"	"	"
URAK	Yes		W	371	Ponape 1932	3-50	"	"	"
ENIMA		Yes	W	373	No	3-50	"	"	"
MALIKUTI		Yes	T	376	No	3-50	"	"	"
DEDUO	Yes		T	378	Ponape 9-50	3-50	"	"	"
NOWA	Yes		T	379	Ponape 1949	3-50	"	"	"
PILIMON		Yes	T	380	Now in Ponape				
TONI	Yes		T	381	Ponape	3-50	"	"	"
HUSAKO	Yes		T	387	Ponape 1938	3-1950	"	"	"
LETI	Yes	Yes	T	392	No	3-50	"	"	"
SIANA		Yes	T	401	"	3-50	"	"	"
TURUKO	Yes	Yes	T	402	"	3-50	"	"	"

NAME	HOOKWORM	WHIPWORM	ISLAND	REFERENCE NUMBER	-40-		SODIUM SULPHATE	TETRACHLOR ETHYLENE	MAG. SULF.
					DATE LAST AWAY	DATE LAST TREATMENT			
SUSANA	Yes			404	No	3-50	Yes	Yes	Yes
TEIT	Yes		T	408	No	3-1950	"	"	"
TUHURU	Yes		T	409	No	3-1950	"	"	"
TOPIKI	Yes	Yes	T	411	Nukuor 8-1949	3-1950	"	"	"
KASUKO	Yes			415	Ponape 1935	No	"	"	"
ENELIA			T	386			Ascaris in Ponape		
MIKAR	Yes	Yes	T	416	June 1950?	Now in Ponape			
KORONIKA		Yes	T	421	Ponape June 1938	3-50	Yes	Yes	Yes
PIKITI		Yes	W	422	Ponape 2-1946	3-50	"	"	"
KARATI		Yes	T	426	Truk 6-47	3-50	"	"	"
HANAHO	Yes		T	429	Ponape 4-49	3-50	"	"	"
YOSITARO	Yes		T	434	No	No	"	"	"
BOMUKALAN	Yes		T	442	Nukuor 1946	3-50	"	"	"
MOTOHENI	Yes	Yes	T	448	Ponape 1946	3-50	"	"	"
PONTAIK	Yes	Yes	T	449	No	3-50	"	"	"
KOITI	Yes	Yes	T	450		Now in Ponape			
DERUITI		Yes		451	Ponape 1949	3-50	"	"	"
TAMASUITI	Yes			453	Ponape 1946	3-50	"	"	"
KINTARO	Yes			455	Ponape 15-8-50	No	"	"	"
SIRO I	Yes			459					
ELEATI	Yes			462	Ponape 15-8-50	No	"	"	"
TEKEWO	Yes			463	Ponape 8-50	No	"	"	"
SUPERE	Yes	Yes		428					
TOMIKI	Yes			275					

34 with whipworm had been treated with oil of chenopod

./.

PART III

BLOOD GROUPS OF THE KAPINGAS, NOVEMBER 1950

Residents of Kapingamarangi whose genealogies are recorded in the files of the Bernice P. Bishop Museum were blood grouped during June, July and August, 1950.

Two hundred were grouped with Anti A and Anti B serum. Of this group, 153 were tested with Anti R₀, Anti rh¹, Anti rh² and Anti hr³ sera. Of these, 54 were tested with Anti M and Anti N sera.

Subjects were selected in the following categories.

- (I) Those thoroughly documented as "Pure Kapinga"
- (II) Those thoroughly documented as having foreign ancestors.
- (III) Certain family groups.

Methods

The Rh typings were done by the test tube, water-bath, centrifuge method. The A-B groupings and the M-N typings were done by the depression slide method. Two percent saline washed cells were used for all tests.

Lack of refrigeration required the greatest caution to prevent contamination of the test serum. The Anti N serum failed one month after it was first opened. The Anti hr³ serum failed after six weeks. The Anti A and Anti B sera were still good after 4 months though the Anti B was slightly weaker.

Control tests were made at intervals to conserve serum. When a control test showed a weakening of a serum, tests done subsequent to the previous control were discarded.

Results

Lack of proper storage facilities and insufficient sera for constant controls limit the conclusion concerning M or N and Rh occurrence. There were found MN, M, and N reactors and all tested were Rh positive. The results of the AB grouping appear in the tables.

Group	Pure Kapinga				TOTALS
	AB	A	B	O	
Male	0	40	0	47	87
Female	0	32	0	50	82
TOTALS	0	72	0	97	169

Mixed Ancestry

Group	AB	A	B	O	TOTALS
Male	0	6	8	4	18
Female	2	4	3	4	13
TOTALS	2	10	11	8	31

There were 10 subjects with known white ancestry

Group	AB	A	B	O	TOTAL
Number	1	4	5	0	10