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SEAGRASS NETS

BY

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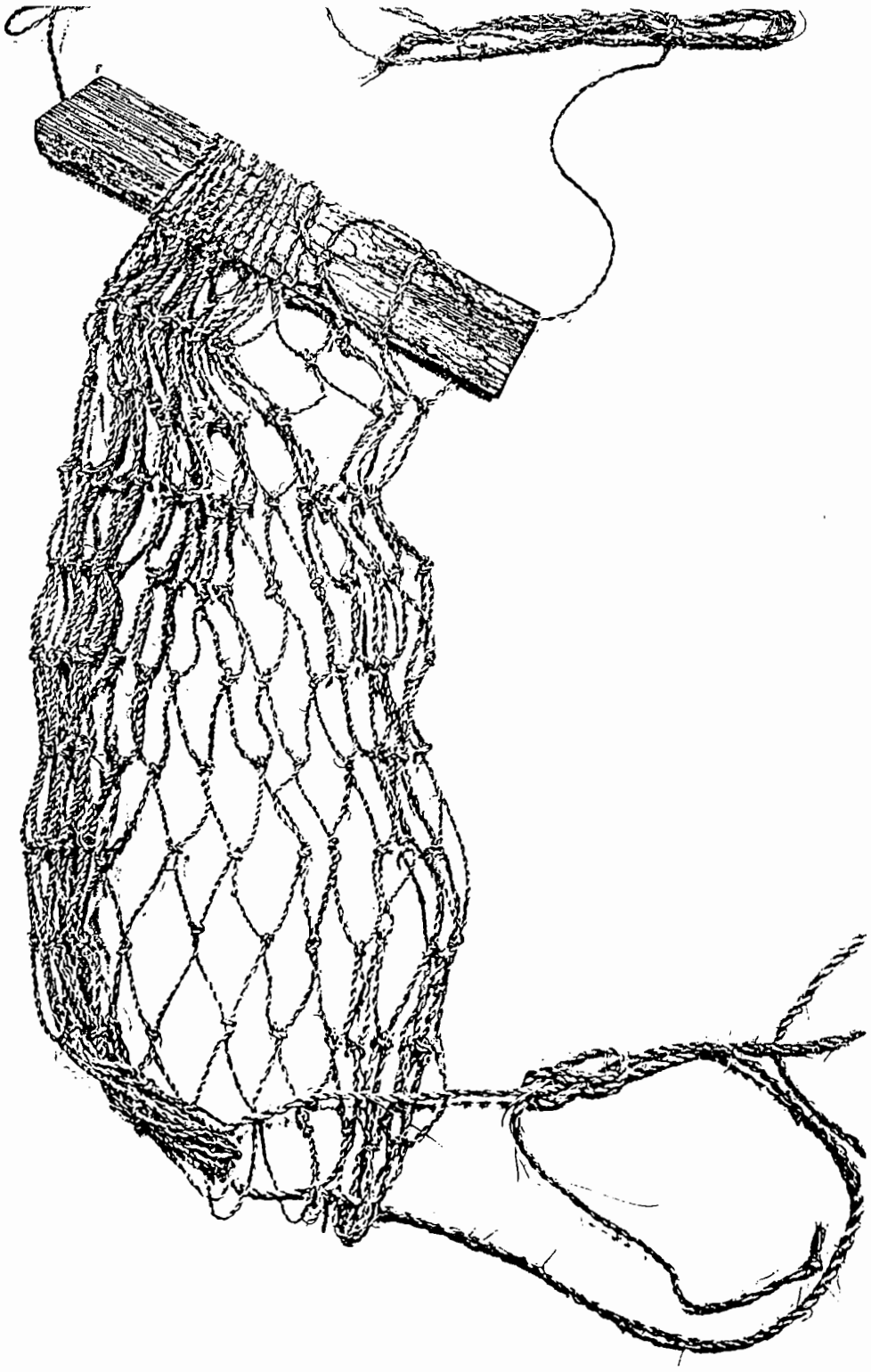

Frontispiece. A seagrass net.

SEAGRASS NETS

BY

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Illustrations by Martin Faimau[1]

Abstract

The persistent bundles of vascular fibers which characterize the seagrass *Enhalus acoroides* (L.f.) Royle, are utilized in the construction of nets which last for generations. The technology and its cultural context, illustrates a number of things about man in the island ecosystem. Since there appear to be few practitioners of the art left, the process is here described in detail. This description is extracted from an ongoing project which will relate the marine environment, species, traditional technology, and culture of the Yap islands.

Introduction

Enhalus acoroides (L.f.) Royle, is one of seven sea grasses reported for Yap (Tsuda et al. 1977), in the Western Caroline Islands. A distinguishing character of this seagrass are the tough vascular bundles which stiffen leaf margins and remain after leaves are broken or gone. These persistent strong fibers were utilized on Yap island in the construction of nets which last for generations. Such nets were in use on Yap until World War II. Today there remain only a few elders who can make these fine nets. We are grateful to Lubuw ni Ga' who introduced us to seagrass nets and to Chonmogon and Gabay (now deceased) for demonstrating the technology to us.

The nets were made in only a few villages located near bays where appropriate seagrass occurred. In the bay of Rumu' village, special marine meadows were protected so that *Enhalus acoroides* would grow long and unbroken. The fibers were then collected at low tide. Today's elders remember that when they were boys, the area would be filled with older men collecting seagrass fibers at appropriate tides. It is said that suitable seagrass grew in only a few places on Yap. Today *E. acoroides* is common in many areas of the Yap lagoon however the special beds in Rumu' are being buried in silt as a result of soil erosion from road construction.

Enhalus acoroides (figure 1) naturally curves up from a horizontal rhizome. It is said that in the past, plants in the special beds lacked the basal beard of fibers because of their frequent collection. When collected (figure 2), leaves were harvested from but one side of the plant. One informant said that this helps to conserve the resource, while another suggested that the fibers are stronger on the convex side of the plant. Prior to harvesting

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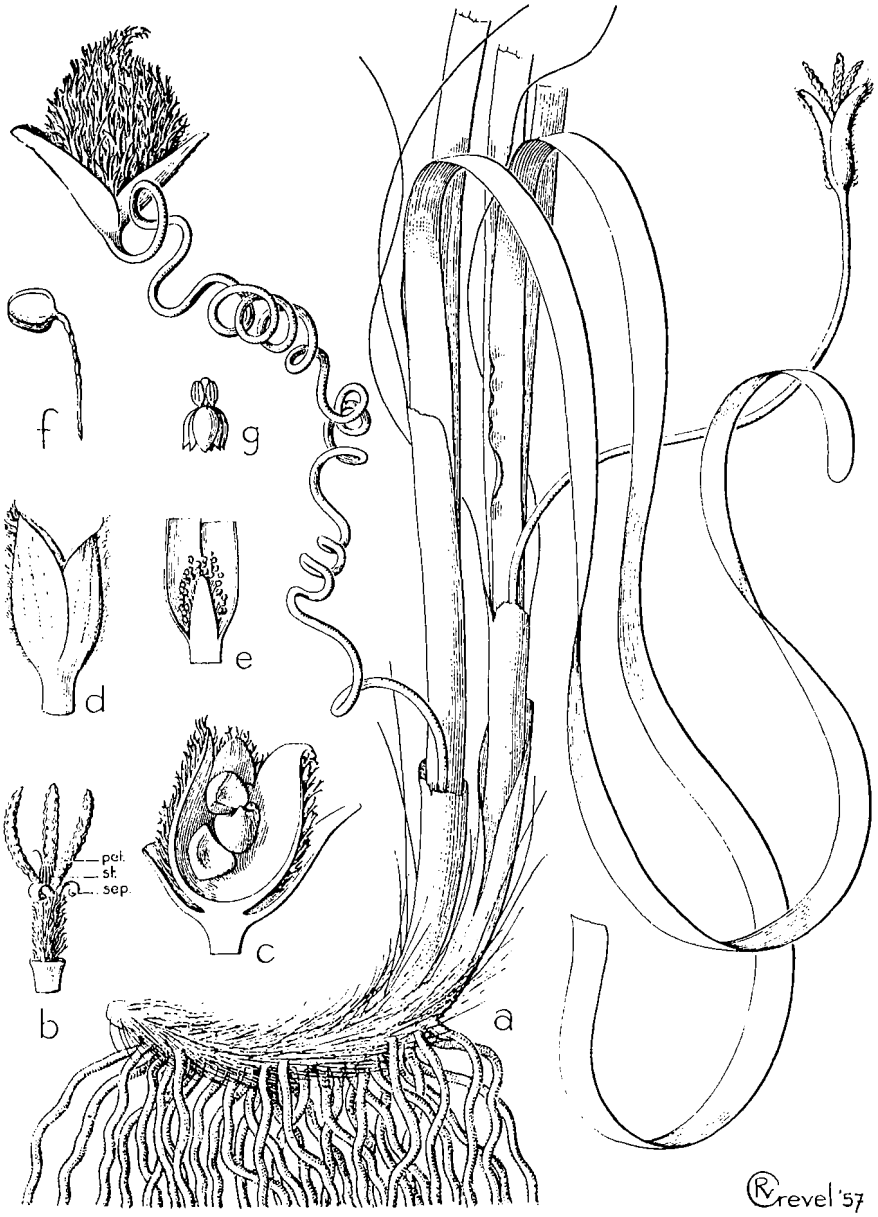

Figure 1. *Enhalus acoroides* (L.f.) Royle (from Den Hartog 1970, p. 218).

the leaf, the collector reaches down to feel which way the rhizome is curving. He then pulls the leaves up, stripping off debris and epiphytes as he does. It is believed that this helps the sea grass to grow better. A thumb is inserted in the axil of the chosen leaf, generally the second from the outside of the plant. The fibers of the outermost leaf, likened to the fibers of a mature coconut husk, are generally broken and too stiff to be used. With the thumb held next to the base of the plant, the collector pushes down and separates the

Figure 2. Collection of seagrass fibers.

leaf with minimal damage to the rest of the plant. The harvested leaf has light colored fibers extending from either side of the base. These are likened to the more supple fibers of a green coconut husk. The basal portion of the leaf is grasped in one hand and the central portion of the leaf blade is stripped away from the distal end of the blade with the thumb of the other hand. The result is a short section of the leaf blade with long strips of the leaf margin extending on either side (figure 3). The longest fibers which we observed collected on August 26, 1988 were 95 cm in length.

After a handful of such strips has been collected, they are scrubbed together section by section starting at the top and continuing all the way to the tips. They are then tied into a bundle by bending the fibers near the top and winding the distal portion around the bend from the top down. These bundles of fibers are left on top of clusters of seagrass exposed during low tide, and another bunch is collected. On his way back to shore, the collector gathers all the bundles. The bundles of fibers are brought to the stone platform of the men's house. Here they are hung on bamboo poles to dry. About a generation ago, some 9 meters of bamboo poles were required to hold all the fibers that were collected during one low tide.

Preparation of fibers

When the strips reach the right stage of dryness, the bundles of vascular tissue making up the fiber are extracted from the surrounding tube-like tissue. Extraction of the entire length of the thin pale fibers, which are only about 0.3mm in diameter, is a delicate operation requiring practice. The double strands are held firmly in one hand and then the connecting leaf blade is grasped firmly between thumb and pointer finger, and stripped off. This exposes the light colored fibers. These fibers are then held firmly and the leaf tissue surrounding the fibers like a sheath, is stripped off. This involves an initial jerk followed by a long smooth pull to slide the ensheathing tissue off. The operation is similar to pulling the drawstring out of a narrow hem, but requires a delicate touch similar to that of pulling one thread from a piece of cloth without breaking the thread. The thumbnail is used in making the initial separation but not after this, lest the fiber be broken. Should the sheath tissue get too dry, it can be wet again, and dried to the appropriate condition to be stripped off. In the old days young boys would take the left over tissue stripped from the fibers, and chew it for its salty flavor (similar to the taste of kelp of Japanese cuisine). Once extracted, the pale buff fibers are stable, and are stored until enough have been collected to prepare twine.

Preparation of Seagrass Twine

Twine is prepared by twisting seagrass fibers together. The bundle of fibers is held under one arm, and about 4-5 fibers are pulled out, the number depending on the desired thickness of the twine. Initially these fibers are twisted together with the fingers. Once firmly twisted, they are rolled on the thigh. A second strand is prepared the same way. Then the two strands are placed side by side and rolled together, first foreword, then briefly back to make the twine tight. Occasionally, when the strands are not tight, or when additional fibers are added, the 2 bunches of fibers may be separately rolled before being rolled together.

After each roll, the free strands get tangled and must be separated. This is generally done by pulling them across the knee. When new strands are added, they are placed, basal (thicker end) up, against the twisted strands and then pulled down until they are even with the end of the twisted strands already in place. Rolling the twine pulls hair from the thigh and the thighs of men who made a lot of twine got blackened and tough. Nowadays a rubber "chap" made from an inner tube is sometimes used to protect the thighs in the similar process of making coconut twine.

After a length of twine was made, strands sticking out may be trimmed off. This is not necessary, if the net is to have a large mesh, but is helpful when making a finer twine for smaller mesh nets. When the process of making twine was demonstrated to us, one person made 4 "drri"[1] (measured to total 6 meters), of twine in about 2 hours. While twine is being made, the seagrass fibers are stored in a rolled section of the basal sheath of a betelnut leaf, "wathir", with notches cut on one end. The twisted twine is then wrapped around these notches. Remaining seagrass fibers are also stored in the rolled "wathir". This "kit", is carried in the basket to be worked on when possible, such as while sitting in long meetings.

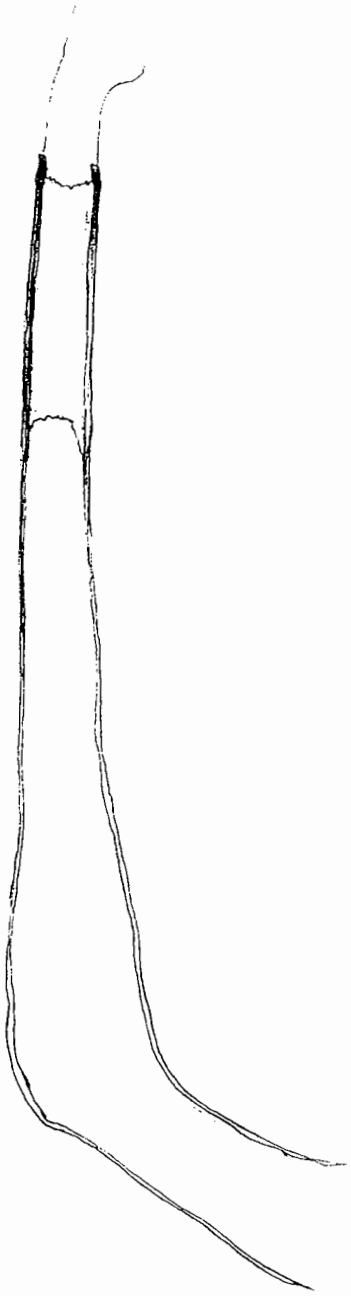

Figure 3. Collected *Enhalus* leaf showing fibers.

Preparation of the "teliyo"

The original net making "needle" was made from a stiff loop of coconut sennit with loops of the finer seagrass twine attached via an ingenious manipulation of the sennit loop and seagrass twine involving fingers of both hands and a toe (figure 4). A length of sennit is knotted into a loop. The longer the twine to be used, the longer the loop. The end of the loop opposite the knot is held in the left hand. One end of the seagrass twine is held with the toes, and a desired length measured out. The twine is bent over at this point and inserted through the sennit loop. The pointer finger is then inserted through the seagrass twine loop and the closest side of the sennit loop is pulled with the third finger (figure 4). The seagrass twine slides off the thumb, and the sennit loop is pulled up and the seagrass loop pulled down toward the knot in the sennit loop.

Another length of seagrass twine is then looped over the toe, looping it to the left (or at least always in the same direction), and then bringing it up, and making a bend. Before the bend is inserted into the sennit loop, the sennit loop is twisted so that the bend is inserted through the opposite side. The procedure described above is then repeated. This results in loops of seagrass twine hanging from alternating sides of the sennit loop. The sennit loop is used like a net needle (figure 5). When additional twine is needed, the uppermost loop of seagrass twine is easily slipped over the end of the sennit loop to release a measured length of twine.

Making nets with seagrass twine

In addition to the teliyo, a second tool called the "yeer" is employed in net making. The yeer is a flat piece of bamboo cut to the desired mesh size and used to space the net knots.

To begin the net, a length of twine is measured out, bent and wrapped around the yeer twice. It is tied with a square knot. The two ends are then wrapped around the yeer in opposite directions and tied again on the top edge of the yeer. This is repeated until the desired number of mesh have been tied to make the desired height of the net. If necessary, the mesh eyes are slid to the left off the yeer to make more room. When enough mesh have been made, the short end of the twine is cut. The other long end of twine will be used to make the rest of the net.

The second row of knots are tied differently. The twine is passed under the yeer and the teliyo inserted through the first eye of the first row and pulled down. The knot is then tied as in figure 5. Care must be taken when the knot is pulled tight to assure that the hitch catches the 2 side strands of the eye above and is tightened so that it holds them. In this way the strands will be fixed in place. The knot strand is held in place over the 2 upper strands with the thumb and/or thumb nail as it is pulled tight. The knot is then pressed to fix it. If this is not done properly and the twine is merely pulled, it will make the hitch onto

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[1] There is no official orthography for the Yapese language, so the spelling of Yapese words is subject to variation.

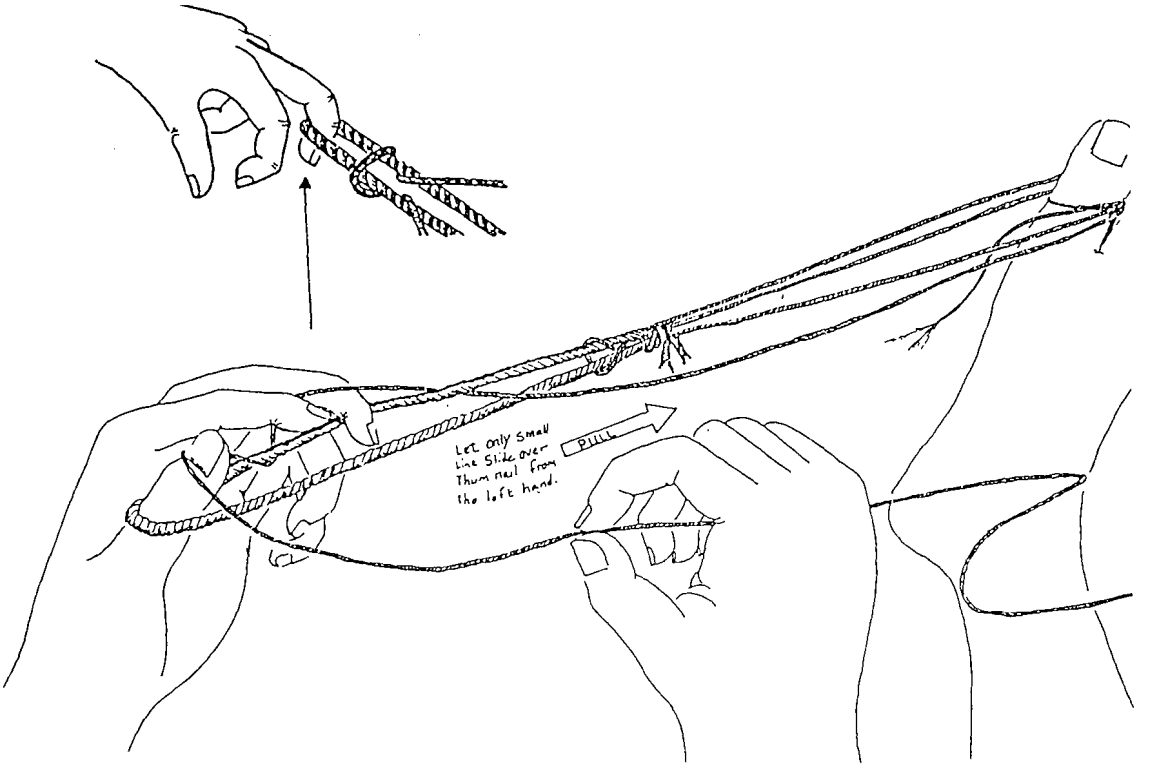

Figure 4. Preparing teliyo.

itself under the 2 strands of the upper eye and allow the upper eye to shift laterally as it pulls through the hitch. This causes friction on the single strand of twine at the lower apex of the upper eye and weakens the net. By holding the knot so that it is formed higher, over the two sides of the upper eye, the net is much stronger, and will hold its shape. Successive rows of knots are made on opposite sides of the net as the net is turned over each time the end of the row is reached.

This kind of knot is used with twine made from fibers of seagrass, coconut, hibiscus (*Hibiscus tiliaceus* L.) and pineapple. It is not used with monofilament line or when making casting nets.

The fine mesh nets were used in a variety of ways. These included hand nets (figure 6) called "k'ef", larger nets set to catch seasonal migrations of small fish, and in a special fishing method in which a large net is pulled between two sailing canoes. The last large seagrass net was purchased by a Japanese visitor to Yap, so measurements are not available. The average size of a small k'ef net is about 55 cm in height, and about 148 cm in length. Such a net would be tied to a k'ef frame about 20 cm in height. The width of the net allows an ample pocket that can be flipped over the frame, to trap fish. The net is tied to the k'ef frame with the knots and eyes forming vertical triangles. This is said to make the net less threatening to fish as the height of each mesh eye is greater than the width

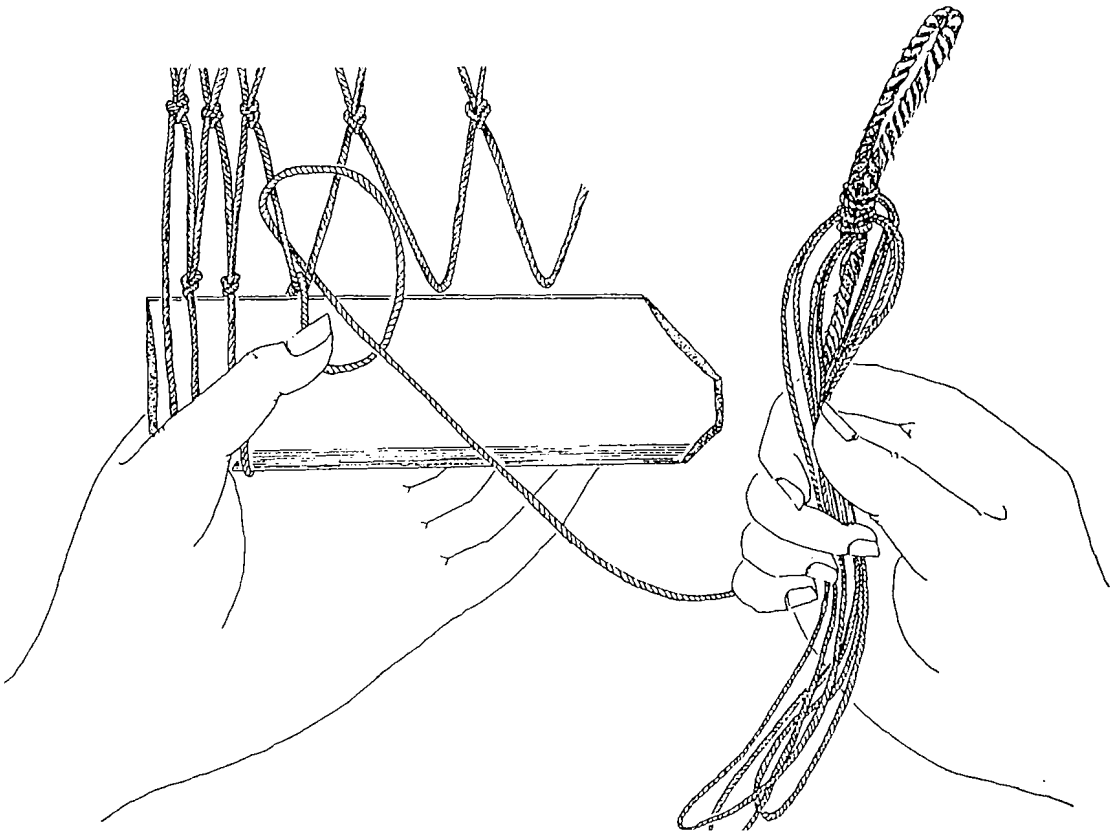

Figure 5. Use of the teliyo in making the net.

similar to the laterally compressed fish which may feel that it can swim through the mesh. The k'ef hand nets were used by individuals or groups in a variety of fishing methods (Falanruw in prep.).

Making K'ef

Figure 6 shows 3 styles of k'ef nets illustrated in Mueller (1917). It was estimated that it would take one to two months to make a pair of k'ef. The most time consuming process is the making of the net as described above. The materials used to construct this frame are collected and prepared in an appropriate sequence. Some time is required to find materials with the right bend, thickness etc. The first thing to be collected are the sticks to be used for the "ya'al", and the "gurfil". In Rumu', these are made from a certain small hardwood tree called "ya'al" (voucher specimen MVCF 5701). This tree occurs in native forest and is not very common. It has straight branches with widely spaced leaf nodes, making it especially appropriate for the ya'al of the k'ef. Other villages which do not have native forest and ya'al trees, use *Ixora casei*, ("gachiyo") for the ya'al.

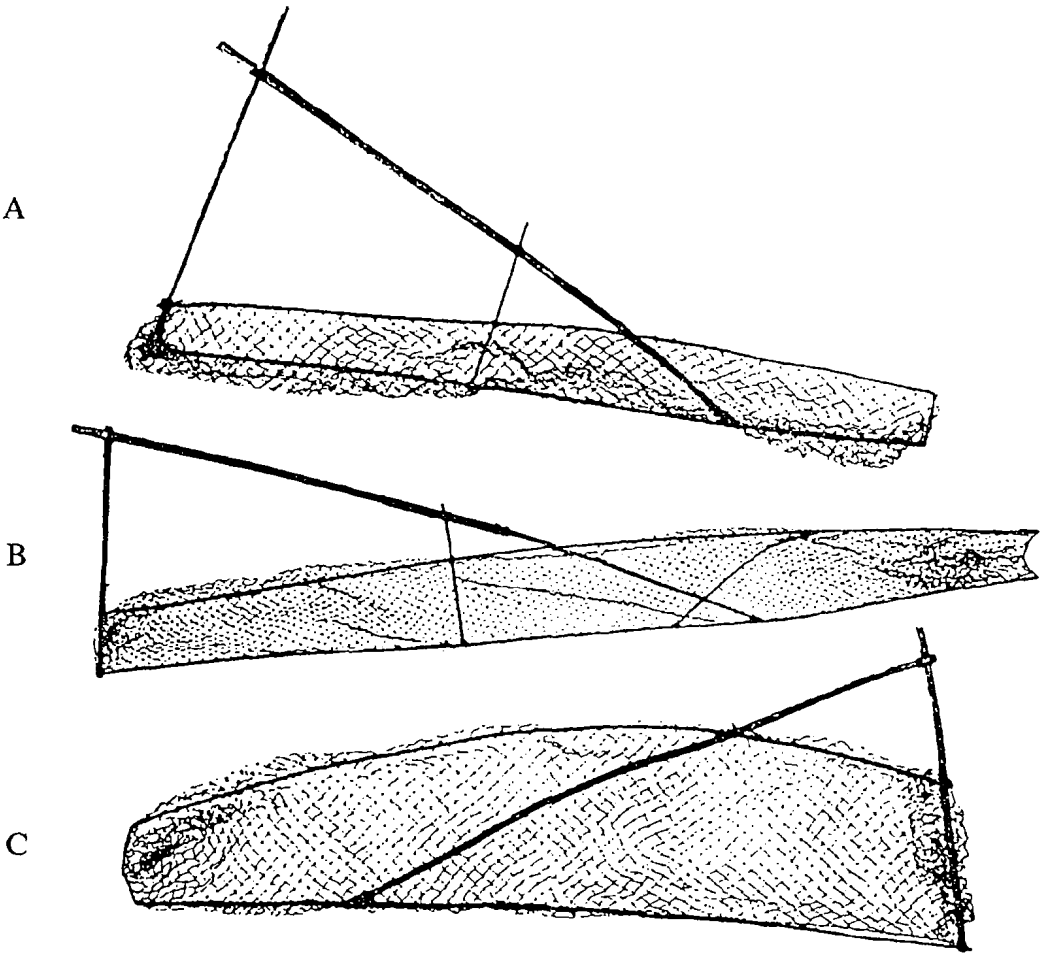

Figure 6. Some kinds of k'ef (figure and descriptions from Mueller 1917): A. Small k'ef, from Onean, 1.78 m long; B. large k'ef, Masolol from Nari, 2.95 m long; C. Wide k'ef, Uruts from Onean, 1.88 m long.

Appropriate sticks are cut from the ya'al tree and placed in salt water and weighted down so they will not be exposed at low tide. The area may have either a muddy or gravely bottom but should not have too much fresh water mixed in as this would cause the sticks to rot. The stick can stay there for years if necessary. When the sticks are retrieved for use, the bark comes off naturally. The ya'al is treated this way to make it strong so it will last a long time.

The next things to be collected are the seagrass fibers—as has been described. Other materials include pieces of large and small bamboo. Two appropriate size and shaped pieces of the large bamboo, "mor" (*Bambusa vulgaris*) are sought for making the "buk-e-richib", and "duga'". These may either be taken from the small branches at the end of a large bamboo, or from a stunted bamboo that grows in the savanna. A section of a smaller species of bamboo, "p'uw" (*Bambusa* sp.) is used for the "terwey". The piece

chosen should be the same size as the ya'al and it should be mature so it will be strong. Both types of bamboo are treated by being submerged in salt water to protect them from the insects that bore holes in bamboo. The pieces are left in salt water from about a week to a month (while waiting for the net to be completed). If left too long they will spoil.

The stem of the viny fern known as "piy", (*Lygodium circinatum*, reference specimen MVCF 360), growing in the savanna, is collected about the same time as the bamboo. It is used to connect the end of the "terwey" and the ya'al because it is flexible, yet stiff enough to maintain the spread. The piy doesn't have to be put in the salt water, just dried. Fibers extracted from the roots of coconut trees can also be used for this end piece. After the seagrass net is completed, the frame is constructed. Small gauge coconut sennit is used in tying the joints.

Care of seagrass nets

If properly cared for, seagrass nets could be used throughout a person's life and then passed on to the next generation. One of our informants had utilized his grandfather's net until it was destroyed during the Japanese occupation of Yap. After each use they were hung up to dry and protected from rain. If not used for a time, they were periodically dipped in sea water and allowed to dry again. When dry, the nets were wrapped in rolled sheaths of the basal portion of betelnut leaves (wathir) to protect them from being chewed by rats and geckoes.

Discussion

The development of a life-sustaining technology and culture based on the limited natural materials available on a small island is the creation of something that wasn't there before—no small achievement. The production of seagrass nets illustrates a number of things about man in the island ecosystem.

The *Enhalus* resource appears to have been managed. Children were not allowed to pull the seagrass up or to play in the area. The stripping of the leaves during harvest removed debris and epiphytes, probably resulting in an increase in light reaching the leaf blade. The practice of removing but one leaf per plant also contributed to the conservation of the resource. In *Enhalus acoroides*, roots are formed from axillary buds on the ventral side of the rhizome. The harvest of only one mature leaf from the dorsal side of the rhizome does not interfere with the formation of additional roots. This practice would serve to conserve the resource whether or not it was a conscious conservation strategy.

Nets were made with a conservation of energy and efficiency of movement characteristic of Yapese technology. The source of materials was near the village mens' house where the fibers were prepared. The collection of fibers was tuned to the tides. Collected fibers were bundled and laid on seagrass leaves exposed at low tide to be gathered on the return to shore with the rising tide. The processing and use of the fibers is organized, orderly and accomplished with the fewest movements needed.

Figure 7. Large collection of leaves drying on bamboo poles near village men's house.

The strength of the thin individual fibers is limited and skill and time was required to make them into fine, durable nets. The development and practice of such a skill requires a freedom from other activities—provided by a tradition of specialization. Though seagrass nets were desired by many, making them was the specialty of a limited group, and provided a valuable medium of cultural exchange and prestige for this group. The making and use of seagrass nets also provided for a mutual exchange of talents between generations. Older men, having lost strength and gained patience, made the nets. In gathering the fibers, they shared companionship and mutual endeavor with other elders. The art of making seagrass nets is satisfying. The product is lasting and valued. Even the discarded semi-dried leaf sheaths provided a special taste treat for the children prohibited from frolicking amid the special seagrass—a taste remembered from his youth by our teacher, and now, even by us, his students. The nets were used by fishermen, who would bring their catches to the mens' house to share with the older men, who would in turn, mend any torn nets and relate their own fishing experience—thus helping to develop the next generation of fishermen, and, eventually, net makers.

References

Den Hartog, C. 1970. The Sea-Grasses of the World. Verhandelingen der Koninklijke Nederlandse Adademie Van Wetenschappen, AFD. Natuurkunde, Tweede Reeks, Deel 59, No. 1. North Holland Publishing Company, Amsterdam.

Falanruw, M.V.C. in prep. Traditional Use of Marine Resources on Yap.

Mueller, W. 1917. Yap. *In* Thilenius, G.(ed.) Ergebnisse der Sudsee Expedition. II. Ethnographie: Band 2, L. Friederichsen and Co., Hamburg, 811 p.

Tsuda, R.T., F.R. Fosberg and M.-H. Sachet. 1977. Distribution of seagrasses in Micronesia. Micronesica 13(2):191-193.

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