

Tuhke Koaros mie Koasoaiepe de Poadope

Amy Eisenberg^{1*}, John Amato², Ringlen Wolphagen³

¹The University of Arizona, Center for World Indigenous Studies Associate Scholar 11848 North Labyrinth Drive Tucson, Arizona 85737 USA

²Photography by John Amato RN

³Translation of title by Ringlen Wolphagen

***Corresponding author:** Amy Eisenberg, The University of Arizona, Center for World Indigenous Studies Associate Scholar 11848 North Labyrinth Drive Tucson, Arizona 85737 USA.

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Abstract

“Tuhke koaros mie koasoaiepe de poadope”- “Every tree has a story” (Figure 1), Pohnpei Director, National Archives, Culture and Historic Preservation at the Federated States of Micronesia National Government, Rufino Mauricio once told me.



Figure 1

While planting a memiap, Carica papaya L. tree in the Caricaceae on Pohnpei at Ohmine Elementary School with students and teachers (Figure 2), my Pohnpeian colleague Randall Harry casually removed his shoe and a handsome centipede crawled out. “They never harm me”, he said calmly, “Centipede, Meninrahn is my clan.”



Figure 2

The volcanic 344 km² western Pacific island of Pohnpei is situated at 6° 54' N longitude and 158° 14' E latitude, north of the Equator in the Eastern Caroline Islands. Steep, rugged and mountainous, Pohnpei is surrounded by mangrove swamps, naniak with an average annual rainfall of 190 inches (4800 mm). As one of the wettest places on earth, its tropical climate, high rainfall and deep volcanic weathered soils support a rich floral diversity. There are more than 935 vascular plant species on Pohnpei, of which, 397 are indigenous and endemic. For more than a hundred years, Pohnpei has been a center for agricultural experimentation and plant introductions in Micronesia.

Keywords: Pohnpei, Micronesia, Traditional Medicine, Agriculture, Agroforestry.

While serving as Sustainable Agriculture and Agroforestry Researcher at the College of Micronesia on the remote volcanic island of Pohnpei (Figure 3), I was attacked by a large and aggressive woman whose Caucasian husband, my supervisor was misappropriating United States Department of Agriculture monies and supplies. My Pohnpei colleagues and I reported that the “leadership” was “cooking the books”!

My wrist was significantly impacted in the assault and the diagnosis was a triangular fibrocartilage complex injury. Serendipiti-

tously one afternoon, I met honorable Pohnpei traditional healer, Sounwini Lepen Lison Leon Aldis when he was sustainably collecting medicinal plants and reciting prayers in the tropical forest of the beautiful mountainous island (Figure 4). He prayed for my healing and for justice to be served. Sounwini Lepen Lison Leon Aldis invited me to his home where he and his lovely wife, Lampein Leilani (Figure 5) worked tirelessly helping people to heal any hour of the day or night. Their home was open to those in need of healing and all were welcome (Figure 6).



Figure 3



Figure 4



Figure 5



Figure 6

Sounwini Lepen Lison Leon Aldis prepared and administered healing plants to treat my injury and trauma (Figure 7). I was placed under an umwulap with steaming medicinal herbs (Fig-

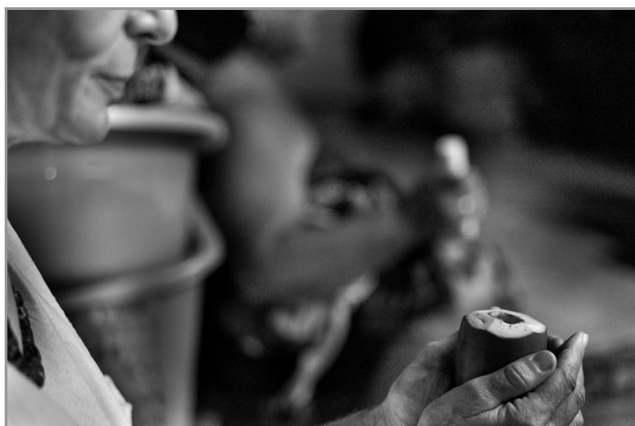


Figure 7

The strand vegetation, ni oaroahr medicinal shrub, remek, *Scaevola taccada* (Gaertn.) Roxb. in the Goodeniaceae grows near the rocky shore where it experiences salt spray, high winds, heat and sunlight [1, 2]. Remek has white flowers, which are added to nih, *Cocos nucifera* L. oil as perfume, and its large leathery spatulate leaves are chewed and the bitter juice is squeezed out and drank [3]. A Pohnpei elder informed me as he gathered the leaves along the shore for health. The buds are squeezed into the eyes to purify the eyes, cleansing them of debris and for treating eye problems. For conjunctivitis, the white fruits are squeezed into the eye until better. Diabetes is prevalent on Pohnpei and to treat type II diabetes, several young remek leaves are boiled in water and consumed until better [4].

Dipwoapw, *Terminalia catappa* L., in the Combretaceae is a medicinal tree originating from India whose native range is Madagascar, Tropical and Subtropical Asia to the Pacific. The seed kernel of the fruit is eaten as food when ripe. The flowers

ure 8). Pohnpei has an extensive pharmacopoeia and Sounwini Lepen Lison Leon Aldis was a highly skilled and well-respected traditional healer. His memory is a blessing.



Figure 8

are greenish-white and the fruits are green ripening to yellow, containing an edible nut within that tastes like an almond. Dipwoapw bark is administered to treat diarrhea on Pohnpei. The leaves possess strong antibacterial and antifungal properties [5, 3, 2]. Kapingamarangi expert, Karmy Hicks informed us that the “Ghost Tree” is sometimes associated with spirit.

Sakau, *Piper methysticum* G. Forst., in the Piperaceae, (Figure 9) is the sacred root on Pohnpei that is shared ceremonially with the greatest reverence and respect. Sakau is higher than the highest paramount chief or any living being or ancestral spirit on the island. Sakau defines the cultural identity of Pohnpei and it has been cultivated extensively in the upland forests of the volcanic island. Sadly, because of its high demand, the upland forests on Pohnpei have become depleted and the watersheds impacted by erosion as a consequence, therefore sakau farmers are strongly encouraged to “grow low” in the cultivated lowland agroforests.



Figure 9

Sakau is of divine heavenly origin according to Pohnpei stories and teachings, and all Pohnpeians acknowledge its extraordinary powers [6, 4]. Sakau is used diversely in traditional healing and its preparation involves squeezing the freshly pounded roots with a press of the inner bark of kolou, *Hibiscus tiliaceus* L., in the Malvaceae, on a special basalt stone slab (Figure 10).

Throughout the Pacific islands, Pohnpeian sakau is unique as it contains the thick slimy consistency of kolou, *Hibiscus tiliaceus* tree sap. The brown mucilaginous fluid of the sakau and kolou inner bark strip press is squeezed into a coconut shell cup and shared. "Happiness permeates the space where sakau is being consumed" [4]



Figure 10

The fresh green fruit of the palm, pwuh, *Areca catechu* L., in the Arecaceae, betel nut is chewed with powdered slaked lime (calcium hydroxide) prepared from fresh coral or clam shell, wrapped in kapwoi, a *Piper betle* L. leaf. Sometimes, tipaker, *Nicotiana tabacum* L., in the Solanaceae is added. Lee et al. noted that prolonged chewing of pwuh, *Areca catechu* results in significant toxic alterations in the mouth, upper digestive tract and the intestinal epithelial cell lining. Laboratory and clinical studies reveal that betel nut acts synergistically with tobacco to produce oral cancer.

Mwahng, *Cyrtosperma merkusii* (Hassk.) Schott, in the Araceae is giant swamp taro. It is among the most culturally important

food plants on Pohnpei and the outer atolls along with breadfruit, bananas, yam and coconut. The hardy mwahng is regarded with great reverence as the staff of life for outer island peoples and its corms are quite large (Figure 11). There are numerous distinguishing cultivars of mwahng on Pohnpei and the outer atolls. It is rich in essential minerals, vitamins and fiber for maintaining excellent nutritional health, enhancing food security and a sustainable environment. As the other taro species, it is available all year round and can withstand strong winds and hurricanes, dry atoll climates and sandy saline soils. Mwahng can remain in the soil for fifteen or more years and still be edible. The genetic diversity of taro cultivars on Pohnpei and the outer atolls is truly remarkable [7].



Figure 11

Sawahn awai, *Xanthosoma sagittifolium* (L.) Schott, and sawa, *Colocasia esculenta* (L.) Schott, in the Araceae are also important species of taro on Pohnpei. The nutritious corms are boiled and consumed. The red-stemmed sawa has been used exclusively for treating sting wounds from a stingray, likendinikep. The roots are wrapped in cloth, soaked in water and placed on the wound to relieve pain and draw out the poison. *Colocasia* corms have antioxidant and anti-inflammatory properties. Native to South America, *Xanthosoma* was reported to have been brought to Pohnpei during the Japanese occupation however Ragone et al. indicated that the period of its introduction is not known. Ohd, *Alocasia macrorrhizos* (L.) G. Don var. *macrorrhizos* is believed to be the second oldest food on Pohnpei [8, 9]. Its large leaves are used to cover the traditional uhmw for cooking and to line the ground around the sakau stone [10, 4].

As Sustainable Agriculture and Agroforestry Researcher at the College of Micronesia, I worked cooperatively with government and non-governmental organizations toward improving health and nutrition on Pohnpei where vulnerable populations experience diabetes, hypertension, obesity and dependence on inferior imported food, as a stark and grave reality. We provided

agriculture, agroforestry, public health, eye care and veterinary resources to outer island communities and enhanced conservation of aquatic ecosystems, vital marine resources, addressing the significant impacts of climate change on small island nations. Crops are affected by erratic climatic events, disease and drought.

We celebrated World Food Day, Rahn en Soumwet en Pohnpei. United Against Hunger, Miniminpense Sewese Pereh Duhpek (Figure 12), in the historic Pwunso Botanical Garden and conducted community-based natural resource management and organic agriculture and agroforestry for improving human and environmental health, nutrition and food security on Pohnpei and the outer islands. We documented and addressed climate change through partnership approaches for safeguarding against climate impacts and gleaned a greater understanding of the challenges facing Pacific peoples, and the magnificent biodiversity of tropical island ecosystems. We promoted conservation of coastal and terrestrial ecosystems, indigenous resource management, invigorating the economy and supporting traditional agriculture and agroforestry. I studied with Pohnpei traditional plant healers and experts.



Figure 12

We practiced, trained, and shared seeds, seedlings, saplings and knowledge in sustainable organic farming and the preservation and enhancement of indigenous plant genetic resources. We investigated, cultivated and disseminated underutilized plant and tree species for enhancing sustainable diversified agriculture, agroforestry, nutrition and health. I collected, presented and distributed nutritious fruits and other plant products and propagated fruit tree saplings and seeds of economically significant woody perennials.

Many economically viable trees in Kolonia's Pwunso Botanical Garden's living collection are aging, rotting and not well maintained therefore we shared transplanted saplings and seeds for gardeners, farmers, schools and communities and created an arboretum of economically significant trees at the Agricultural Experiment Station in Palikir at the College of Micronesia. More than 433 new plants and trees have been introduced to Pohnpei in the past 150 years altering the natural environment and contributing

to its subsistence and cash economy. The center of introductions was the former Agriculture Station, which is the Pwunso Botanical Garden. Plants were brought to Pohnpei from 33 different islands and countries. The Pwunso Botanical Garden's diverse trees and plants are a national treasure, which represents what was once the finest collection of economic and useful plants in the Pacific. May its 100-year legacy and germplasm be preserved [9].

Weipwul, *Morinda citrifolia*, L., in the Rubiaceae is a large medicinal shrub or medium sized tree of the low coastal coral island forests of Pohnpei. It has large, deeply veined, glossy ovate leaves and small white flowers. The pungent edible fruits, flowers, terminal buds, leaves, stipules, bark, and roots have many diverse healing applications. Traditional stories indicate that weipwul was the first food on Pohnpei. Before there was breadfruit, mahi, *Artocarpus altilis* (Parkinson) Fosberg, and meipa, meikole, *Artocarpus mariannensis* Trécul, weipwul was presented

to the chiefs during feasts [11]. The fruit extract of weipwul contains potent antioxidant compounds and antibacterial [5]. Small fruits and buds are used topically to bring down fever. Weipwul is taken nasally for migraines and it soothes aches and pains. The terminal buds are applied for abscesses and the stipules are employed in treating wounds caused by scorpion fish. This woodland species' root bark yields a red pigment used for dyeing [3].

“Wein pein eni”- Fruit of the gods. Breadfruit grows freely and is available to everyone. – Pohnpei saying [8]. The fruits of mahi, *Artocarpus altilis* (Parkinson) Fosberg, and meipa, *Artocarpus mariannensis* Trécul in the Moraceae are prepared as food on Pohnpei. They are rich in carotenoids, Vitamin C, protein, thiamine and dietary fiber [2]. The breadfruit tree collection in the Pwunso Botanical Garden is a valuable plant genetic resource that should be judiciously conserved, researched and maintained [9]. Stan from Yap explained that the dried androecium of *Artocarpus* is lit as a mosquito coil.

An extremely aggressive invasive species on Pohnpei is *Spathodea campanulata* P. Beauv., *dulip en Aprika* in the Bignoniaceae family. Native to West Africa, this fast-growing tree forms thickets and suckers competing with Pohnpei native plants for space, light and nutrients. *Dulip en Aprika*'s large orange-yellow flowers give rise to reddish brown seedpods with several hundred thin papery winged seeds that are widely dispersed by wind. It is quite difficult and challenging to control the establishment of this species however young trees can be pulled or dug out. Islands are highly vulnerable to biological invasions thus some introduced species on Pohnpei have caused tremendous loss in biodiversity and the degradation of natural ecosystems [12].

The fast-growing invasive aromatic perennial shrub, *sakau likamw*, *Piper auritum* Kunth, in the Piperaceae is under eradication on Pohnpei. Native to Mexico, the Guianas, Ecuador and other countries in Central and South America, it grows on Pohnpei in thickets in the forest understory and on cleared land along with the traditional and deeply significant and sacred *sakau*, *Piper methysticum*. *Piper auritum* is quite difficult to control as it spreads by suckers and the roots break when pulled [10].

Another fast-growing invasive perennial shrub, *limemeirpwong*, *kehsapahl*, *Mimosa diplotricha* C. Wright ex Suavalle var. *diplotricha*, in the Fabaceae is native to Brazil [2, 1]. It forms dense thickets of spiny tangled stems that can trap animals and injure humans on Pohnpei. During the dry season, it is a fire hazard and the seeds that are dispersed by animals and water, remain viable in the ground for many years [10].

Wisolmat, *masikisik Chromolaena odorata* [2, 1] in the Asteraceae is a noxious weed in the lowlands of Pohnpei. The invasive native perennial of Tropical America with an extremely fast growth rate and prolific seed production is found in forest clearings, along roadsides and open disturbed areas of the island. It is toxic to animals and is a potential fire hazard during the dry season [10].

Risiel, *Clerodendrum paniculatum* L. in the Lamiaceae is native to India and Southeast Asia. It is an invasive ornamental perennial shrub with large heart-shaped leaves and a pyramidal

shaped inflorescence. The colorful flowers are used to create *mwaramwar* (garland or lei) and to decorate houses [2, 10].

Dihng, *Cheilocostus speciosus* (J. Koenig) C. D. Specht, which is a synonym of *Hellenia speciosa* (J.Koenig) S.R.Dutta in the Costaceae is a tall invasive herbaceous perennial that is native to Malaysia [1]. It grows in disturbed areas along roadsides and in the understory of forests on Pohnpei. This plant is used in making *mwaramwar* and to treat *karakar* (high fever) [2, 10].

Aipikohrd, *Coccinea grandis* (L.) Voigt [1], in the Cucurbitaceae is native to Africa, India and Asia. It is an extremely aggressive perennial gourd vine that produces white stellate flowers and smooth red fruits. *Aipikohrd*, which was introduced for food and medicine, smothers native vegetation and is under eradication on Pohnpei [10].

Okira, *Abelmoschus esculentus* (L.) Moench, in the Malvaceae is an annual cultigen; a plant that has been altered through selective breeding. It is cultivated successfully on Pohnpei and its mucilaginous green fruits are rich in pectin, iron and calcium, and are a quality source of fiber and nutrients for the people.

Chaya, *Cnidoscolus chayamansa* McVaugh is a synonym of *Cnidoscolus aconitifolius* subsp. *aconitifolius* Breckon in the Euphorbiaceae. It is an arborescent shrub with milky latex, large palmately lobed leaves and white flowers that is native to the Yucatan Peninsula of Mexico. It is cultivated on Pohnpei for human and animal consumption. Its young leaves and shoots are cooked and eaten in soups. The whole plant is fed to pigs. *Chaya* is a nutritious leafy green vegetable that is high in protein, fiber, vitamins and minerals [13, 2].

Duhrien, *rawahn*, *manka*, *Pangium edule* Reinw. in the Achariaceae is an evergreen tree whose native range is Nicobar Island to the Western Pacific and Southeast Asia. It grows in forests on Pohnpei and bears large, edible sweet fruits with yellow flesh that are rich in provitamin A and other carotenoids [2]. I brought some to share on World Food Day - *Rahn en Soumwet en Pohnpei*. United Against Hunger, *Miniminpense Sewese Pereh Duhpek*, and they were well received (Figure 13). The seeds are used to trap and poison wild chickens on Pohnpei, however the seeds can be processed for consumption and have an almond-like flavor.

The fruit of *kipar*, *deipw*, *Pandanus tectorius* Parkinson ex Du Roi, in the Pandanaceae is a valuable indigenous Micronesian atoll food. The small to medium sized tree has aerial roots and stiff sword-shaped leaves that are barbed along its leaf margins and on the adaxial midribs. Its apetalous fragrant flowers are in a compact sessile head, and the aggregate fruit is large and bright orange (Figure 14) [5]. Fruit segments are an excellent source of provitamin A carotenoids, niacin, iron, thiamin, riboflavin and Vitamin C with a high content of lutein and zeaxanthin [2]. There are numerous pro-vitamin A and carotenoid-rich *Pandanus* cultivars that should be promoted for their significant health benefits because Vitamin A deficiency is a serious health problem in the Federated States of Micronesia [10]. Some *Pandanus* species are cultivated for their large, sweet and juicy edible keys, fragrant flowers, useful leaves and stilt roots that are used as a building material [1]. *Pandanus* roots and leaves are applied as medicine for curing the sting from a *likendinkep*, stingray [5, 14].



Figure 13

Mwoakil indigenous expert, Emihner Johnson of Island Food Community of Pohnpei and Lihn Mwoakilloa – Women’s Group of Mwoakilloa, are deeply committed to restoring and preserving the kipar, deipw cultivars on Mwoakilloa atoll. They proposed to vegetatively propagate kipar, deipw cultivars along the shoreline of their small atoll. Kipar, deipw cultivars are well adapted to the saline, sandy and coralline soils of Mwoakilloa, where agricultural production and provision of a nutrient-rich diet are a great challenge. Planting kipar, deipw would contribute to food security, economic development, and would serve as a sea break for erosion control. Their collaborative project would mitigate the impacts of climate change and rising sea levels on vulnerable outer island communities. They proposed to identify and record the diverse cultivars of Pandanus on Mwoakilloa for preserving their culture and transmitting intergenerational plant knowledge about this indispensable tree for the Mwoakil people.

Pandanus is one of the most utilitarian fuel and fibrous plants on the outer atoll where Mwoakil artists use the leaves to create large woven mats, baskets, trays, placemats and hats. The nutritious, juicy, pro-Vitamin A rich multiple composite fruits composed of individual pieces referred to as keys that are attached to a fibrous core, are eaten raw or baked and prepared as a flour or paste, which can be preserved for years. Mwoakil people chew, suck and eat the sweet pulp of the inner part of the keys as a healthy snack and it is regarded as a social activity. The orange fruits are an excellent source of carotenoids, niacin, iron, thiamine, riboflavin, Vitamin C, lutein, zeaxanthin, and fiber, which is essential for proper functioning of the intestines and bowel [11].

Fiber consumption is tied to reducing the risk of diabetes, control of blood sugar levels and cholesterol. Kipar, deipw fruits are boiled and eaten or steamed, pounded into a paste and then dried in the sun or over hot stones. The dried cakes are broken and made into flour. There are some Pandanus cultivars with fruits that contain small edible seeds. The seeds are strung to create necklaces, the fruit fibers and root tips are fashioned into paintbrushes and the strong aerial roots are used to make local apparatuses to catch fish. Stilt roots are split and serve as crossbars in the construction of traditional houses [2]. As medicine, central leaves are



Figure 14

consumed and young roots and leaf shoots are pounded, squeezed in water and taken internally, or as an admixture in topical preparations with coconut oil.

Uhn Mahng is a fibrous Pandanus cultivar of Mwoakilloa that does not bear fruit. It is used for handicrafts and the stems are fashioned into harpoons for fishing. Its leaves and fibers are smoother and finer for weaving and creating earrings, ornaments, fans, baskets, mwaramwar, hats and belts. However today on Mwoakilloa, handicrafts are rarely sold. According to a survey of twenty households that was conducted by Emihner Johnson in July 2010, ninety percent of the households on the atoll grow only about three or fewer Pandanus cultivars and roughly ten percent of the households have six Pandanus varieties (Emihner Johnson, personal communication, 03 November 2010). This is critical because it is the most important tree on Mwoakilloa.

The Mwoakil people are noted for their superb carpentry skills in boat making. They use Pandanus for transport on the sea as part of their daily life; the mast, sail and outrigger are composed of its wood and fiber. The folklore, local art skills, food security and wellbeing of the Mwoakil community center around Pandanus. Emihner Johnson explained.

We still have our roots, our identity and our moral values that make us Mwoakillese however we are losing our landmarks because of erosion and the depletion of our Pandanus cultivars. There are no more trees. The rising sea has been eating away at the land. Our surveys reveal that Pandanus is becoming rare. We are committed to bringing them back and to produce more Pandanus cultivars because without them, the local skills will not be passed on. Through learning sessions and training, many Mwoakil people are dedicated to preserving our local talents, the crafting skills of our elders who will pass them on. We seek ways that we can help and gain the knowledge and skills to be passed on to future generations.

The Mwoakil people seek to understand and record Mwoakil-Pandanus interactions in their cultural and environmental context, their diverse cultivars, and significant indigenous knowledge associated with this Mwoakil giving tree of life. This study was

designed to further biodiversity conservation and the preservation of native plant genetic resources on Mwoakilloa through the community-driven activity of planting Pandanus cultivars by asexual reproductive field methods. Island life and culture revolve around biological diversity. This life-sustaining tree that provides food, medicine, fiber, tools, fuel and support gave birth to the Mwoakil civilization, and will continue to enrich the lives of the people for generations. There is a great need for Pandanus on Mwoakilloa to ensure food security, and human and environmental health. "This is what I grew up with," Emihner Johnson explained. The nutritional value of Pandanus cannot be underestimated. She added, "The life of a developing Pandanus tree on Mwoakilloa, from 1-3 years, is tended to and monitored by women" (Emihner Johnson, personal communication, 30 November 2010). Restorative propagation of Pandanus with progressive community assessment and monitoring foster sustainable harvesting, equitable sharing of benefits from botanical resources, and sound coastal land management on Mwoakilloa.

Emihner Johnson stated: From 1975, when I grew up on Mwoakilloa, my family had a very small land mass. We had about eighteen varieties of Pandanus. Now, based on our survey and scientific values, there are fewer, and they are hard to find. What has been the talk of most Mwoakil women is the need to plant for the well-being of the people. This is our heritage, to preserve the craft. Other community members are so enthusiastic about this project. They will go back to Mwoakilloa to help this project. They are retired teachers, managers and congressmen who are willing to go back because it is significant to the next generation. There is a commitment, if we have financial assistance. We feel strongly about this initiative. Each will plant along the coast on one's own land. It is hands on training.

For the vulnerable small island atoll of Mwoakilloa, sound coastal area management and biodiversity conservation are key to community survival. Mayor Edmond of Mwoakilloa, village leaders and the community are in full support of the project that will strengthen viable indigenous management systems and community-based protection of Mwoakilloa's cultural and natural heritage. Local food educator, Emihner Johnson emphasized, "If I do this project, I know that I am going to move the sea!"

Emihner recently directed awareness in the Mwoakil community about local foods. Ninety-five percent of the women that she spoke with want to do something about the problem. Emihner explicated.

We are a very small community. Once we commit ourselves for our children, we will complete this project for their benefit. It is strongly gender-based. These are our moral values and what we grew up with. Women do not have a voice in community meetings. Women do all of the domestic work, bearing children, fishing... we do all of this. Yet we cannot be elected. We do not have a vote. Compared to women on Pohnpei, we are the firewood provider, and we go to the taro patch. Men's responsibilities are fishing and carpentry. However, building your own cookhouse is a woman's responsibility! The women initiated and want to start this project. When I asked about it, the women really spoke out.

Improving Vitamin, A status in deficient populations can decrease health risks and health-related causes of mortality. Thus, Pandanus

cultivars should be promoted as a strategy to diminish Vitamin A deficiency and to provide added health benefits, enjoyment and preservation of Pandanus genetic resources and the biodiversity of traditional Mwoakilloa indigenous knowledge systems.

Ilau, *Volkameria inermis* L. whose synonym is *Clerodendrum inermis* (L.) Gaertn. is in the Lamiaceae family. It is a native woody medicinal vine or small tree with aromatic opposite leaves and bell-shaped fragrant flowers. The leaves are employed to treat coughs, and to protect people from evil spirits while cooling fever, if the body is shaking. Pregnant women have been given ilau leaves during labor to protect them from evil spirits and to ensure a safe delivery. When combined with weipwul, *Morinda citrifolia* L. in the Rubiaceae, the leaves of ilau are applied to treat inflammation of the anal sphincter, and the young shoots are consumed to reduce stress [5]. To treat a cough, rub the leaves between hands and rub under the chin. Consuming the diluted leaf juice may be beneficial for treating asthma. Yurlene gave me some leaves to apply to John's itchy scalp. I pounded the fragrant leaves and blended them with nih, *Cocos nucifera* L. oil and Sounwini Lepen Lison Leon Aldis' protective formula.

Ilau flowers and leaves are made into mwaramwar or worn directly in the hair. To treat headache, four young leaf apices are eaten [2]. The native range of ilau is Tropical and Subtropical Asia to the Western Pacific. The Kapingamarangi people use tihia, *Volkameria inermis* L. to reduce stress as it has antihypertensive properties pharmacologically. Glassman documented that the leaves are used in conjunction with other plants for treating rheumatism, as a hemostatic in menstruation and as an abortifacient [3].

Pwulok, *Xylocarpus granatum* J. Koenig is a medicinal mangrove tree in the Meliaceae with tannin-rich smooth bark, well-developed buttresses and an intricate above ground root system. It has alternate leaves, small white or pinkish flowers, and the fruit is a large, globose, pendulous woody capsule. The heartwood is reddish brown and the extraordinary Kapingamarangi carvers use this wood in their works of art. Pwulok is among the most important wood for making canoes and it grows in the naniak, mangrove forest on Pohnpei in tidal swamps of brackish or salt water [3, 1]. The bark scrapings are employed in the umwulap treatment for healing muscle, joint or backpain [2].

Mahrek, *Cyclosorus heterocarpus* (Blume) Ching in the Thelypteridaceae is an indigenous medicinal fern of Pohnpei lowland and primary forests and cultivated land. The young fronds of mahrek in circinate vernation are pounded and applied as a poultice on boils to reduce swelling [5]. To use as soap, the fronds are mashed and rubbed onto the skin. The fronds are employed as a wrap for other medicines on Pohnpei [3].

Wihnmoar, *Barringtonia racemosa* (L.) Spreng. in the Lecythidaceae is a medium sized medicinal tree of freshwater swamps on Pohnpei whose ellipsoid or conic fruits are used as laundry soap [2]. The fruit scrapings mixed with nih, *Cocos nucifera* L. meat, are rubbed onto skin rashes and the stem epidermis is employed in treating back pain in men. The bark has analgesic properties as it contains phenolic and steroidal constituents [5]. The terminal buds are used to alleviate pain after childbirth and for treating earaches [3]. The seed scrapings of the fruit are applied to fungal infections [4].

Oahr, tepwek, *Premna serratifolia* L. in the Lamiaceae is a low-land, low-growing medicinal shrub or small tree with opposite leaves. Its leaves, when placed on a fire to create smoke, repel mosquitos. Young shoots are used as a charm to improve luck when fishing. Bark scrapings are boiled in water and consumed to treat asthma. For fungal infections, many fruits are pounded, wrapped in cloth and rubbed gently on the skin [4]. Pounded leaves are mixed with nih, *Cocos nucifera* L. oil and applied to insect bites until healed. Tepwek leaves are crushed and placed on boils held in place by another fire-warmed leaf with nih oil. The stem epidermis is scraped and wrapped in cloth and the juice is placed in water and consumed to treat coughs. Tepwek shoots are pounded and placed in cloth and the juice is squeezed into each nostril for relieving severe headaches. On Mwoakilloa Atoll, oahr leaves are boiled in water and patients with hepatitis are showered with the infusion [5]. Under an umwulap, tepwek leaves are applied as a steam inhalant for clearing the lungs.

Konok, *Piper ponapense* C. DC. in the Piperaceae is a fragrant indigenous ornamental vine that grows on *Ficus* and other tall trees. Its plant parts are employed to alleviate stomachaches, headache, joint and back pain, conjunctivitis, sore eyes, boils, cuts, toothache, symptoms of syphilis in men, and depression [3]. The vine is used to scrub clean the *Piper methysticum*, sakau stone with water. The leaves and vines are made into mwaramwar [4, 5].

Kaikes, *Adenanthera pavonina* L. in the Fabaceae is a fast-growing, deciduous nitrogen-fixing tree whose native range is Tropical Asia to Northern Australia. It has dehiscent pods with shiny scarlet red seeds that are roasted and eaten by children. The young leaves can be cooked and consumed. The wood is used for building small structures such as cookhouse [2]. Kaikes grows in the nansapw, the area of agricultural cultivation and human settlement on Pohnpei [8].

Luwekindenloal, *Phyllanthus mariannensis* W. L. Wagner & Lorence in the Phyllanthaceae is a tree or shrub with ovate leaves that is endemic to the Mariana Islands; [15]. Shortly after marriage, women drink an infusion of the plant parts to aid conception. Some luwekindenloal plant parts are applied to relieve emotional

distress and the fruits are consumed to decrease anxiety [8]. Two fruits of the plant are wrapped around young leaves and eaten each morning for eight days to treat a broken heart. Four or eight fruits are consumed for treating depression, or four leaves are pounded, wrapped in cloth and squeezed into water and drunk. For stimulating a baby's appetite, the parent chews eight leaves until soft, placing small pieces in the baby's mouth [2].

There are several species of *Cinnamomum* that are grown and utilized on Pohnpei. Madeu, *Cinnamomum carolinense* Koidz., in the Lauraceae (Figure 15) is a native forest tree of low elevations with fragrant bark, abundant yellowish-white flowers, alternate ovate leaves and round fruits [8, 5]. It is used in the preparation of a refreshing beverage, as a seasoning and medicine [8]. The yellowish-brown bark is cut from the tree, boiled in water and consumed regularly as tea, and is regarded as an immunostimulant. Madeu has been administered to treat syphilis, arthritis and joint pain on Pohnpei. The bark contains the carcinogenic compound safrole that has been known to cause liver cancer however when the bark shavings are boiled during the traditional Pohnpeian preparation of madeu as tea, the safrole is degraded and cannot be found in the prepared beverage [2]. The bioactivity of safrole is altered thus preventing the hepatocarcinogenic effect [5]. The inner bark has been used as a hemostatic for excessive menstrual flow [8]. The pounded stem epidermis of madeu, *Cinnamomum carolinense* with inipal, coconut fibers is used to treat back pain in men. The juice is squeezed into water and consumed daily for eight days [5]. *Cinnamomum verum* J. Presl, whose native range is Sri Lanka, was introduced from Java during the Japanese occupation of Pohnpei and is used as a spice [3].

Katar, *Sphaeropteris nigricans* (Mett.) R. M. Tryon, which is a synonym of *Cyathea nigricans* Mett. is a pantropical tree fern in the Cyatheaceae with large fronds that have a black, pubescent midrib? Its brown spores are contained in numerous sporangia on the abaxial surface of the fertile fronds. The thick and fibrous trunk with its strong inner core, is used as a support for *Piper nigrum* and orchid cultivation (Figure 16) (Figure 17). As a result, this species is at risk of endangerment and possible extinction on Pohnpei [5].



Figure 15



Figure 16



Figure 17

Katar grows in the highland nannahna, wet and humid dwarf elfin moss forests on Pohnpei [1]. The fronds are eaten as food, and the durable trunks are used as posts in house construction and for making footbridges [8]. When it is raining and chilly in the forest, the fronds are applied as thatch for hut walls and roofs and Pohnpeians cover themselves with the fronds as a blanket to keep warm and dry. The fronds also make a soft sleeping mat. Katar is applied as a styptic to stop bleeding, prevent infection and heal wounds. The frond petiole is cut, and the meristem tissue is scraped and mixed with the frond fiber and a young frond in circinate vernation and placed inside the wound [4]. An infusion of the fronds is employed as a contraceptive for women [8].

Katar is used to alleviate excessive menstrual flow. A young shoot is cleaned, and combined with the meat of a young ripe fallen fruit

of nih, *Cocos nucifera* L. The nih drupe fruit is cut in half and its endosperm is scraped out and pounded together with the young katar shoot and inserted into the vagina. This treatment is reported to stop excessive menstrual bleeding [5].

I encountered the erect, spreading medicinal perennial, *Calotropis gigantea* (L.) W. T. Aiton in the Apocynaceae on Pohnpei along the margin of woodlands and in sandy soils. This fiber-producing shrub's native range is South China to Tropical Asia however it has become naturalized in many countries. Its showy corolla is lilac to purple, its fruit is an ovate follicle, and its thick fleshy leaves are opposite and entire (Figure 18). This toxic plant produces milky latex, and it is bitter in taste.



Figure 18

Peinuhpw, *Paraderris elliptica* (Wall.) Adema in the Fabaceae is a vine or liana with entire oblong leaves, pink flower petals and brownish winged fruits [1]. Traditionally, young stems are chewed to treat stress. Peinuhpw has strong antioxidant and antibacterial properties. Rotenone, the highly potent mitochondrial toxin was isolated from the root, which is used for poisoning fish [5, 8]. The roots are pounded to prepare the fish poison, which stuns reef fish. The pounded roots are placed under coral rocks to catch the fish.

Roots are collected, mashed and placed underwater beneath rocks, where the fish live. Within minutes, the fish are stunned or die. For treating itchy skin or skin rash, roots are cleaned, pounded and mixed with shredded copra placed in a cloth or Cocos fiber and applied to skin. The large stems are used as rope, and the young leaves are applied to treat ear and vaginal infections. Young leaves are ingested to ease labor, and for bedwetting in children, very young leaves are rubbed in the hands and the juice is squeezed

onto the child's penis or labia majora [2]. Peinuhpw is also used to treat pigs that have worms. Anna at the Village informed us that peinuhpw is used as a natural insecticide on Pohnpei. The roots are squeezed to extract the juice and sprayed onto agricultural plants. She added that it is also mixed with nih, Cocos oil and applied to skin to treat dermatitis and infections.

Tuhke karisihn, *Falcataria moluccana* (Miq.) Barneby & J.W. Grimes, which is a synonym of *Falcataria falcata* (L.) Greuter & R. Rankin is a large, introduced fast-growing tree in the Fabaceae with pinnately compound leaves and small white flowers. It is used as firewood on Pohnpei. Ringlen Wolphagen informed me that this highly flammable tree produces a light, soft wood that makes excellent canoes. Nitrogen-fixing tuhke karisihn improves soil fertility for growing mahi, *Artocarpus altilis* and sakau, *Piper methysticum* [4]. Tuhke karisihn's native range is Maluku to the Santa Cruz Islands.

Pwuhr en Pohnpei, *Fagraea berteriana* A. Gray ex Benth. is an epiphytic tree in the Gentianaceae, whose native range is Papuasia through the Pacific. It grows in the nanwel, the highly threatened upland forest of primary vegetation on Pohnpei [1, 2]. Pwuhr en Pohnpei has many branches, smooth, thick leaves, fragrant, fleshy tubular flowers and succulent fruits. The fruits are applied to treat boils that develop under arms and on testicles [5]. The sticky flesh of the peeled fruit is used as a flytrap to draw flies away from food. The flowers are made into special mwaramwar, head garlands and leis, and as a charm for protection against sorcery. The fruits and buds are used to treat kilsarawi, shingles, Herpes zoster and the fallen leaves are used in the treatment of kanahria, gonorrhea. Young shoots are pounded and ingested with water to treat kidney stones, and pounded young shoots and leaves are consumed with water for treating other kidney ailments [5].

Ais, *Atuna racemosa* Raf. subsp. *racemosa* is a large tree in the Chrysobalanaceae that grows in the nanwel, the highly threatened upland forest ecosystem of primary vegetation on Pohnpei whose substrate is from weathered volcanic rock [8, 1]. Large ancient

trees grow on the weathered volcanic substrate of this richly resplendent tropical forest [1, 2]. The enduring wood of this tree is used for house construction and spearing fish. Ais fruits are a source of glue or paint. The nuts are scraped and mixed with the red soil of Nanpwoarenais, Madolenihmw. This is placed in a pot over a fire and stirred until it becomes a thick red resin, which is used to paint and protect the wood of canoes from rotting. The roasted and grated seeds are a source of varnish. A protective paint is also made when the seeds are roasted in a metal container in an uhmw for half an hour. Seeds are then grated and squeezed to obtain the liquid used to paint canoes with inipal, *Cocos nucifera* L. fiber. Fruits are used as an insect repellent by placing them in a fire, whereby the smoke keeps mosquitoes away. The fragrant fruit and seed scrapings mixed with nih, *Cocos nucifera* oil are applied to enhance skin and hair. The ripened fruit is applied to the skin to make it beautiful, and the white seed oil is applied to rashes. Ais bark is used to treat bloody diarrhea and amoebic dysentery. The grated seed is employed as medicine for treating dysentery and yaws, *Treponema pallidum* subsp. *pertenue*, the chronic disfiguring and debilitating tropical bacterial infectious childhood disease [2, 8].

Nih, *Cocos nucifera* L. in the Arecaceae is the palm of life for Pacific peoples (Figure 19). This tall pantropical species grows in the low coral island forest or atoll forest and in the nansapw, where agricultural and agroforestry cultivation and human settlements are found on Pohnpei [4, 8]. Kapingamarangi friend, Karmy Hicks informed me that pahi, slings are made from the husks of tiniu, *Cocos nucifera* L. in Kapingamarangi language. Uhpw, the sweet liquid inside the fruit of *Cocos nucifera* is a refreshing drink. Oil is extracted from copra, which is produced after the endosperm of the fruit is dried in the sun. Leaf base fiber is employed as cloth for placing and squeezing medicinal plants that are rubbed on the skin. Nih flowers are applied to dog bites and are consumed as liquid for treating dysentery. As an eye wash, the inner part of the leaf stalk is scraped in cloth and squeezed into the eye. The roots are pounded, squeezed and consumed in water for treating seizures [2].



Figure 19

Oil from the fruit of nih is a valuable emollient and the husk fiber extract has antibacterial and antiviral properties for treating skin infections. The roots of nih are cut, cleaned, pounded and wrapped in cloth and the juice is squeezed into water and consumed to treat Hepatitis A [5]. Nih is an indispensable ingredient in many medicinal preparations for treating a number of diverse ailments on Pohnpei.

Nih husks provide sennit, a cordage for binding traditional house beams, for fastening outriggers to canoes, and as fuel. The hard shell of the coconut serves as an excellent container for liquids and is fashioned into jewelry. “Sohte wasa ehn nih me sohte ah doadoahk.” – “There is no part of the coconut palm to throw away.” – Pohnpei belief [8].

Puka, *Pisonia grandis* R. Br. is a synonym of *Ceodes grandis* (R. Br.) D. Q. Lu in the Nyctaginaceae. It is a tropical island native tree with soft light wood and large light green elliptic, oblong or ovate leaves with long petioles. It grows in dense stands on coral cays and islands in the Indian and Pacific Oceans as well as adjoining coastal areas, from Madagascar to Polynesia. Kapingamarangi expert, Karmy Hicks informed us that the large, pleasant-tasting leaves are eaten fresh or cooked. Puka is used as medicine for treating hypertension and diabetes. The leaves are also fed to pigs. Puka can be propagated vegetatively. Adelina Lepehn indicated that this tree is called mehs in Mwoakilloa language. According to the Missouri Botanical Garden, thickets of this tree are preferred nesting sites for some seabirds that disperse the sticky seeds from island to island.



Figure 20

Chrysophyllum cainito L. is the introduced tropical American star apple tree in the Sapotaceae that was cultivated for its nutrient-rich edible fruit [9]. The delicious oval-shaped subglobose fruit is smooth-skinned and purple when ripe. Pohnpei children apply the sticky leaf petioles with their shiny elliptic leaves to their face and ears (Figure 22).

Pouteria campechiana (Kunth) Baehni in the Sapotaceae was cultivated in the historic Pwunso Botanical Garden on Pohnpei for its nutritious fruit. The sweet and delicious smooth yel-

Kaikes, *Adenanthera pavonina* L. is a native, medicinal deciduous tree of tropical Asia in the Fabaceae that grows in the secondary agroforest or nansapw on Pohnpei [8, 2]. The leaves are bipinnately compound and the flowers are small and yellowish. Its trunk is used as a stake for supporting *Piper nigrum* cultivation, its wood is fashioned into small structures and the nutritious scarlet seeds are consumed by Pohnpei children [2].

Oahs, *Metroxylon amicarum* (H.Wendl.) Hook.f. is a tall native palm in the Arecaceae with a large panicle terminal inflorescence. It grows in coastal freshwater wetlands and highland rainforests of Micronesia. Its imbricated fruits, which are round to pear shaped are carried by ocean waves, and its seeds are disseminated by water or wind. The roots are employed as medicine for treating high fever, caused by shaking sickness. The root pulp is consumed with water until shaking ceases. Boiled oahs roots in water are also reported to treat back pain. The patient drinks the beverage copiously for eight days [5]. Oahs bark is scraped, pounded, squeezed into a cup and consumed to treat diarrhea. The roots are pounded, wrapped in Cocos fiber and squeezed into a cup of water and consumed to treat seizures [2].

Oahs is a valuable palm for weaving, construction and ornamentation [8]. For many years, buttons have been manufactured from the fruits of the ivory nut palm [3]. The large leaves are harvested and sewn together for roof thatch and the wood is employed as lumber. The ivory fruits (Figure 20) are carved into necklaces and small sculptures (Figure 21).



Figure 21

low-orange eggfruit is rich in carotene (provitamin A). Many of the drupe fruits had fallen from the tree and their seeds germinated. Bill Raynor and I collected and widely shared the large glossy seeds and young saplings with farmers and gardeners as it grows beautifully on Pohnpei (Figure 23). *Pouteria* leaves are evergreen and alternately arranged and the slender trunk is furrowed producing white latex. Its spreading crown with young velvet brown branches give rise to fragrant flowers. The native range of this wonderful tree is Mexico to Central America.



Figure 22



Figure 23

Mworopw, *Inocarpus fagifer* (Parkinson ex F.A.Zorn) Fosberg in the Fabaceae is an evergreen tree that is native to Malesia and the South Pacific islands. On Pohnpei, it grows along the coast, riverbanks, uplands and taro patches. Tahitian chestnut has a dense canopy of glossy, oblong alternate leathery leaves and fragrant white flowers. It produces irregular, ovoid or oblong slightly flattened edible fruits that are boiled, roasted or baked (Figure 24). On Pohnpei, the nutritious fruits are boiled for an hour or two and the skin is removed. Mworopw is a medicinal

tree whose inner bark is scraped and mixed with other healing leaves for treating diarrhea. A strip of the inner bark with pounded leaves of marasau, *Aglaia mariannensis*. Merr. in the Meliaceae are wrapped in cloth and squeezed into a cup of water and consumed to treat amoebic dysentery. Bark scrapings are pounded and wrapped in inipal, Cocos fiber or cloth and squeezed into water and consumed for treating joint and muscle pain and headache noted that mworopw wood is an excellent kindling [4, 3].



Figure 24

There are a number of medicinal fungi on Pohnpei. Saleng en eni, *Favolaschia manipularis* (Berk.) Teng = *Filoboletus manipularis* (Berk.) Singer in the Mycenaceae is a bioluminescent Basidiomycetes fungus that grows in clumps on dead wood in Pohnpei forests. Didimwerek is its common name, which means to be

phosphorescent and to sparkle because it glows in the dark [4, 14]. It has a white to pale cream convex to bell-shaped umbonate pileus with a brown tinted central raised umbo and rounded symmetrically arranged adnate pores on its undersurface. Its central, white to ivory-colored stipe is covered with minute scales.

On Pohnpei, earaches are treated by placing saleng en eni into half a nih, Cocos shell. Heated stones are then put on the fungi and the other half of the Cocos shell with a hole in it encloses and covers the bottom nih shell. The steam, which comes out of the shell hole is directed into the painful ear. Saleng en eni is also rubbed onto sore arms, etc. to relieve pain. Eni refers to ghost, usually malicious [14]. Some Pohnpeian people fear and consider bioluminescent fungi to be related to eni (ghost) and they tell little children to behave or eni in the forest may torment them [6].

Diospyros discolor Willd. in the Ebenaceae was planted in the historic Pwunso Botanical Garden on Pohnpei. During the German occupation, this tree was introduced from Hong Kong for its edible fruit [9, 2, 1]. Mabolo is a dioecious species with evergreen alternate leaves, white waxy 4-merous flowers and beautiful oblate yellow, orange, dark reddish purple pubescent fruit that is mildly sweet, tart and mealy. Its native range is Formosa to Borneo.

Dillenia indica L. in the Dilleniaceae was also planted in the historic Pwunso Botanical Garden for its edible fruit [9, 2, 1]. Elephant apple is a medicinal tree with large, beautiful fragrant flowers and edible fruit composed of fleshy sepals that can be eaten raw or cooked. Its native range is temperate and tropical Asia, India to China and West and Central Malesia.

Nihn, *Ficus tinctoria* G.Forst. in the Moraceae is a medicinal tree, which begins its life as an epiphytic strangler that develops into a large banyan tree with prop roots. Its dark green and glossy ovate leaves are alternately arranged and its axillary syconium fruits are usually paired. On Pohnpei, nihn roots are harvested to treat back pain. They are placed in cloth with a hot stone and applied to the painful area until symptoms subside [5]. A liep, which is a cord that is looped around ankles for climbing nih, Cocos trees, is made from a strip of bark of a small nihn sucker that is softened and twisted. Ropes, belts and enduring fishing lures are also made from nihn bark. The wood is employed in construction and as firewood. This powerful plant is used to keep ghosts away from an ill person. The latex from the cut trunk is applied to cuts and wounds and the fruits or leaves are pounded and placed in a cloth and squeezed into the ear to treat earache [4]. Pohnpei expert, Melvin informed me that the milky sap from chewed leaves can be applied to dog bites and other wounds. Nihn is native to Hainan, China and the Pacific.

Spondias dulcis Parkinson is a vigorous deciduous tree in the Anacardiaceae with glabrous pinnately compound leaves, small white flowers in terminal panicles and sweet and acidic oval fruits whose endocarp has spiny projections. It was introduced on Pohnpei for its edible fruit (Figure 25) [9, 4, 3]. Its native range is East Malesia to the Santa Cruz Islands.



Figure 25

Manilkara zapota (L.) P.Royen in the Sapotaceae family was introduced from Java to Pohnpei for its latex during the Japanese occupation. It is native to Central and South America and is grown pantropically for its edible fruit, medicinal properties, wood and latex. Glassman (1952:22) indicated that it was cultivated in the Agricultural Experiment Station on Pohnpei for its fruit [4, 9]. *Manilkara* is an ornamental and medicinal tree that is grown in tropical regions for its fruit and its bark yields latex for chicle - chewing gum. Various parts of the tree have diuretic and tonic properties for treating inflammation, pain, fever, coughs, dysentery and diarrhea.

Koatun, *Ceiba pentandra* (L.) Gaertn. is a tall, deciduous ornamental tree in the Malvaceae with a straight trunk that is wide

and buttressed at its base. The smooth bark has conical spines and the palmately compound leaves have 5-9 foliolate, narrow elliptic-ovate entire acuminate leaflets. Kapok is native to Mexico through tropical America and was introduced on Pohnpei during the German and Japanese occupation for its fiber [8, 9, 2]. The brown oblong fruits are capsules containing smooth black seeds that are surrounded by silky cottonlike fibers. Koatun is employed to treat boils on Pohnpei. The shoots of young leaves are pounded and applied to the boil as a poultice until it opens and drains [5]. Some Pohnpeian people eat the black seeds, and the fibers are used for making pillows.

Auleng, *Curcuma australasica* Hook.f. is a native medicinal turmeric on Pohnpei in the Zingiberaceae. Its leaves are applied

in the preparation of mahr, preserved and fermented breadfruit. Many auleng leaves are placed in the ditch for wrapping fermented food [4]. Welsihter from Pingelap informed me that she dries the rhizome of auleng and pulverizes it for healing wounds and rashes. For making skin smooth, the rhizome is scraped and mixed with grated nih, *Cocos nucifera* and is squeezed onto the body before showering. For treating infections and infected cuts, the tuber is cleaned, pounded and squeezed onto the infected area. Glassman reported that auleng is frequently found in the rainforest on Pohnpei [4, 3].

Eugenia uniflora L. is a medicinal, ornamental and many branched small tree or shrub in the Myrtaceae with opposite, simple ovate leaves and fragrant white flowers. The fleshy and juicy green fruits with 1-3 resinous seeds, turn deep scarlet, bright red, orange, crimson, dark purple or maroon when ripe. *Eugenia* is native to Brazil and southern South America. It was introduced on Pohnpei at the Agricultural Experiment Station for its edible fruit, which is an excellent source of Vitamin C [4, 1].

Santol, *Sandoricum koetjape* (Burm.f.) Merr. is a large tropical, medicinal ornamental evergreen tree in the Meliaceae that produces delicious, golden colored globose or oblate fleshy edible fruits that are eaten raw or cooked. Its native range is Malesia to New Guinea however it is widely cultivated and naturalized. Santol was introduced on Pohnpei in the Agricultural Experiment Station for its nutritious fruit that can be dried, candied, or made into jams, jellies and marmalades [9]. The ripened fruit is also fermented with rice to make an alcoholic beverage. Augustine called the fruit, which is a capsule, “golden apple star” and said that it was like a soursop in the center. The tree has spirally arranged trifoliate leaves that are elliptic to oblong ovate. Its fragrant wood is used for its aromatic properties in perfumery and the bark is employed in tanning fishing nets in the Philippines. In Asia, *Sandoricum* is also valued for its wood and as a shade tree. On Pohnpei, santol was growing below the track by PICS, Pohnpei Island Central School.

Pwompwomw, *Passiflora foetida* var. *hispid*a (DC. ex Triana & Planch.) Killip is a synonym of *Passiflora vesicaria* L. according to Kewscience Plants of the World online (<http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:184938-2>). Pwompwomw is a slender herbaceous vine in the Passifloraceae. It is native to Tropical America and was introduced and has become naturalized throughout the tropics. It grows along roadsides and abandoned fields on Pohnpei [10]. The tart and fleshy orange ellipsoid or globular fruits are eaten as food. They have a distinctive odor when opened. The vine is used as medicine to treat fever and skin diseases in babies, and other children's illness, and the tendrils are pounded with stone and applied to boils to drain and reduce pain [4, 13]. Pwompwomw has three-lobed leaves with glandular hairs and the bracts subtending the flowers and fruits are finely and deeply dissected.

Ketieu, *Ixora casei* Hance in the Rubiaceae is used as medicine on Pohnpei to treat childhood illnesses such as skin diseases and boils. Ketieu is employed in treating the stings from rarahni, crown of thorns starfish [5]. It is native to the Caroline Islands, Marshall Island and Gilbert Islands, and it grows in the nansapw, secondary vegetation on Pohnpei. The nansapw is where agri-

cultural cultivation takes place and human settlements exist [1, 4]. The roots of ketieu are used as a hemostatic in menstruation. In the past, spears were made from its wood (Glassman 1952:94) and currently, a nahi, stick is made from a short piece of ketieu wood for lashing to the breadfruit harvesting pole with pwehl, Cocos fiber cordage [2].

Rose Mulholland, innovative farmer in Dolonier, Nett observed that small black ants, were eating the white flies on her *Capsicum* L. plants. So, she sprinkled sugar around her *Capsicum* plants that had white flies to draw the ants, and the following day, she observed that the leaves of her *Capsicum* plants were cleared of white flies!

Ioakim was given a *Garcinia mangostana* L. sapling and after two months, I noticed that the little tree looked more developed than any other *Garcinia mangostana* sapling I had encountered on Pohnpei. I asked Ioakim what he was doing to enhance the growth of his sapling and he stated, “I added a little salt to the soil. Since people need some salt, I thought that plants do too.” The leaves looked very well.

Garcinia xanthochymus Hook. f. ex T. Anderson is an evergreen tree in the Clusiaceae that was introduced to Pohnpei for its edible fruit [4, 9]. The fragrant yellow acidic globose or ovoid fruit is eaten raw or cooked. It can be made into jams, jellies, curries, sherbet and vinegar and the juice of the fruit produces a dye. *Garcinia xanthochymus* is the source of a useful gum-resin. Its native range is the Indian Subcontinent to Yunnan and South West Guangxi Provinces, China and Indochina.

Mwerer, *Syzygium cumini* (L.) Skeels medicinal trees in the Myrtaceae were growing in Kitti by the Nanpei Church and cemetery. Mills Santos informed us that his grandfather Nanpei brought the seeds from Hawai'i and broadcast them in Rohn, Kitti. This large, medicinal evergreen tree's native range is Tropical and Subtropical Asia to North Queensland, Australia. It is widely cultivated in Asia, Africa and South America and has become naturalized. The sweet and sour ellipsoid or subglobose fruit, seeds, leaves and bark are reported to have antidiabetic, antioxidant and anti-inflammatory properties due to the presence of various biologically active phytochemical compounds. The astringent and nutritious fruits can be eaten raw or made into jams, jellies, preserves, vinegar, wine and other fermented beverages.

Kirekiniwel, *Syzygium stelechanthum* (Diels) Glassman is an endemic woodland tree in the Myrtaceae with very dense hard wood, white flowers, and edible cauline red fruits [4]. The berries have been taken along on mountain trips by Pohnpei native people [10]. Its native range is the Caroline Islands of Micronesia.

Isidro Alfonse spoke of growing *Vitis vinifera* L. in the Vitaceae on Pohnpei. *Vitis* was formerly grown on Pohnpei for its fruit during the German occupation. The vine was introduced from California and wine was produced from the green grapes [2, 9].

Raphael Alfonse grew an abundance of delicious *Passiflora edulis* Sims fruits in the Passifloraceae. The sweet and tart aril and

seeds of the *Passiflora* fruit is eaten or made into a beverage. The fruit is cut in half and the aril and seeds are scraped out and consumed or placed in water as a refreshing drink [2, 9]. With great enthusiasm, I recommended that he bring his wonderful fruits to market. The native range of this herbaceous perennial climber with beautiful solitary flowers is Brazil to Northeast Argentina.

Neolamarckia cadamba (Roxb.) Bosser is an economically important medicinal, tropical tree in the Rubiaceae. It has simple, glabrous opposite leaves, a capitate globose inflorescence and pentamerous fragrant flowers with partially exserted stamens. The drupaceous fruit is glabrous and edible. The buds and leaves smell like wintergreen and the seeds are dispersed by bats. Its native range is South China to Tropical Asia, and it has been planted to rehabilitate degraded, deforested land in Sarawak. This deciduous tree was growing by the river across from the Pwunso Botanical Garden on Pohnpei.

Kehamwise, Kasik, *Vitex trifolia* L. subsp. *trifolia* in the Lamiaceae is a medicinal, ornamental shrub or small tree with smooth bark and fragrant purplish to blue flowers. It is used by the Kapingamarangi people to keep mosquitoes away. The aromatic leaves are burned and placed around the house in the evening [2].

Ngih, *Pemphis acidula* J.R.Forst. & G.Forst. is a medicinal shrub or small tree in the Lythraceae with simple and entire opposite leaves, flowers containing hypanthia and reddish capsulate fruits? It grows among the *ni oaroahr*, strand vegetation on Pohnpei and the basaltic islets of Micronesia. Its durable wood is used for house posts, rafters, spears, tool handles and utensils, and is considered the strongest tree on Pohnpei [8]. The bark scrapings are used to treat dysentery and ulcers [2]. The dense, hard wood of *kini* is used as a wedge by the Kapingamarangi people. Its native range is Somalia to Mozambique and the Pacific.

Ikoik, *Cordia subcordata* Lam. is a medicinal shrub or small tree in the Boraginaceae with alternate leaves and beautiful, fragrant orange flowers that are made into *mwaramwar* and added to *ni* body oil for its lovely scent. Its ripened fruit, which is a nut is eaten as food and the leaves and bark are employed in healing [4]. The handsome dark-grained wood of *lakaume* is used for carving by the Kapingamarangi people. House posts and furniture are made from *ikoik* wood. It grows along the *ni oaroahr*, strand vegetation on Pohnpei and the basaltic islets [8]. Its native range is South Somalia to Northern Mozambique, the Indian Ocean and the Pacific.

On June 12, 2011, plant veterinary medicine with *utun-we-usel*, *tikap*, *Musa textilis* Nee fiber in the Musaceae were applied to Mauka, the pup's swollen leg and distended bleeding abdomen [2, 8]. Sounwini Lepen Lison Leon Aldis prepared frozen healing plant medicine and this compress was placed on Mauka's swollen leg and distended bleeding abdomen. Mauka tolerated the treatment quite well and licked some of the plant medicine. *Musa textilis* Nee was introduced on Pohnpei during the Spanish and German occupation for its excellent fiber. It is now naturalized there and while the fruit is inedible, the succulent petioles are a source of water [9, 4, 8].

Honorable Pohnpei traditional healer, Sounwini Lepen Lison Leon Aldis prepared a mixture of healing plants for my injured wrist. He gathered four buds of *kolou*, *Hibiscus tiliaceus* L. in the Malvaceae, four fronds of *kideu*, *Arachniodes aristata* (G.Forst.) Tindale in the Dryopteridaceae, which is added for sweetening local medicine and to "make the insides good". The new fronds of *kideu* taste sweet [2]. Four fronds of *Microsorium scolopendria* (Burm.f.) Copel. in the Polypodiaceae is another fern he gathered called *kideu* (Figure 26), which grows in the *naniak*, mangrove forest [8]. The *naniak*, which encircles and protects Pohnpei, is in swamps that are affected by ocean tides and contain saline or brackish water (Balick 2009:8).



Figure 26

Sounwini Lepen Lison Leon Aldis collected four leaves of the slender perennial trailing vine, *sonsol*, *Ipomoea pes-caprae* (L.) R. Brown subsp. *brasiliensis* (L.) van Ooststroom in the *Convolvulaceae*, which grows among the *ni oaroahr*, strand vegetation where the sandy land rises from the water, along the rocky shore. These plants experience salt water, drying high winds, heat and full sunlight [1, 4, 8]. Lepen added four *nih*, *Cocos nucifera* L. roots to this mixture.

Sounwini Lepen Lison Leon Aldis prepared four buds of *rehdil*, *Asplenium protensum* Schrad. in the *Aspleniaceae*, four buds of *kolou*, *Hibiscus tiliaceus* L. in the *Malvaceae* and four buds of *omp*, *Ipomoea littoralis* Blume, in the *Convolvulaceae*. On *Pohnpei*, a poultice is made of *omp* leaves that are rubbed together with *nih*, *Cocos* oil poured over them for treating boils. The poultice is applied to the boil as a plaster and repeated when the leaves dry and fall off. For reducing stress, four young shoots of *omp* are chewed and swallowed each morning for four to eight days [5].

Sounwini Lepen Lison Leon Aldis and his lovely wife *Lampein Leilani* provided me with a poultice of these plants for massaging my injured arm. The soothing mucilage of *kolou*, *Hibiscus tiliaceus* L. is very useful for its gliding quality mixed with the other medicinal plants for healing. I returned to his home for four days. Sounwini Lepen Lison Leon Aldis gave me the root of *nih*, *Cocos nucifera* L. to ingest with a piece of *upw*, *Cocos* “meat”.

Sounwini Lepen Lison Leon Aldis told me to return after the four days of treatment, if my arm was not healed. A few weeks later, my arm needed stronger medicine and protection. Therefore, I returned on May 29, 2011. Sounwini Lepen Lison Leon Aldis requested that I return *lakapw* (tomorrow) for treatment.

On May 30, 2011, *Lampein Leilani* first welcomed me when I returned, and anointed my body with fragrant *nih*, *Cocos nucifera* L. oil. This was applied from head to toe. *Lampein Leilani*’s strong and skillful hands were very warm as she gently massaged my arm with natural floral fruit essence and *nih* oil.

I was given a soothing treatment of a healing *umwulap*, steam inhalation under a light sheet. A hot bucket of steaming plant medicine steeped in the bucket like a small healing volcano. The bucket was placed beneath my legs and I placed my injured arm over the heat, which was very comforting. I remained under the sheet in the healing *umwulap* for about thirty minutes breathing in the vapor of the healing plants.

My diagnosis at *Pohnpei State Hospital* was ulnar nerve damage and Dr. Joel provided me with a sling on May 30, 2011. *Neuroparaxia*, peripheral nerve injury would require 3-6 months to heal. Lamentably, the large woman who attacked me continued to harass me and photographed me against the orders of the President of the College of Micronesia. I informed Sounwini Lepen Lison Leon Aldis that the father of the woman who attacked me recently died so she returned home and left the island. It was a comfort that she was not on *Pohnpei* however I felt sorry for her pain and loss.

On June 2, 2011, after drinking a cup of bitter medicinal plants tea, Sounwini Lepen Lison Leon Aldis prepared a bucket of steaming leaves and stems of the four plant species arranged in a *mwaramwar*, garland for the *umwulap* treatment. After thirty minutes under the sheet, Sounwini Lepen Lison Leon Aldis and I spoke together. He informed me that the healing medicine is prepared in the latter part of the day at sundown. “This is when the power of the good medicine returns.” *Koht*, God gave Sounwini Lepen Lison Leon Aldis this gift [14]. We offer *sakau*, *Piper methysticum* G. Forst. as a way to honor the spirits of the plants and as an acknowledgement of their healing power. He added, *sakau* (*ava*) is also prepared in Samoa.

One heals because of one’s belief in God. It is not just the power of the plants. It is the goodness of God who has endowed Sounwini Lepen Lison Leon Aldis with this ability and the love of people. He performs treatments in the evening because this is the time when the power of the good medicine returns. “There is evil in the daylight hours.”

Sounwini Lepen Lison Leon Aldis relayed a story about *nih*. The coconut was split on a reef and a woman from the west chose the part with the eyes. The other half was selected by a woman of the east.

Sounwini Lepen Lison Leon Aldis and *Lampein Leilani*’s medicine is strong and good. It gave me strength and I was able to sleep deeply through the night. On June 3, 2011, I returned to drink a bitter tea and young *nih*, *Cocos nucifera* L. with the prepared plant medicine for protection. Traumatically, I felt the attacker’s hand around my arm this morning when I awoke. It was still quite painful. I would try to rest my arm and to be moderate at work until it is healed. With Sounwini Lepen Lison Leon Aldis and *Lampein Leilani*, I was in good hands. Safe.

For eight days I returned for treatments. Sounwini Lepen Lison Leon Aldis prepared and gave me a bitter tea containing *kideu*, *Arachniodes aristata* (G. Forst.) Tindale in the *Dryopteridaceae*, and *Microsorium scolopendria* (Burm.f.) Copel. in the *Polypodiaceae* with young *nih*, *Cocos nucifera* L. There are several plant medicines used in this admixture for tea. The tea and steaming plants have a positive effect for aiding in deep sleep and rest. Still, the pain sometimes awakened me at night.

Sounwini Lepen Lison Leon Aldis emphasized that the medicine from the plants must be accompanied by thankfulness and prayer, to God and the spirits of the plants in order for the healing to be effective. On my last day of treatment, I gave an offering of *sakau*, *Piper methysticum* G. Forst. to the spirits of the plants for giving their medicine. After sundown is when the plant medicine is most effective. Its goodness returns. One must believe in the healing power of God in order for the plant medicine and healing treatments to be effective. At the home of honorable Sounwini Lepen Lison Leon Aldis and *Lampein Leilani*, the dear children and family, patients and friends all contribute to a loving, healing environment. Lucky, the sweet puppy lay beside me just outside, while I was under the sheet with the steaming plant medicine of the *umwulap*. The bucket of steaming plants caused sweating and clearing, and the moist warmth to my injured arm was soothing. Lucky playfully nipped at me through the sheet. His playful happiness was a comfort that contributed to my healing.

Kau is the untwisting of the nerves that were damaged, compressed and impacted. Nih, *Cocos nucifera* L. and other plant medicine in the young coconut clears this. My arm felt lighter and clearer after this drink, which was taken after consuming the bitter tea of kideu and other plants. Sounwini Lepen Lison Leon Aldis gave me exercises to perform in the morning for healing my arm. We drank sakau, *Piper methysticum* G. Forst. together to commemorate Sounwini Lepen Lison Leon Aldis for his healing gifts and we also gave thanks to the spirit of the plants for giving their medicine. I returned in the evening with sakau from Awak, which is considered the best on Pohnpei.

June 6, 2011 was my final treatment with Sounwini Lepen Lison Leon Aldis. I presented him with four bottles of fine quality sakau, *Piper methysticum* G. Forst. from Awak. Kroan Augustine Primo delivered them even amid yet another funeral in his family. Peter, Sounwini Lepen Lison Leon Aldis' brother and several other men ceremonially prepared the roots of a ten-year-old sakau, *Piper methysticum* plant from Awak, and we drank it together. I gave blessings of gratitude to Sounwini Lepen Lison Leon Aldis and Lampein Leilani and the spirit of the plants for healing. I thanked all who were present for their work and love. I would miss nightly treatments at Sounwini Lepen's home. It is dynamic, warm and loving with the beauty of the children and the kindness of family and friends.

Sounwini Lepen Lison Leon Aldis instructed me to apply the fragrant nih, *Cocos nucifera* oil before leaving the house, for

protection. The woman who attacked me was to return to Pohnpei on June 16, 2011.

Sounwini Lepen Lison Leon Aldis recommended planting kehp, *Dioscorea* Linnaeus in the Dioscoreaceae when there is a full moon. The vine is trained from right to left as it climbs for support toward the sun. On Pohnpei, kehp is the most significant root crop and knowledge of its cultivation is surrounded by great secrecy. It is a seasonally cultivated crop on Pohnpei, and one must never plant kehp on rainy days or when one is ill or feeling weak as it is believed that this could be transferred to the yam itself [16].

Sounwini Lepen Lison Leon Aldis likes to view the lay of the land from the hillslope to the sea (Figure 27). His memory is a blessing.

Chief of Public Health and Preventive Medicine, Dr. Rally Jim once said that, "After a funeral, there is a sunshower. It is a way for the departed to say good-bye to their family members."

Isipahu, King Hebel of Madolenihmw told us that Nan Madol was built in 1160. It is the dwelling place, burial site and temple of his ancestors (Figure 28). Isipahu is deeply concerned about the possibility of the Pohnpei Government's proposed casino development with a Chinese corporation in Madolenihmw, Pohnpei [17].



Figure 27



Figure 28

Declarations

Ethics Approval and Consent to Participate

All Micronesian peoples featured consented to participate in this study

Consent for Publication

All Micronesian people involved in this work consented to publishing this work.

Availability of Data and Materials

https://pbase.com/jamato8/fsm_people_and_geography_

Competing Interests

There are no competing interests

Funding

There is no external funding

Authors' Contributions

Dr. Amy Eisenberg conducted the research and wrote the manuscript. Professional photographer, John Amato, RN photo documented every aspect of this project.

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