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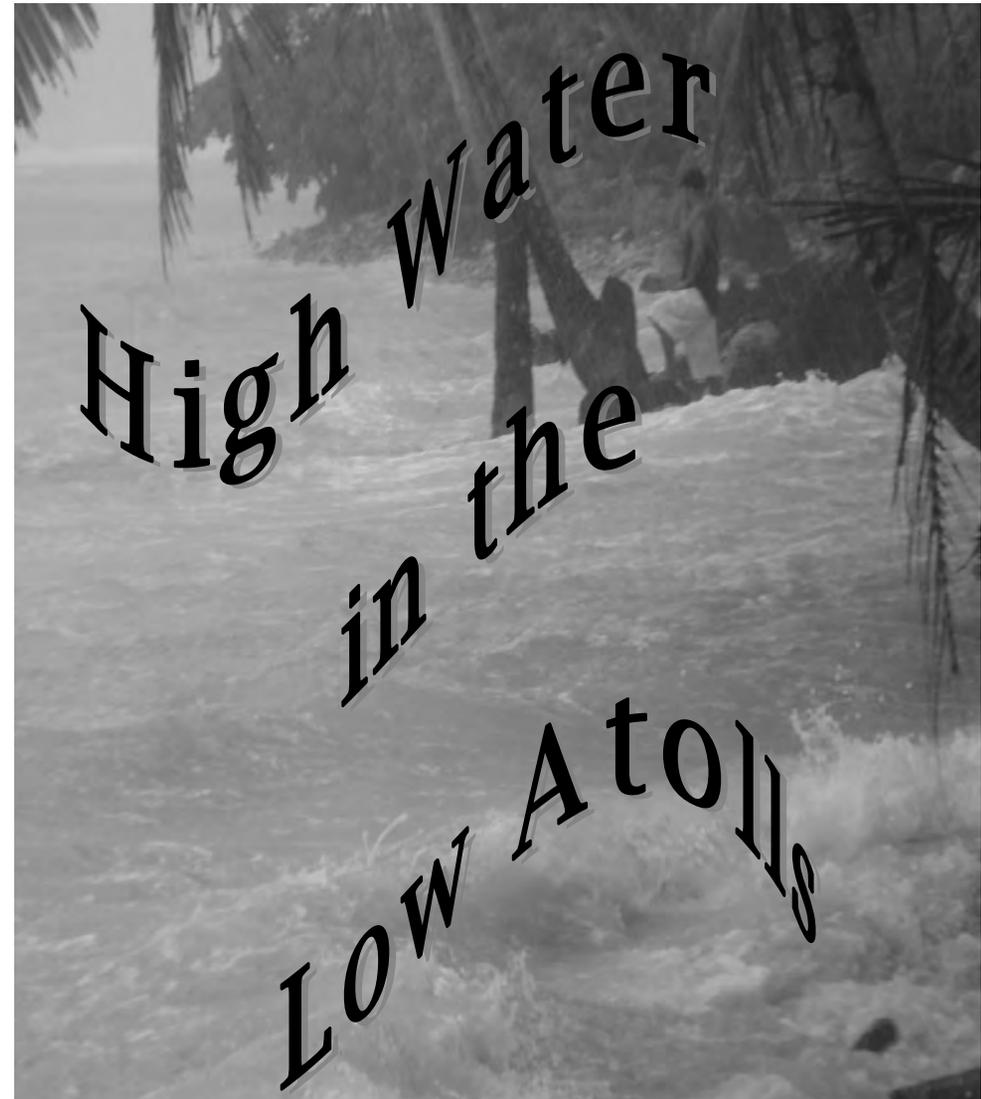
Part 5: History of Micronesia

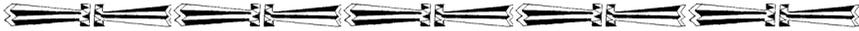
"March Toward Self-Government"



The election of President Kennedy in 1960 signaled a profound change in US policy in its Trust Territory, beginning with a focus on education and health services. As the budget increased, the list of government employees expanded. So did the population of the district centers, along with the problems these towns faced. Meanwhile, the quest for an economy to support all this growth continued without any real results. The Congress of Micronesia

offered new leadership roles and a vision of full self-government, as the islands moved closer to political autonomy. But this same body also revealed the fissures in an area that had been unified for a century under foreign rule.





Introduction

In recent years, islands in the Micronesian region have suffered serious damage due to wave surges, salt water flooding, and drought. While shoreline erosion is a common and increasingly serious impact, a more insidious one has to do with the salt water damage to agricultural crops.

Most recently, it has been the high waves that have commanded the attention of island inhabitants, some living on atolls that are barely eight feet above sea level. From November 2007 through March of the following year, the region experienced exceptionally high tides, causing shoreline erosion and heavy loss of local crops. The high tides, as high as 20 inches above normal, were attributed to a La Niña effect in which sea levels rise as water temperatures increase and the easterly trade winds become more intense than usual. A year later, in December 2008, wave surges were again felt throughout the area—this time in the Marshalls as well as in FSM. The abnormally high tides



Water damage along the shoreline of Kosrae



plants more salt tolerant. This type of genetic engineering can be and is being done, but it has proven to be a controversial issue. In this day in which natural food has come to be so honored, do we wish to buy into such engineering? Further, if sea levels continue to rise, might any of these efforts only be temporary?

At present, many are looking to quick fixes to solve the problem of taro loss in the atolls. Small aid packages are being gratefully received from countries like Australia, China and Japan, but these are emergency measures to provide for immediate needs. Our leaders must think beyond this. Unless we are willing to simply write off our outer islands, we must all be engaged in active planning on short and long-term strategies for the islands. This is essential if we hope to preserve the viability of life in the atolls that are so dependent on the crop that is being threatened.



Catching fish where none should be found: boys from Lukunor displaying fish caught in the taro patch inland.

buttruss the case for rapid global warming can appreciate the need to curb our use of fossil fuels, if only because we are quickly running out of them. The discussion of these broader issues is necessary and useful, but it will certainly entail a long and drawn out debate.



Concrete taro bed in the Outer Islands of Yap

Meanwhile, we in the Pacific will have to spend less time spinning out our apocryphal visions of total submersion of our atolls to focus on the immediate business at hand. The problem of endangered resources is not something to contemplate in the future; it is upon us now. To the populations of the Micronesian atolls it is much more pressing than the receding shorelines and debris-strewn roads and causeways caused by high tides and wave surges. Without taro the atoll populations will have lost their most dependable food resource. We simply don't have the luxury of waiting until we have settled the global warming question to address this issue. It is affecting us now.

There are means of protecting taro against saltwater incursion, but the concrete beds that will do so are not cheap to make. An alternative is to genetically modify taro to make the



Tidal surges sweeping over Lukunor in the Mortlocks

and wave damage, although confined to two or three weeks this time, did even more damage than a year earlier. This is because the effect of the high tides was compounded by 12 to 15 foot wave swells generated in a storm area east of the Marshalls.

Some Micronesians are beginning to wonder whether they can expect high tides and wave surges as an annual Christmas gift from Mother Nature, with a drought thrown now and then for good measure. Scientists explain the timing of the wave event as a result of the stronger gravitational pull of the moon at this time of the year, when the moon is at its closest point to the earth and tidal effects the greatest. To make matters worse, the earth was recently closer to the sun than in any point in an 18-year cycle. This only added to the gravitational pull, hence the size of the tides.

Perhaps the confluence of these events adequately explains the high tides and the wave surges at the end of 2007 and 2008, but is there a trend developing? The President of



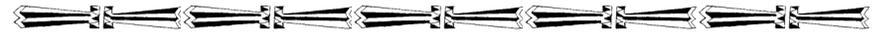
Kiribati, an island nation that is complaining of rising sea levels and seepage of saltwater into its water lens, foresees the day when his people will be forced to move from their atoll homes to higher land elsewhere. Today Pacific Island leaders are taking to the pulpit ever more frequently to warn of the dangers that climate change could work on their vulnerable islands. Some feel that events such as those that Micronesia experienced at the end of 2007 and again at the end of 2008 are omens of what's to come unless the world adopts a much more protective approach toward the environment, decreasing fossil fuel emissions, among other things. There are those who warn of the threat of submerged islands in 20 years, 40 years, or by the end of the century.

Whatever its cause, the damage is real and people who depend on these crops are harmed.

Can these wave surges and high tides simply be ascribed to the confluence of causes having to do with orbital cycles of the earth, moon and sun? Or is there something more ominous at work here? Whatever cause we ascribe to these recent events, it is incontestable that the wave surges and high tides did serious damage to features of the islands and to important food resources, especially taro, in the coral atolls. Whatever its cause, the damage is real and people who depend on these crops are harmed.

Salt Water Intrusion in 2007

Even before the December wave surges, Micronesia was already suffering because of salt water inundations of several atolls. These were not wave related, but instances where the sea rose, flooding areas, sometimes for several hours. Meanwhile other atolls were suffering from a prolonged drought.



intercensal period. As the atoll population of FSM was registering a net gain, the more remote atolls in the Marshalls (ie, all atolls outside of the population centers of Majuro and Kwajalein) were also growing in population. Although the gains were not as great as in the centers, it is clear that atoll people are not quite ready just yet to pack up their belongings and catch the next ship to town.

The problem of endangered resources is not something to contemplate in the future; it is upon us now. To the populations of the Micronesian atolls it is much more pressing than the receding shorelines and debris-strewn roads and causeways caused by high tides and wave surges.

Short of adopting forced evacuation as a solution, then, the larger community will have to help the atoll people find ways of dealing with their problems.

What Kind of Action?

The saltwater damage to taro on low-lying coral islands inevitably raises larger environmental questions that are being widely debated today. Is this yet another effect of the general sea level that is ascribed to global warming? Those who would argue that it is can use this as another bit of evidence to make their case that the only true solution to these problems lies in worldwide reform of our prodigal ways. We must learn to control carbon emissions by curbing our reliance on fossil fuels. Even those who remain unconvinced by the scientific evidence amassed to

ship repair and fuel rise. Because of the reduction in government supported ship traffic, the atolls are now returning to a level of isolation not seen in decades. With the decline of the copra industry, atoll dwellers lost an important source of cash, although some would argue that remittances from relatives who have migrated to the US have more than compensated for the loss of this income. Finally, governments are more hard-pressed than ever, because of the financial constraints under which they operate, to deliver quality education and health services to those who live in remote areas. As people ponder their future, the threat of loss of their backup food resource is only one of the many factors they must take into account.



Shoreline erosion on Eauripik,

There is no demographic evidence to suggest that people in the atolls have abandoned their homes in any substantial numbers. The overall atoll population in Yap State dropped by 500 between 1989 and 2000. At the same time, however, the outer island population on Pohnpei grew by more than 100, while that of the atolls in Chuuk expanded by 1,500. Indeed, five of the atoll populations in Chuuk doubled during that 11-year



Water damage to a store in Kosrae

After the early wave surges in December, unusually high tides continued to inundate some of the islands through the following two months. Many coastal areas, even on the high islands, were flooded, resulting in damage to roads and public utilities. Kosrae, for instance, suffered infrastructural damage, some shoreline erosion and loss of coconut trees. There was also damage to 18 homes on the shoreline, six of which were all but destroyed. With the erosion of an average of 10-15 feet of shoreline, moreover, many other homes are now only a few feet away from the shore and are exposed to waves during even moderate high tides. Fortunately, there was little crop damage done on Kosrae since most of the taro patches are located well inland.

Serious damage on other high islands was mostly limited to some coastal erosion. Chuuk and Yap suffered taro crop damage in their low-elevation coastal fields. Woleai in Yap State suffered serious damage to the seawall that protects its airstrip and the seawall that was built to protect the high school on the island.

In the outer islands of Chuuk, in which 13,000 people or one-fourth of the state population resides, an estimated 90 percent of all taro was destroyed.

But the major damage was to taro crops in the outer islands of Chuuk, Pohnpei and Yap. In the outer islands of Chuuk, in which 13,000 people or one-fourth of the state population resides, an estimated 90 percent of all taro was destroyed. In Pohnpei State, taro damage was heaviest in the outliers of Kapingamarangi, Nukuoro and Sapwuafik, where 90-100 percent of taro was destroyed. In Yap State two outer islands were especially affected: Falalop, Ulithi, where 90 percent of the taro was lost, and Falalop, Woleai, where an estimated 75% was destroyed.

By the end of the three-month period of high tides and wave surges, the FSM government declared a national state of emergency and conducted a joint FSM-FEMA assessment of the extent of the damages.

Wave Surges in 2008

The following year, in early December 2008, the wave surges struck again, this time affecting atolls in the Republic of the Marshalls as well as in FSM.

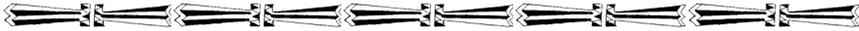
Even if the resources can be found to protect taro adequately from saltwater intrusion for now, will future weather patterns ensure enough rainwater to flush the salinity from taro beds? Will wave surges and high tidal events continue, making any mitigation efforts only temporary?

It is clear that atoll people are not quite ready just yet to pack up their belongings and catch the next ship to town.

Perhaps the larger issue is whether life in the remote atolls remains viable in today's world. Fear of inundation of their islands as a result of climate change is simply one of the problems atoll populations face today. There are many more immediate challenges that inhabitants of these islands must confront. Ship service from the population centers to the more remote atolls has already become more unpredictable as costs of



Flood waters on the main road of Kosrae



The Plight of the Atolls

People in some of the outlying atolls have taken steps to protect their taro from saltwater intrusion. Some, especially on the high islands, have constructed cement block walls to keep water out, but the cement is porous and seawater moves through it and around it. In a few of the neighboring atolls of Yap, raised beds have been built for taro planting. This does a good job of distancing root systems from salt water contamination. Other outer islands of Chuuk have lined some taro beds with concrete. This measure offers good protection to taro from saltwater seepage from below. The problem with this approach, of course, is the initial expense of transporting cement and constructing the beds and the limitations on the size of the taro bed. Most are under 20 feet in length, although a few extend to as long as 100 feet.

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In other atolls, however, residents steadfastly continue pit cultivation, with their crops showing the signs of salt toxicity, and minimal success.

Are the people of these atolls willing to consider changing their cultivation practices? Can they afford to build enough of these concrete beds to guarantee them enough taro to see them through periodic disasters such as the wave surges they've suffered from for the past two years?



Wave damage was extensive in the outer islands of Yap. On the small island of Eauripik waves uprooted coconut trees along the shore, destroyed seawalls, and washed away some of the foundations of a men's house. Similar damage was reported in other outlying atolls in Yap, including Satawal, Lamotrek, Elato, Fechaulap, Piig, Ifaluk, Woleai, and Ulithi. Every outer island reported severe costal erosion, with water washing over parts of the island and heavy debris pushed as much as 400 feet inland. Sea walls were destroyed, homes and private property damaged, and, worst of all, salt water intruded into many of the islands' taro patches.



Shoreline erosion on Eauripik

Majuro and Kwajalein in the Marshalls were also affected by the wave surge. When the high waves struck Majuro, some 350 people were reported to have fled their homes and taken refuge in another part of the island. There was some damage to homes, but a more serious concern was the debris and garbage washed ashore in many places, leading to sanitation and health concerns. On nearby Arno, the wave surges forced 130 people to evacuate their homes because of flooding. On Ebeye, the

causeway running to the islets to the north was flooded and made impassable by the debris scattered by the waves. Other atolls also reported flooding.

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Some of the high islands also incurred damage, as the waves destroyed breadfruit and coconut trees along the coast and eroded the shoreline. Kosrae, as in the previous year's weather events, seemed to be affected more than the other high islands. Two homes there were destroyed, 13 greatly damaged, and another 13 sustained minor damage. As before, there was minimal food loss.



Cookhouse damage in Lelu, Kosrae



Damaged taro pit in Eital, Mortlocks

five-year recovery period is needed, assuming no further saltwater intrusion takes place. Yet, people on several of the islands surveyed last year spoke of saltwater damage occurring in consecutive years, so that the taro is not able to regenerate properly. Moreover, the restoration of health to taro patches depends on normal rainfall during the year, but survey teams found that drought conditions existed in some of the islands they visited. Consequently, people in many islands complained that the swamp water has been becoming more saline over the past ten years, contaminating the patches from their lowest part out to the edges.

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Coastal erosion on high islands is ecologically unfortunate and leaves homes and other buildings more exposed to the elements, but it does not threaten the livelihood of the population. Taro damage does.

Saltwater intrusion in taro patches may occur in any of these three ways:

- Wave surges, which bring salt water and debris inland, often flooding agricultural areas, and which also causes shoreline erosion.
- Overtopping, which comes in the form of rising seas, and not necessarily accompanied by large waves. Water may inundate areas for hours at a time.
- Drought, which tends to make the fresh-water lenses under the islands shallower (by evaporation, plant activity and human consumption from wells), bringing salt water up closer to the surface, where it is more likely to impact crops that have roots projecting below the surface.

All these types have the same result, especially on crops – the soil is infused with salt water, effectively killing plant life. When this happens, the center leaves of the taro plant curl and the stalk and outer leaves brown as the corm rots. This is exacerbated on those islands that practice their agriculture in pits. Pits not only trap and concentrate any surface water (good and bad), but also position plant roots closer to the underlying salt water.

When taro is lost to saltwater intrusion, normally two years of rainfall are required to flush out the saline contamination. This would be followed by a two to three year period for taro growth from initial planting to harvest. Hence, a

Again, the most serious damage done by the wave surges was to the taro patches in the low-lying atolls. In four of the outer islands of Yap (Ifalik, Elato, Lamotrek and Satawal) the taro crop was all but completely wiped out, while in two other islands (Woleai and Fechaulap) taro suffered very severe damage. Elsewhere in the atolls of Yap, there was less damage recorded.



Saltwater-damaged taro in Ettal, Mortlocks

In Pohnpei State, the hardest hit atolls were Kapingamarangi and Nukuoro. The other three atolls escaped without serious loss of taro, although they did lose an average of 50-100 coconut trees in each place. Kapingamarangi sustained the most severe damage to its food production system, losing 80 percent of its taro due to flooding in addition to an estimated 80 percent of its breadfruit trees. In effect, then, the island lost the equivalent of four-fifths of its total local food resources in the wave surges. Nukuoro, a nearby atoll, lost just about the same percentage of its total taro and breadfruit.

The outlying atolls of Chuuk State, as before, were the hardest hit by the wave surges. According to assessment reports of the damage, taro loss ranged from nearly total on some islands (Ettal, Satawan, Ta) to very extensive, with three-fourths destroyed, on others (Moch, Kuttu, Namoluk) to about half lost on others (Oneop and Lukunor). As in Kapingamarangi and Nukuoro, breadfruit trees were also seriously damaged. Reports on the damage in the Namonuito Islands and the Western Islands were not as detailed as those for the Mortlocks, but they suggest that the taro crop was virtually destroyed in these island groups. Murilo, the most populous atoll in the Hall Group, also sustained severe damage to its food supply. The assessment report concludes: "The outer islands of Chuuk have essentially lost their swamp taro resource."

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By late December both FSM and the Republic of the Marshall Islands had issued declarations of a state of national emergency. As local efforts were made to assess the damage done by wave surges, larger nations offered relief funds to help. But the key questions lingered: Is this problem of our own making? Can we expect this to happen again? If so, what steps can be taken to minimize the damage next time?

Taro Crop Damage

Of all the damage that has been done to the islands, the most alarming has been the destruction of taro. Coastal erosion



Interior of a rotten taro plant

on high islands is ecologically unfortunate and leaves homes and other buildings more exposed to the elements, but it does not threaten the livelihood of the population. Taro damage does.

Taro, a common food in Micronesia, is sometimes referred to as the "potato of the Pacific." Breadfruit is the preferred food in most of Micronesia (with Palau and mainland Yap being notable exceptions), but it is a seasonal crop, ripening only two times a year. Unless breadfruit is preserved, it is available for only six or seven months a year. Taro is the fallback crop for the rest of the year, offering a continuity of food across the seasons. Of the several different varieties grown in Micronesia, the most common is giant swamp taro (*Cyrtosperma*).

Taro is grown across FSM in lowland swamp areas. Taro is propagated by replanting portions of the corm. Under ideal conditions, the taro can be harvested about two to three years after planting. Yet, the location of taro patches in lowland swamps makes it especially vulnerable to damage from saltwater, which can destroy the plant.