

ATOLL RESEARCH BULLETIN

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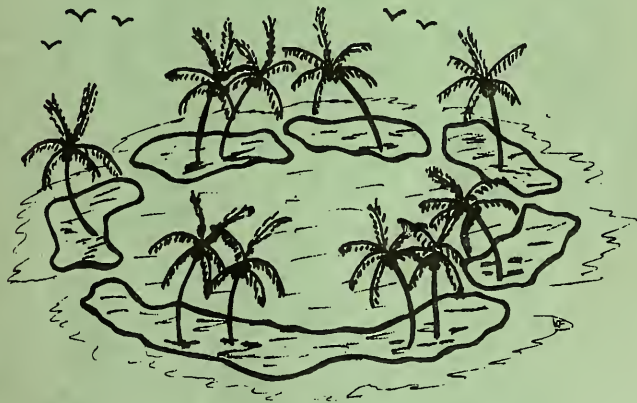
by PRESTON E. CLOUD, JR.

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✓ 14. *Description of Kayangel Atoll, Palau Islands*

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THE PACIFIC SCIENCE BOARD

National Academy of Sciences—National Research Council

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

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DESCRIPTION OF KAYANGEL ATOLL, PALAU ISLANDS

By J. L. Gressitt
Pacific Science Board

Kayangel Atoll is the northernmost land area of the Palau Archipelago in the western Caroline Islands, except for Ngaruengl, a sand bank on an incipient atoll to its north. There are no other atolls within 150 miles. Kayangel is separated from Babelthuap, the largest island of the Palaus and a volcanic island, by about twenty miles of water. Between, there are only two small islands, Ngaregur and Ngarekelau, just north of Babelthuap, and the large "V"-shaped Kossol Reef pointing towards Kayangel, in the middle of the intervening space. Other reefs extend somewhat north of Babelthuap to the west, particularly, and also to the east. From the hill above Olei at the north end of Babelthuap, Kayangel may be seen as if it consisted of a small islet at the left and a long one to the right (east).

Kayangel is a small atoll, with a north-south diameter of less than three and one-half miles and an east-west diameter of only two miles. The atoll consists of an almost complete circle of reef, with four islets. The latter are all on the east side, occupying a little less than the eastern half of the perimeter. The islets decrease markedly, and somewhat geometrically, in size, proceeding from north to south. The entrance to the lagoon is not very distinct, and is shallow. It is located on the west side a little north of the center, and west of the pier at the middle of the main island. It consists of a sand-bottomed break in the reef a number of yards wide and extending obliquely inward in a northeast direction. It is only one to two fathoms deep at low tide and is dotted with coral heads of varying size, so that passage of craft larger than canoes must be undertaken at very slow speed, and is very dangerous in rough weather. At high tide in good weather a craft of less than one fathom draft can pass over the reef at the south end, one hundred yards west of Gorak Islet.

The lagoon is largely of sand bottom and varies from very shallow to a few fathoms deep. Most of the southeastern one-third of the lagoon is less than two fathoms deep and has large scattered coral heads except in the shallower parts. In some shallow areas east of the center or near the center of the main island stag-horn coral grows on the bottom. Quite a bit of it has been broken by canoes or fishing operations. In the central and northern parts of the lagoon the water is deeper with the coral heads less visible. In the southwestern part the coral heads are quite large and widely separated, and the water a few fathoms deep. In the western part the coral heads are closer and the water shallower approaching the inlet.

The reef forming the atoll is, in general not very wide on the west side, and the water becomes deep rather soon, particularly near the south end. At several points there are large blocks of coral rock which have been washed up onto the reef, and two of these on the southwestern part are even visible at moderately high tide. At lowest tide the reef is visible at a number of points in the different parts. On the east side, seaward of the islets, there is for the most part a fairly flat platform exposed at low tide. It consists of more or less solid coral limestone, marked in part with tidal pools of a shallow nature and with old coral structures generally evident. At some points, particularly near the ends of the islets, masses of coral rocks or gravel have been washed up. The sea bottom slopes off at an initial grade of 10-25 degrees.

The intervals between the islets are rough and rocky, with tilted coral slabs in part, on the seaward side, and sandy on the lagoon side. At lowest tide it is possible to walk between the two northern and the two southern islets largely on exposed sand, with only short distances to wade in shallow water. The route between the two northern islets is over very fine white sand in a large broad arc curving into the lagoon, whereas between the two southern islets it is almost direct but the sand is mixed with coral gravel in part. The water is deeper on the lagoon side between the middle islets, and the distance is greater and there is some coral growth. Near the south end of the lagoon side of the second island (Ngariungs) are some eroded mushroom-shaped blocks of coral rock exposed at low tide, some of which have fallen over.

The east or seaward shores of the islets consist for the most part of fairly narrow sloping beaches of rough coral gravel or accumulations of coral rocks with almost no sand. On the main island, however, there is a higher proportion of sand on the east coast, even to pure sand or only partially mixed with broken coral gravel. The west or lagoon shores of the islets are almost entirely of sand beaches, though the sand is rather coarse and mixed with coral fragments in part. Near the north end of the lagoon side of the second island (Ngariungs) there is an area of solid coral rock, or beach sandstone, mostly of irregular, flat or sloping surfaces, with some up-tilted slabs or boulders. The ends of the islets are more rocky and have narrower beaches. The north ends are largely gravelly. The south ends of the second and fourth islets are largely rocky, that of the main islet is sandy with some rocks or gravel, and the south end of the third islet (Ngarapalas) is largely sandy. There is at least some sand at the north end of the north island.

Kayangel Atoll apparently has a rather wet climate, with an estimated annual rainfall of perhaps 150 inches. The four islets are almost entirely covered with vegetation. This includes about 13,000 coconut palms in the less than one square mile of land area, but also quite a bit of apparently natural vegetation. The human population in 1951 was 124, the village being on the main island. Coconut palms grow on all four islets, but taro, breadfruit and other crops only on the main island, except for a little near the north end of Ngariungs Islet. The altitude above high tide water level is largely from three or six feet except where it is raised a few feet higher by the nests of megapode birds or by artificial coral-slab platforms of houses or graves.

The main island, or Ngajangel, the northernmost, is the largest. It is about one and one-third miles long and about one-quarter to two-fifths of a mile in width, being narrower towards the south end. The pier is located near the middle of the lagoon side. The village extends in a double row of widely spaced houses along a pair of parallel avenues near the lagoon shore for about one-third the length of the island from a little north of the pier to the beginning of the south quarter, where the school and the old cemetery are located. Near the pier and the cemetery there are some very large Calophyllum inophyllum trees with platforms of coral slabs built up around their trunks. Along the beach in the village area are some canoe sheds, including some large ones near the pier, and a number of small copra drying sheds. Along the beach grow Hibiscus tiliaceus, Barringtonia, Messerschmidia, Scaevola, Hernandia, Thespesia and other common strand plants. Behind these tower coconut palms in regular rows, spaced about five yards apart. The palms were planted by the Germans and are about 60 years old and 50-60 feet tall. The trunk of most of them has an orange colored alga growing on the surface. The palms are apparently in good

condition

condition, with fair yields. They grow almost the entire length of the west side of the island, except near the north end. The east half of the island has some younger coconut groves, but they are mostly limited in area and do not reach the east coast. The remaining area is largely of mixed second growth, except for the cultivated areas, and includes some very large trees (one with almost creamy white bark) and some rather dense growth. The north end appears more natural and less disturbed, and has quite a variety of plants. Pandanus tectorius grows along the entire east coast, as well as elsewhere, in places forming rather dense tangles.

In the northcentral, broadest part of the main island are the taro beds, consisting almost entirely of the large false taro (Cyrtosperma chamissonis, "b'rock") growing in large submerged areas. Some small areas of ordinary taro (Colocasia esculenta, "ku-kae") are found nearer the village. Some cassava (tapioca) fields are scattered in patches in yards in the village, and also in clearings in the eastern half of the island. Breadfruit trees and banana and papaya plants grow largely in the neighborhood of the houses, but there are also some in scattered clearings, one even near the southeastern shore of the island, which is largely grown up with very tall weeds. There are a number of lime trees growing in the village, producing a surplus of fruit. Betel palms are rather scarce. A few dwarf coconut palms grow in yards in the southern part of the village.

Just north of the village is the principal water supply for the community. It consists of a pool of slightly brackish water about three yards square, walled by large squared blocks of coral rock. The water is frequently at about the same level as high tide. Toads (Bufo marinus) introduced since the war to control monitor lizards (Varanus indicus), are numerous in the pool and contaminate it by dying in the water or in crevices between the rocks. (The monitor lizards are controlled by feeding upon the toads and being killed by their poison glands.) The introduction was an unfortunate one, since not only do the toads pollute the scarce water supply, but the monitor lizards are predators upon the coconut rhinoceros beetle, recently introduced into Kayangel. The introduction was made because the monitor lizards prey upon chickens, but the coconut palm is far more important to the Palauans than are their chickens. In addition to the above pool there are some smaller, less elaborate pits dug for water, which generally contain a few inches of water.

The second island, Ngariungs, is both narrower and shorter than Ngayangel. It likewise tapers somewhat from north to south. Just over one hundred yards from the north end of the islet is a shallow inlet from the east coast which widens in the middle of the island and reaches to within 25 yards of the western shore. Its floor is partly of coral rock and partly of mud or sand, and it contains a small amount of mangrove, probably all that is found in the atoll. There is a small island (at high tide) near the western edge of the inlet. At low tide the deeper part forms a small brackish lake.

The wide northern end of Ngariungs is largely covered with rather heavy jungle, including some large trees of a few feet in diameter with somewhat buttressed trunks.

Among these were many vines, including Epipremnum pinnatum and Mucuna sp., also birds nest ferns, Asplenium nidus. Not far from the northeast corner there

are some small clearings in the jungle where some false taro, tapioca and squash vines still grow, though poorly tended. At the extreme north end of the islet there is a small tin-roofed shelter and an oil drum which collects the rain water which runs down the trunk of a Pandanus plant. In the shady jungle nests of megapode birds are common, some of them measuring 25 feet in diameter and five feet in height. They consist of sand and bits of worn coral from the jungle floor, after the vegetable matter which incubated the eggs has rotted away. One or two old worn down nests were also seen on the main island. The young birds emerged from one nest on Ngariungs between visits two days apart, in September. The birds were frequently heard in the dense jungle. Other land birds seen were kingfishers (Halcyon chloris teraokai) and the morning bird (Colluricincla tenebrosa). Several monitor lizards were seen.

The part of Ngariungs south of the inlet has fewer tall trees, but is rather densely covered with second growth forest. Coconut palms were limited in number to only about 330 grown palms, of which quite a number have been killed and consumed by the coconut beetle, which reached this islet first, of Kayangel, about 1946. The largest were just west of the inlet, and are all lost. The jungle has grown up around most of the remaining palms, which are seriously affected by the beetle. This islet was inhabited by American troops just before and after the close of the war.

The third islet, Ngarapalas, is again much smaller than Ngariungs, and is separated from it by much more than its own length. It is broad at the north end, where it is largely covered with dense scrub jungle of rather short trees, except on the west side which is partly bare except for rows of coconut palms up to ten years in age. This western part consists of coral gravel. There are some taller coconut palms near the center of the islet and around the cove on the east side. The eastern part of the tapering southern portion of the islet has some low scrub. The northern part of the east shore is of rough coral limestone with loose coral rocks washed up. The southern part of the east coast is sandy, and here high on the beach a large sea-turtle nest was found containing at least 100 eggs. Off of this beach is a large platform of rough coral rock, somewhat uneven in nature, which is largely exposed at low tide and which connects with the last islet.

The southernmost islet, Gorak, is much smaller than Ngarapalas, and close to it. Most of its northeastern half is flat and almost barren, with just a few shrubs and young coconut palms. Some terns and other sea birds lay their eggs among the coral pebbles and drift wood on this open area. Triumfetta procumbens and some low-lying prickly herbaceous vines grow on this portion. Scaevola and a few other plants are also present. The remainder of the islet, roughly rounded, bears about 55 coconut palms mostly about 40 feet in height, besides some younger ones, some of which extend north a short distance along the edge of the beach on the west side. Just a few other shrubs and small trees flank the coconut palms, or are mixed with them. The east and south shores of the islet are covered with piled up coral rocks. Some floating logs from elsewhere have been washed ashore by storms, even to the center of the islet, which is less than 100 yards across. From Ngariungs, Ngarapalas appears to be several times as long as Gorak because it is nearer and more fully covered with tall vegetation. Ngarapalas islet is owned by the chief of Kayangel, and Gorak islet by the second chief.

The northeastern end of Gorak Islet, the southwestern end of Ngarapalas islet, and to a lesser extent the northwestern corner and south end of Ngariungs appear to have been added to since earlier maps were made, as those portions consist largely of coral rocks, rubble and sand. In the case of the former two the material is raised approximately to the general level of the islands. New vegetation is taking root on those situations and to some extent on the point extending towards the sandflats on the northwestern corner of Ngariungs, where the sand is also raised fairly high. The plants involved are mostly Barringtonia, Cocos and some creeping vines including Triumfetta. The common moth Utetheisa was extremely abundant on Gorak islet, presumably breeding on Messerschmidia.

The soils of Kayangel consist largely of coarse loamy sand, sometimes mixed with coral gravel, but in some parts, such as much of central Ngajangel it consists largely of gravel, with or without a thin layer of sand or loamy sand on the surface.

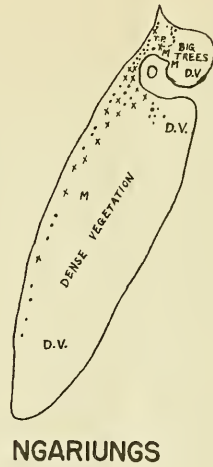
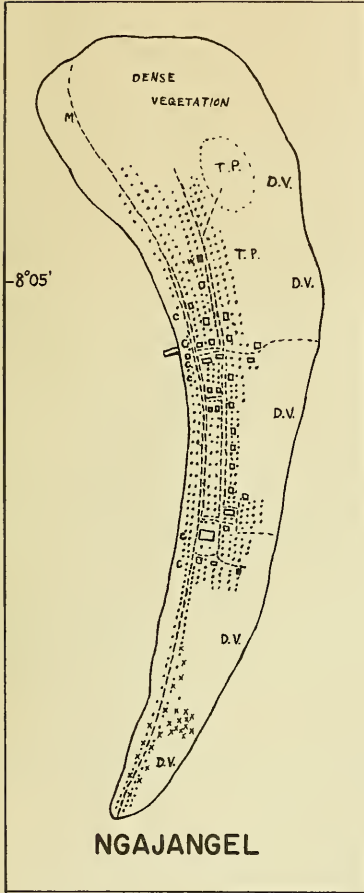
A small rat (Rattus exulans?) is common around stumps or in the small grassy areas between coconut palms on the main island. Examination of four stomachs showed that they fed almost entirely on copra, probably from the drying sheds along the lagoon beach.

The above notes are based on visits to Kayangel Atoll during July 24-25, September 13-17 and November 24-25, 1951. The northeastern corner of the main island was not seen, and its northern tip was seen only at high tide. On the two maps the outer reef outline and outline of main island were taken from A.M.S. W752 (1942, 1943) and the soundings from 64th Eng. Top. En. USAFCPEC No. 1023 (1944) based on H. O. Chart 6074.

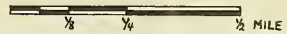
LEGEND FOR MAPS

⊙	Coral heads
HHH	Edge of coral reef
YYY	Staghorn coral
===	Solid reef limestone
1 3/4	Soundings in fathoms
⊙	Sand exposed at low tide
⊙	Coral gravel
%%	Loose coral rocks
ww	Beach sandstone
D. V.	Dense vegetation (semi-natural)
T. P.	Taro pits
M.	Megapode nests
:::	Coconut palms
x x	Coconut palms killed by coconut rhinoceros beetle
w	Well
□ □	Houses, a-bais or school
----	Paths
===	Main avenues

ISLETS OF KAYANGEL ATOLL



8°02'30"



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