

LIMU

An Ethnobotanical Study
of Some Edible Hawaiian Seaweeds

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LIMU
 An Ethnobotanical Study of Some Edible Hawaiian Seaweeds
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COMMONEST EDIBLE HAWAIIAN ALGAE

1 LIMU ELE'ELE (<i>Enteromorpha prolifera</i>)	2 LIMU PALAHALAHA (<i>Ulva fasciata</i>)	3 LIMU WAWAE'IOLE (<i>Codium edule</i>)
<i>Pyramid Beach, Makapu</i> 4 LIMU LIPOA (<i>Dictyopteria plagiogramma</i>)	LIMU HABITAT near Lawai-Kai Kauai	5 LIMU KALA (<i>Sargassum echinocarpum</i>)
6 LIMU PAHE'E (<i>Porphyra</i> sp.)	7 ↙ LIMU KOHU (<i>Asparagopsis taxiformis</i>)	<i>Punalu'u</i> 8 LIMU HULUHULUWAENA (<i>Grateloupia filicina</i>)
<i>090</i> 9 LIMU ↘ MANAUEA (<i>Gracilaria coronopifolia</i>) <i>10.7% Dry matter 1.64% Nitrogen</i>	<i>Honouliuli Punalu'u Honouliuli</i> 10 LIMU 'AKI'AKI (<i>Abnfeltia concinna</i>)	12 LIMU MANE'ONE'O (<i>Laurencia nidifica</i>)

(See Table I)

Gelidium sp. - Punalu'u

*Brown - Kaneohe Bay
 Acanthophora spicifera*

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INTRODUCTION

In late 1972 the authors were given a superb opportunity to interview Hawaiians from Kauai to Hawaii to learn their uses of edible seaweed (limu). We contacted persons who had been recommended to us by former Kamehameha Schools classmates and friends, and took with us specimens of 15 common seaweeds,⁽¹⁾ some of which had Hawaiian limu names known to us and some which were unknown to us. Speaking in Hawaiian to the older informants, we sought three kinds of information: 1) the Hawaiian common names used for a particular kind of seaweed; 2) a discussion of these common names and their meaning, and 3) uses of these and other algae by Hawaiians. We were pleased to learn that "country folk" still use many seaweeds for food, and that the older Hawaiians retain a large amount of information and folklore about these plants.

The word "limu" is defined by Pukui and Elbert (1957) as "a general name for all kinds of plants living under water, both fresh and salt, also algae growing in any damp place in the air, as on the ground, rocks, and on other plants;

⁽¹⁾These serve as voucher specimens and they are now deposited in the herbarium of the Bernice P. Bishop Museum.

also mosses, liverworts and lichens . . ." The first part of the definition is equivalent in scope to the word algae, but not equal to the word seaweed which at least is applicable only to marine plants. In use, both current and ancient, the word limu to most Hawaiians means edible seaweeds and the prefix *li* is used with the proper name, for example *lipe'epe'e* for limu *pe'epe'e*.

The vast majority of algae growing throughout the islands are without common Hawaiian names and this implies that they are either unknown to be edible, or that the common names have been lost in the passage of time. The senior author's mother (as well as our current older informants) was very careful to distinguish between the common names she knew and could associate with a definite seaweed, and the seaweeds for which she had no name. But she further distinguished in the latter category between those that were edible and without name, and those not edible and therefore "ōpala" (rubbish). (A large number of scientifically interesting forms that were brought home were so designated). Since the old Hawaiians were well known for their nearly specific distinction of most land plants, carried to extremes for example in their naming of about 67 taro varieties, it would be surprising to find that they did not discriminate as sharply among

foods that were eaten from the sea. We therefore suspect that many names have been lost over time.

As with many common Hawaiian names of flowers (*e.g.*, moki-hana, lehu'a, 'ilima) the meanings of limu names are sometimes lost. We have tried to find meanings and have had the old people explain the words that were known to them. It appears that most of the names are descriptive of the nature of the plant ('a'ala'ula — red fragrance) or of its habit (pahēe — slippery), or its habitat lipē'epe'e — hidden). More than one meaning is possible, of course, and legends arise over the meaning of others (limu kohu koko, limu kala).

In 1907, Reed listed 70 "economic" seaweeds for Hawaii. A current list compiled in 1972 from all published sources by Dr. M. S. Doty at the University of Hawaii contains 149 names of seaweeds supposedly used by Hawaiians. Including duplications, an analysis of the scientific and Hawaiian names shows that of these, 86 are of unknown use and may not be edible algae. (For example, Moore and Scheuer (1971) have found that "limu make o Mū'olea" is an animal (*Palythoa*, Coelenterata). Of the remaining 63 algae on Dr. Doty's list which are thought to be edible, 29 can be identified by both their Hawaiian and scientific names. There are 18 species with valid scientific names that are currently in use; only the 12 most commonly used are included here.

Seven of these may be found in the fishmarkets when in season.

It was not our purpose to lengthen extant lists but rather to define them, and to tie common names to scientific names and specimens which would stand the test of time. Unfortunately, most of the scientific names applied by Reed (1907) were incorrect since their correct application demanded a far greater knowledge of tropical algae or of the Hawaiian language than the author had. Nevertheless, her compilation of the Hawaiian common names was made at a time when more names were known than is the case today. It remained for the Hawaiian speaking botanist and anthropologist authors of this paper to confirm the seaweeds to which these names apply and to find the meanings of the names.

EDIBLE LIMU

The current resurgence of interest in Hawaiiana of all kinds has revitalized interest in the natural foods used by the Hawaiians, including limu which formed an important part of the Hawaiian diet.

In olden times, limu was the third component of a nutritionally balanced but monotonous diet consisting of fish and poi, (which is prepared by pounding and straining the cooked stems of taro). Together they furnished the necessary protein, carbohydrates and minerals for adequate nutrition. While limu primarily supplied variety

and interest, they also added significant amounts of vitamins and other mineral elements to those contained in poi. It has been estimated (Chapman, 1970) that 100 grams dry weight (about 3 ounces) of certain seaweeds provide more than the necessary daily requirement of Vitamin A, riboflavin, and Vitamin B12, and about half the daily requirement of Vitamin C. Amanori or asakusanori (a seaweed imported from Japan) contains in general, for each 100 grams, about half the necessary daily basic protein requirement of an adult. Other vitamins and minerals, especially iodine, have been found in a variety of seaweeds. In addition, minerals and vitamins were obtained by the old Hawaiians from vegetables and fruits readily available in kitchen gardens or by exchange with relatives, ko kula uka, (those from the uplands), from mauka areas (Handy and Handy, 1972) where taro, sweet potatoes and bananas were grown.

Before the coming of the white missionaries and the intervention of Queen Kaahumanu (1819), certain foods were kapu (forbidden) to women including pork, bananas, coconuts, and a variety of fish such as ulua and kumu as well as the sea turtle (Handy & Pukui, 1958). Hence, rewards came to those who mastered the arts of search and preparation of the non-kapu food which in this case were seafoods such as invertebrates and algae.

Salting and drying were the common methods of preparation and storage of a variety of seafoods, some of which are practiced at present.

Most limu as eaten by Hawaiians was consumed in the raw state, either as fresh but lightly salted material or salted for storage. Occasionally because of the characteristic of gelatinizing on heating, limu manuea and limu aki-aki might be added to stews or to the imu where other foods were being prepared, thus thickening any meat juices. Some are added to cooked foods as they are being served and, while not cooked, do add flavor.

Forty or fifty years ago it was a common sight in periods of low tide to see small groups of Hawaiian women in muumuu and hats, surrounded by their playing children, cleaning limu along sandy beaches. On Oahu, the shore from Kahala to Waikiki and at Ewa Beach were two favorite places; on Hawaii, the best places were around Hilo Bay.

Various kinds of limu are common to abundant in amount in the different districts of each of the major Hawaiian islands. Certain ones are especially well known from specific areas such as limu kohu from Kauai, although it is possible to find this seaweed on the other three larger islands as well.

Today we still follow traditional methods of cleaning: first the process of removing bits of coral, sand, and clinging animals from the limu is usually done at the beach. The cleaned seaweed is then placed in "limu bags" which in other days were poi bags of unbleached cotton muslin about 8 by 12 inches and modified with a drawstring top.

(The senior author still prefers this collecting bag over a plastic bag). At home, the limu is washed again, this in fresh water and re-examined for foreign matter. Depending on the kind of limu, it is chopped "limu oki'oki" (limu manaua or limu huluhuluwaena), pounded (limu wāwae'iole or limu lipoa) or soaked overnight in water (limu kohu or limu 'ele'ele). Salt is added at this time, as is chopped chili pepper or 'inamona (roasted kukui nut kernels) if these are desired. Several different kinds of limu can be mixed (ho'ohui) if the harvest is poor. Favorite mixtures are limu wāwae'iole with limu lipoa, and limu manaua with limu māneoneo. Limu kohu, limu lipoa and limu 'ele'ele however were rarely mixed with any other seaweed as the flavor of each is highly desirable in its "pure" state.

In older times the prepared limu was kept in small calabashes covered with ti leaves, or in the case of limu kohu kept in a ti leaf pū'olo (packet). With no refrigeration, most had to be eaten within a few days except for limu kohu or limu lipoa which could be kept for many weeks. With refrigeration, all of the limu could be kept for longer periods, sometimes for months. It was a rare Hawaiian household that did not have some kind of limu at all times.

While most common limu found in Hawaii are edible, some are more tasty than others and certain

special flavors are highly prized. Some fresh water or brackish water algae, called limu palawai or līpalawai also were eaten, especially by mauka (mountain) dwellers since these grew readily in taro patches and mountain streams.

Favorite ways of eating limu in the past, as in the present, were with raw fish (ia maka). Generally, raw fish is prepared in five ways: a soft-fleshed fish, such as 'o'io is crushed and mashed between thumb and index or third finger (i'a lomi); or served in chunks if a firm-fleshed fish such as aku (i'a nahupū); or mashed lightly with added entrails, liver, and other parts of the fish, occasionally including the head (i'a palu); or torn into chunks and mixed with other parts of the raw fish such as the liver and allowed to ferment for a few days at room temperature (i'a ho'omelu); or the whole (cleaned) fish is lightly salted and served in such a way that each person might further prepare it to his liking (i'a maka). Different families would have various favorite ways of eating raw fish; a modified i'a palu is sold in Honolulu markets currently (1973) as aku palu.

Certain kinds of limu were frequently preferred with certain fish by different families. There were favorite limus for certain invertebrates also, as well as for raw liver (ake). In coastal country areas to this day many Hawaiian families have limu in their refrigerators, sometimes mixed with ha'uke'uke (*Colobocentrotus atratus*) or wana (sea urchin gonads), or raw liver,

or, in the Japanese-like modification, using soyu and sugar. *Kimilau*, a Filipino preparation combining raw fish, vinegar, onions, fresh ginger and soyu with seaweeds is liked by Hawaiians also. Current Japanese and Korean uses of limu consist of very skillful combinations of various seaweeds, vegetables and sauces, and seem more appropriate to eat with rice than with poi.

The use of limu by Hawaiians is the object of this paper, but because of the wide enjoyment of seaweeds as food by other national groups in Hawaii, we include a few sample recipes. They are not strictly Hawaiian, but reflect the transfer from other parts of the Pacific of food customs which are enjoyed by all racial groups now living in Hawaii, including the native Hawaiians.

Ogo Kim Chee

(Korean; modified after the Korean methods of preparation of their famous pickled cabbage.)

- 2 lb. ogo ("limu long manaua"), chopped into 2-3 inch pieces
- Handful of coarse Hawaiian salt
- 2 cloves garlic (chopped) per quart of wilted seaweed
- 1-2 chopped round onions, or 1/2 c. chopped green onions
- Chili pepper, chopped (to taste) or 1/2 tsp. cayenne to taste)
- 1/2 tsp. paprika

Wash and clean the limu. Salt and wilt by standing overnight. Next day, drain off any liquid, add garlic, onions, chili pepper and paprika. Pack tightly in jars, seal and

refrigerate. Let stand a few days before using.

Note: Several other seaweeds such as limu wawae'iole, limu palahalaha and limu huluhulu-waena may be added in small quantities along with the ogo.

Gulamom Salad

(Filipino: Ilocano for seaweed)

- 1 lb. or about 3 c. packed limu wawae'iole or limu manaua
- 3-4 c. boiling water
- 4 large tomatoes
- 1 tsp. salt
- Chopped green onions
- Chopped fresh ginger
- 2 Tbsp. shoyu

Wash and clean seaweed. Pour boiling water over the cleaned seaweed; let stand for a few minutes. Drain well. Chop or mash tomatoes and add to seaweed; add remaining ingredients. Serve cold.

Sunomono

(Japanese; from: "Our Favorite Recipes" published by Maui Home Demonstration Council, Wailuku, Maui, Hawaii. 6th Printing, 1963.)

Carefully clean and wash limu manaua (ogo) in water; pour boiling water over it until the seaweed turns green. Drain well.

Serve with one of the following sauces:

Vinegar Sauce

- 1 Tbsp. sugar
- 1/2 tsp. salt
- 1/2 c vinegar
- 1/2 tsp. MSG

Miso Sauce

- ¼ c. miso
- 2 Tbsp. vinegar
- 2 Tbsp. sugar
- ½ tsp. MSG

OTHER USES OF LIMU

Limu kala, *Sargassum* species, is frequently used on open coral cuts. It is chopped or chewed and applied as a poultice. At one time this seaweed contributed to the 'ohāna (family) ritual called "Ho'oponono" which means "to set aright". In times of family dissension, a member of the family would gather young leaves of limu kala, clean and wash them and present them to the family assembled in a circle. After praying and seeking forgiveness of each other, the limu was eaten. This ceremony led to the Hawaiian name for this seaweed, "kala" which means "to forgive". Mrs. Momi Waialeale of Koloa told us about this custom, remembering it as happening in her childhood, and Mrs. Daisy Lovell of Anahola confirmed it, adding a saying derived from this ceremony, "He kala no, a ho'i ka pilikia" meaning that trouble leaves with forgiveness.

Limu kala also was used by priests (kahuna) in at least two rituals, according to Malo (1903). One ceremony was performed for those who were purified (huikala) following the burial of a relative whose body they had watched and mourned over. A temple priest, kahuna pule heiau, brought with him a dish filled with sea water which

also contained limu kala and turmeric; standing before those who needed cleansing, he prayed for their purification, finally sprinkling them with the water.

The second ceremony was an annual one, participated in by fishermen (po'e lawai'a) in the month of Hinaiaele'ele (corresponding to July) when opelu could be taken by net and used for food, or as we would now express it, at the opening of the opelu season. Before starting out to fish for the opelu, according to Malo, the fishermen would assemble at the ku'ula heiau in the evening, bringing with them their nets that they might spend the night and worship the god of fishing. All sat in a circle, and the kahuna would bring a dish of water with limu kala and turmeric and standing in their midst offer a prayer for purification (pule huikala). When the fishermen set out to sea the next morning, the pigs were placed in an imu in preparation of a feast on the return.

Neck leis and head leis, (lei o ka po'o) fashioned of limu kala, were worn by Iolani Luahine in 1972, when she performed hula hoe (canoe paddling dance) in honor of the showing of canoe paintings by Herbert Kawainui Kane at the State Capitol. This is a nearly forgotten dance and cultural practice.

Probably because it eats this seaweed, "kala" is also the name applied to one of the surgeon fishes. Turtles are known to eat this seaweed also, and probably accounts for the name limu honu (turtle limu).

The green sea lettuce, *Ulva fasciata*, was used as adornment in olden times in the hula and given the name of "pahapaha o Polihale" after the locality where it was used in western Kauai. Limu līpe'epe'e (*Laurencia* species) was kapu to hula dancers as pe'epe'e means hidden (referring to its nestling habit) and it was believed that the secrets of the hula would be hidden from the dancers who ate the seaweed.

A cultural kapu of limu pakaiea was observed by those who had the shark as aumakua (family god), according to a legend in Beckwith (1940). One of the early ancestors of the present shark aumakua was

wrapped in limu pakaiea after birth, and put into the sea in this garment, remnants of which are thought to be seen in the green sides of certain sharks. Limu pakaiea in this context is thought to be sacred to this shark god, and should not be eaten by those the god protects.

The following table gives the correct scientific name and the corresponding verified Hawaiian names of the 12 most frequently eaten seaweeds in Hawaii at this time. Short scientific descriptions by which each algae may be recognized, together with an illustration and notes, follow this table.



LIMU for sale in local market

TABLE I. Commonest Edible Hawaiian Algae

SCIENTIFIC NAME	KAUA'I	O'AHU
1. <i>Enteromorpha prolifera</i>	'ELE'ELE	'ELE'ELE
2. <i>Ulva fasciata</i>	PĀPAHAPAHA PĀHAPAHA	PĀPAHAPAHA
3. <i>Codium edule</i>	WĀWAE'IOLE 'A'ALA 'A'ALA'ULA	WĀWAE'IOLE
4. <i>Dictyopteris plagiogramma</i> (<i>Dictyopteris australis</i> also)	LĪPOA	LĪPOA
5. <i>Sargassum echinocarpum</i>	KALA	KALA
6. <i>Porphyra</i> sp.	PAHE'EHE'E LŪA'U PAHE'E	—————
7. <i>Asparagopsis taxiformis</i>	KOHU LĪPEHE KOKO	KOHU
8. <i>Grateloupia filicina</i>	HULUHULUWAENA	HULUHULUWAENA
9. <i>Gracilaria coronopifolia</i> (ogo: Japanese)	MANAUEA	MANAUEA
10. <i>Abnfeltia concinna</i>	KO'ELE'ELE	—————
11. <i>Laurencia parvipapillata</i> <i>L. dotyi</i> <i>L. succisa</i>	LĪPE'EPE'E	LĪPE'EPE'E
12. <i>Laurencia nidifica</i>	MANE'ONE'O	MANE'ONE'O

(Limu) With Hawaiian Names

MOLOKA'I	MAUI	HAWAII
'ELE'ELE	'ELE'ELE	'ELE'ELE
PĀLAHALAHA	PĀLAHALAHA	PĀKAIEA
WĀWAE'IOLE	WĀWAE'IOLE A'ALA'ULA	'ALA'ULA WĀWAE'IOLE
LĪPOA	LĪPOA	LĪPOA
KALA	KALA	KALA
PAHE'E	PAHE'E	PAHE'E
KOHU LĪPEHU	KOHU LĪPA'AKAI	KOHU
PAKELEAWA'A	PAKELEAWA'A HULUHULUWAENA	HULUHULUWAENA
MANAUEA	MANAUEA	MANAUEA
————	'AKI'AKI	'AKI'AKI KO'ELE'ELE
LĪPE'EPE'E	LĪPE'EPE'E	LĪPE'EPE'E
MANE'ONE'O	MANE'ONE'O	————

1. LIMU 'ELE'ELE (black limu, from the dark green color it takes on standing.) *Enteromorpha prolifera*. Figure 1.

Name used on all islands.

Other common names: huluilio (dog's hair, a name used in common for several finely branched algae).



Figure 1 *Enteromorpha prolifera*

Plants about 2 inches tall, growing in tufts, usually on small rocks buried in fine sand; dark green, hair-like, 1/8-inch wide with finer irregular side branches.

Where found: Common wherever there is freshwater intrusion, such as freshwater streams entering the ocean, or underwater springs such as are found at Hookena and Punaluu on Hawaii; Pukoo, Molokai; Kahala and Hauula, Oahu; Hanapepe and Hanalei, Kauai.

Collection and preparation: These plants are usually slippery to pick up and a strainer or shrimp net is sometimes used to help collect them. They should be cut off about 1/2 inch above the base. Care must be taken to remove all sand, after which washing in several changes of fresh water is necessary. After draining, a light amount of salt is added (about 1 tablespoon of Hawaiian salt to a cup of cleaned limu), and the limu refrigerated in a tightly covered container or kept at room temperature if a stronger flavor is desired. It may be eaten the next day, and will keep under refrigeration for a week or ten days when it will have developed a fermented odor.

How eaten: Usually in stews, or with a soft raw fish (i'a lomi) such as awa, or with manini or aholohole (i'a ho'omelu). A small amount will flavor a large amount of stew.

2. LIMU PĀLAHALAHA (spread out). *Ulva fasciata*. Figure 2.

Name from Oahu, Maui, and Molokai; other names are pāpāhapaha (young taro leaves) from Kauai, and pakaiea (ruffled, heart-shaped leaves) from Hawaii Figure 3.

Other common names: sea lettuce. Limu pakaiea may apply to a different species, as yet unidentified. It is shorter, broader, has irregular margins and is a lighter green in color.

Plants mostly 4-6 inches wide at the base, tapering upwards to less than 1 inch wide at the tip, sometimes 2-3 feet long, branched and dissected into ribbon-like portions,

becoming narrow with age, very dark green, gold at the margins when reproductive, firm in texture.

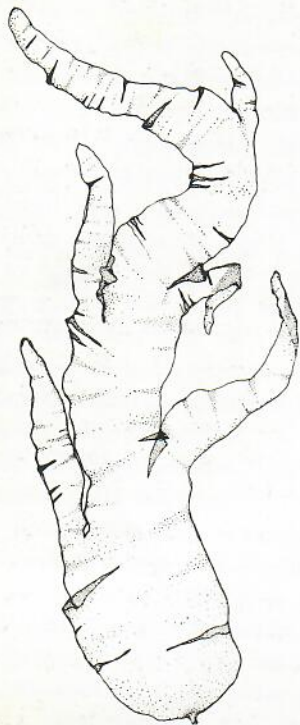


Figure 2 *Ulva fasciata*

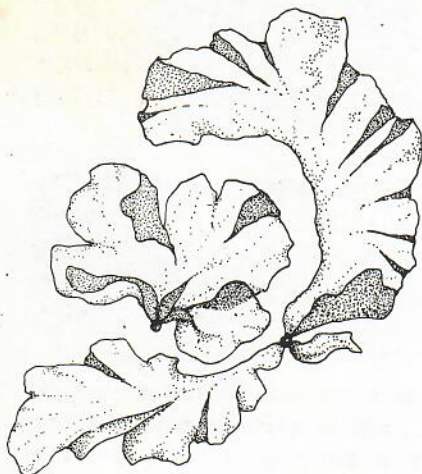


Figure 3 *Ulva fasciata*

Where found: Common throughout the islands, especially on lava rock and old coral. Limu pakai-*ea* usually grows on other seaweeds.

Collection and preparation: Easily collected; remove small black snails that are usually feeding on the blades. Wash well and chop into small pieces less than one inch square. Mix with other limu (such as *huluhuluwaena*) to serve.

How eaten: 1) Mix with other seaweeds and serve, salted, with raw fish such as *aku palu*. 2) Drop into boiling water and serve as a light soup to which may be added other vegetables and pieces of leftover meat. 3) Serve with chili pepper and onions in a special "zuke" (relish) dish, dressed with *shoyu* and sugar (Japanese).

See text for cultural uses and cultural *kapu*.

3. LIMU WĀWAE'IOLE (rat's feet, after the thin cylindrical branches). *Codium edule*. Figure 4.

Name known on all islands.

Other common names: 'ala'ula (red fragrance); a'a'la'ulla (Maui) and 'a'ala (Kauai), making a red fragrance, both names applied to the prepared seaweed which exudes a red liquid, becoming fragrant on standing; *huluhulu'iole* (rat's hair, obsolete); *wāwaemoa* (chicken foot, obsolete); *miru* (Japanese); *ambalang* (Visayan); *popoklo* (Ilocano).

Plants more or less creeping over coral, forming small to large mats incorporating bits of coral and shells, firm but spongy to touch, dark green and with a felt-like sur-

face; branches 1/8-1/4 inches wide, usually repeatedly divided.

Where found: Common throughout the islands from low intertidal to subtidal, 6-10 ft. depth — more common subtidally than intertidally. On Oahu, easily found at Waikiki, Kawela Bay, Nanakuli; Kihei on Maui. Formerly abundant in Honaunau Bay, Hawaii.

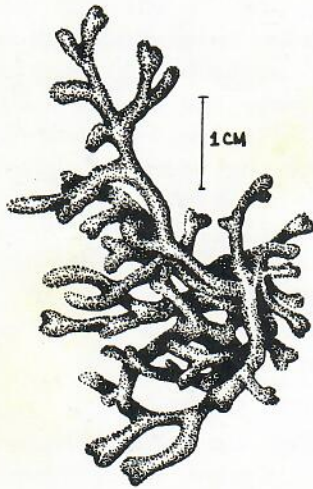


Figure 4 *Codium edule*

Collection and preparation: Since plants grow over old coral and are frequently attached in several places to the coral, cleaning frequently requires cutting off hardened and irregular portions. Chop or pound the plants and mix with salt. A small amount of chili pepper, some raw cleaned sea cucumber (loli), haukeuke gonads (flat sea urchin, or *Colobocentrotus*), raw octopus or other seaweeds may be added. Under refrigeration, it will keep almost indefinitely, but is best eaten within 10 days.

How eaten: Usually as a single limu with fish or in a stew, but also added to other foods as above.

Codium reediae (Figure 5) To some people, this is aalaula, the name wawaeiole being reserved for *Codium edule*, but most use the two names interchangeably. This species is an erect plant, segments are about 1/2 inch wide (thus 3-4 times wider than *Codium edule*) and flattened; small, shiny, bead-like structures may be seen on the surface of the plant; the plants are lighter green in color than *Codium edule*. They are commonly found subtidally from Ewa Beach to Sand Island on Oahu, on the southwest shore of Maui, and it has supplanted (1973) *Codium edule* in the Honolulu markets, where it is usually found mixed with other foods. Tomatoes, onions and salted salmon are frequent additions seen.

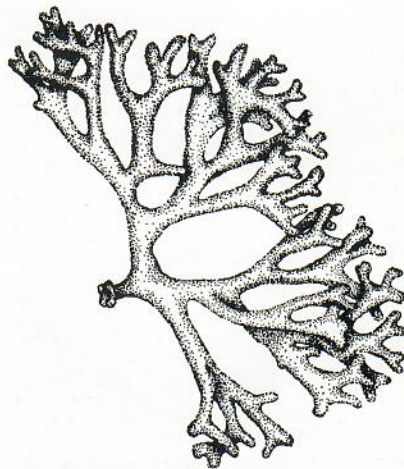


Figure 5 *Codium reediae*

Codium arabicum. This species is widely distributed in the Hawaiian

islands but only occasionally found, never in abundance. It is without branches, flattened, and tightly adheres to rock and coral. It is reported to have been called (Setchell, 1905) *limu huwae*, a name without any known meaning. Although edible, it is difficult to clean and is therefore not a prized item.

4. LIMU LĪPOA (limu that is gathered from the deep. *Dictyopteris plagiogramma*; also *D. australis*, a less common species. Figure 6.

Name known on all islands.

Other common names: none. The name līpoa has been ascribed by Setchell (1905) and Neal (1930) to species of *Dictyota* also. Our informants were uniformly certain that the Hawaiian name applied only to those plants that had a midrib, that is, *Dictyopteris*. Furthermore, some pointed out that limu alani (a name which has been used for some species of *Dictyota*) means "bitter" and asked the obvious question: who would eat bitter limu?

Plants 2-8 inches high, several branches growing together from a fleshy base (kumulipoa), branches leaf-like, 1/2 to 1 inch broad, somewhat wavy, golden colored, with a prominent dark brown midrib.

Where found: Nomilu, Kauai; Kaneohe to the Blowhole and Wai-kiki, Oahu; Olowalu and Lahaina, Waihee to Sprecklesville, Maui; Kohala, Hawaii. Plentiful where found — subtidal only, although sometimes cast ashore in large windrows. Said to be eaten by the 'o'io fish.

Collection and preparation: These are deep-water plants, from 3-15 feet depth, frequently in "meadows" beyond the reef. Plants are easy to pick since they are relatively tall and coarse. Older plants have a tough midrib and base and these

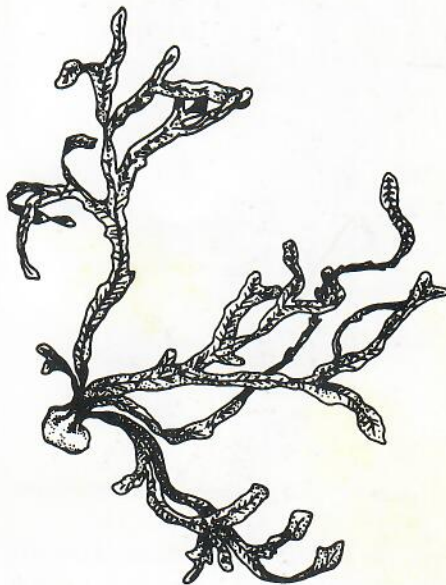


Figure 6 *Dictyopteris plagiogramma*

should be discarded. The leafy branches are washed and cleaned and heavily salted (lipa'akai). They will keep indefinitely without refrigeration in this state. Younger leaves may be chopped or pounded, lightly salted and refrigerated.

How eaten: The characteristic odor and unique spicy flavor are highly favored. The limu is usually eaten as an accompaniment to fish, especially uhu, or meat dishes, and is a favorite in stews; frequently eaten with raw octopus (he'e maka), and ake (raw liver).

5. LIMU KALA (to forgive — see text). *Sargassum echinocarpum*. Figure 7.

Name used on all islands.

Other common names: limu honu

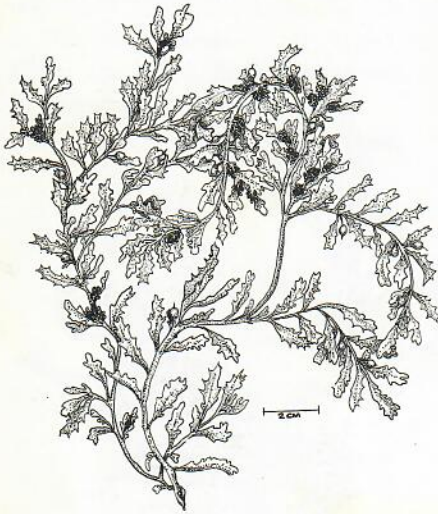


Figure 7 *Sargassum echinocarpum*

(turtle limu); holly limu. Hawaiians distinguished two kinds by the size of leaves: kala-launui — large leaved, and kala-laulii, small leaved.

Plants 10-20 inches high from a fleshy base, bushy, with leaves borne around the stem (kumulimukala), leaves usually 1-4 inches long, about 1/2 inch wide, a golden brown, with conspicuous dots, and a clear midrib; occasional round floats are borne at the base of the leaves; margins of leaves smooth to spiny (with teeth).

Where found: Common throughout the Islands in rocky and sandy places. Eaten by the fishes kala, palani, and enenu.

Collection and preparation: Since the plants are common and easily reached, they are easy to pick. Only the youngest leaves should be used since the older ones are tough. After washing and removing bits of other seaweeds which cling to the limu kala (moopuna o limu kala is the name of one of the clinging seaweeds), the leaves may be soaked in fresh water overnight and used as a stuffing in baked fish; or salted and kept for long periods under refrigeration.

How eaten: Limu kala is usually chopped, or put through a grinder and combined as a minor addition to other limu, or cooked in soup. Unless it is chopped finely or ground, it is rather tough to chew.

Other uses: (see text). Used also as bait for fishing of kala and enenu (Kohala).

6. LIMU PAHE'E (slippery, referring to texture of the plants).

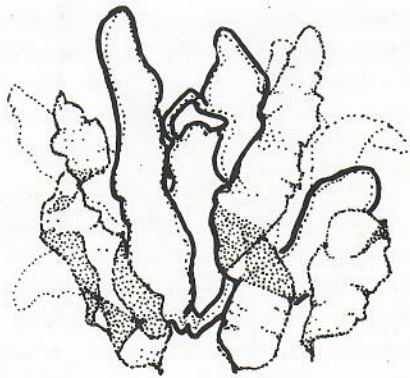


Figure 8 *Porphyra* sp.

Porphyra sp. The senior author was unable (1972) to identify the species because of the rare occurrence of this plant in the tropics, and the difficulty of finding other plants with which to compare these. However she is reasonably sure that there is only one species in Hawaii. Figure 8.

Name used on some parts of all islands except Oahu. Also paheehē (slippery) and luau (appearance of cooked taro leaves) — Kauai.

Other common names: nori (Japanese).

Plants 3-4 inches long, 1/2 to 2 inches wide, growing in groups on tops of rocks, usually seasonally in winter, a lavender to light purple color; thin, blades soft and slippery to touch.

Where found: Occasional winter and early spring annual on all large islands wherever there are large rounded boulders or rocks and a heavy surf: Moloaa and Kailihwai, Kauai; Waimea and Maile, Oahu; Honolulu and Hana, Maui; Kohala, Kona, Waikapuna, Kalae, Hawaii.

Collection and preparation: Carefully scrape from rocks, wash off sand and small animals in seawater. Cut into small pieces, add a small amount of salt and let stand for a few hours before eating. Does not keep well prepared in this way. May be quickly sundried and stored for future use.

How eaten: With delicately flavored raw fish (ia lomi).

7. LIMU KOHU (supreme) *Asparagopsis taxiformis*. Figure 9.

Name used on all islands. Also kohu lipehe (light-colored kohu), and kohu koko (dark red kohu) are distinguished on Kauai.



Figure 9 *Asparagopsis taxiformis*

Other common names: Limu lipa'akai, after the old method of storing with large amounts of salt for preservation (a method still used on Niihau today).

Plants 3-5 inches tall, with a creeping entangled basal portion from which erect stems arise; stems usually naked near the bottom, with brushes of soft fuzzy branches on the upper portions, dark red, tannish pink to brown, with a

strong iodine odor developing on standing.

Where found: Growing on edges of reef where there is constant water motion. Occasional on all major islands but found especially in the Anahola district of Kauai which supplies the bulk of limu kohu for the island markets. Also from Wai-anae and Kahuku, Oahu; Molokai; Hana, Maui; Kohala, Hawaii.

Collection and preparation: Erect portions of plants are collected by diving ("seed" is left by Hawaiians by never taking the creeping portions). The plants are freed of pieces of coral and sand, and soaked (waiwali-no) half a day or overnight, lightly salted and upper branches pounded, then rolled with the stems into balls about the size of a large walnut. They will keep indefinitely in this way, and portions taken for use as needed. Only a small quantity is used as the flavor is penetrating.

How eaten: ia palu; ia lomi of various kinds, and ia nahu pu; added to cooked stewing beef.

There are several legends relating how limu kohu koko got its dark red color, each of them referring to an event connected with legendary or real alii, enforcing the view that not only is the limu supreme but especially choice for alii. It is still (1973) the favorite limu of most Hawaiians.

8. LIMU HULUHULUWAENA (pubic hair, after the dark, finely branched stems). *Grateloupia filicina*. Figure 10.

Name is from Hawaii, in the region of Hilo. Name from Maui and Molokai is pakeleawaa (slipping from the canoe) after the fine slippery branches.

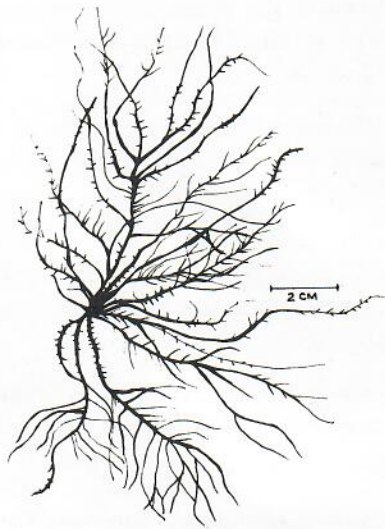


Figure 10 *Grateloupia filicina*

Other common names: "Chop-chop" (Lahaina), after method of preparation; ake limu, referring to its most frequent use.

Plants bushy, pyramidal in shape, stems flattened, with fine branches in one plane at right angles to the stem, slippery in texture to rather wiry, dark purple to blackish, growing in small groups on rocks covered with sand.

Where found: Occasional on major islands: Honokowai, Maalaea, Maui; Kupeke, Molokai; Waikiki, Hanauma Bay, Oahu; Hilo, Hawaii. The Waikiki plants are said to have been brought from Honokowai, Maui, for Queen Liliuokalani and planted at her seaside home there.

Collection and preparation: Individual plants, growing in small groups may be gathered in shallow water. Except for some other seaweeds that may grow on them, they are usually rather clean. After washing, the plants are usually finely chopped, and lightly salted. A few chopped chili pepper and for color, a few pieces of limu pahalalaha are usually also added.

How eaten: Combined with ake (raw liver) and ia maka; added to cooked beef stew at serving time; eaten with dried and broiled hee (octopus).

9. LIMU MANAUEA (erect branches — allusion unknown). *Gracilaria coronopifolia*. Figure 11.

Name used on all islands.

Other common names: Ogo (Japanese name for species of *Gracilaria*). The seaweed sold as "ogo" in the fish markets is another species of *Gracilaria*, *G. bursapastoris* which is different in that it is a longer plant (frequently 10-12 inches long) and the branches a little flattened; it is obtained from depths of 8-12 feet.

Plants 4-6 inches tall, in crisp clumps with a rounded top; branching repeatedly, nearly all branches cylindrical and of the same width, dark rose to pink with greenish cast.

Collection and preparation: This seaweed is easily collected as it comes in small bushes. It is crisper and more tender than the market "ogo." Remove other clinging seaweeds, bits of coral and small animals; rinse in fresh water and chop

in fine pieces. If it is to be eaten at another time, it should be lightly salted and refrigerated. It may be frozen successfully.

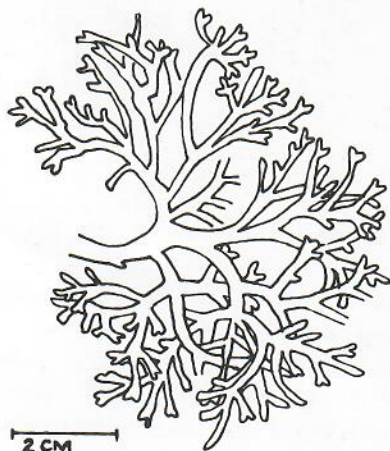


Figure 11 *Gracilaria coronopifolia*

How eaten: Mixed with other seaweeds and eaten with fish or meat; added to chicken stew with grated coconut, limu manaua will gelatinize on heating and thicken the stew.

10. LIMU 'AKI'AKI (nibbles, after the small bites necessary to chew it). *Abnfeltia concinna*. Figure 12.

Name from Hawaii.

Other names: According to Pukui and Elbert (1957) 'eleau is used on Maui for this seaweed; also the name awikiwiki. We could find no one who had heard or recognized these names. Limu koelele is also sometimes used for this species, but is used for other species as well (Hawaii).

Plants 6-12 inches high, growing in thick erect golden brown clumps on pahohoe lava boulders, branching densely near the tops of the plants.

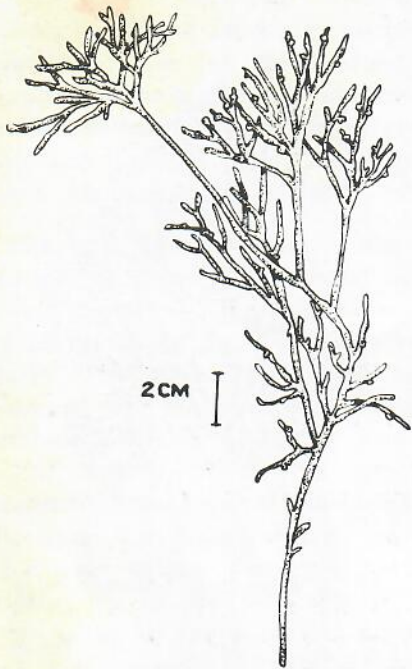


Figure 12 *Abnfeltia concinna*

Where found: Abundant where present, but rare on Oahu; common at Hanamaulu, Kauai; common everywhere on Maui and on Hawaii, especially on rounded lava boulders.

Collection and preparation: Easily collected. Remove small animals and clinging seaweeds (rock crabs or alamihi hide in these and eat the seaweed as well). Chop well.

How eaten: Old Hawaiians used this limu with the baking of chicken or fish in the imu, or baked (lāwalu) in ti leaves. Today it is frequently added to cooking chick-

en, beef or pork for flavor and thickening. Also eaten with opihi (raw limpets).

11. LIMU LĪPE'EPE'E (hidden limu, after the nestling habits). *Laurencia succisa*, *L. parvipapillata*, and *L. dotyi* are 3 species or kinds of *Laurencia* which are closely

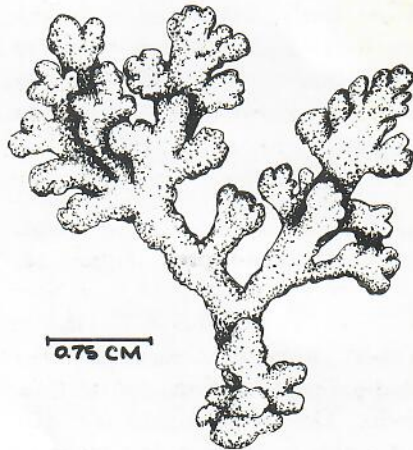


Figure 13 *Laurencia*

related and few can discriminate the technical points which separate them. In the field, informants showed no distinction among these, naming all of them limu lipe'epe'e. In practice, then, we accept all predominantly creeping, flattened species of *Laurencia* in Hawaii as limu lipe'epe'e. Figure 13.

Some version of name used on all islands. Līpe'e is the shortened version; lipepe is the Niihau version.

Other common names: Limu ape'epe'e is said by Pukui and Elbert (1957) to be a variety of lipeepee.

We have found no one who recognizes this name. Limu hoonunu is said by the same authors to be *Laurencia obtusa* variety *racemosa*. This species is not recognized in the monograph (Saito, 1969) of Hawaiian species of this genus, and we have not found anyone who recognizes this common name.

Plants usually short, crisp, 2-3 inches high and creeping for 1-2 inches, with flattened branches either growing downward towards shady places, or nestling in sea urchin and haukeuke holes, dark purple to brownish and dark red, with branchlets making small bumps along the margins.

Collection and preparation: Common except on Hawaii, in areas of moderate to heavy surf, especially in small pools on aa basalt (Poipu, Kauai; Halona, Mauna Lanihale, Oahu; Hana, Maui). The cartilaginous rather stiff clumps are easily collected if the habitat is the right one, but in marginal places plants are few and far between. The plants are usually free of animals and clinging algae and are thus easy to clean.

How eaten: Limu *līpe'epe'e* may be frozen successfully, then thawed and chopped as needed to eat with raw fish. Its texture and flavor are particularly liked.

12. LIMU MANE'ONE'O (ticklish, after the peppery flavor). *Laurencia nidifica*. Figure 14.

Name from Maui.

Other common names: mustard limu (Maui). Palewāwae (Setchell, 1905), meaning foot-covering, an

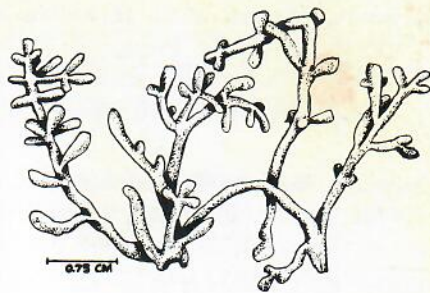


Figure 14 *Laurencia nidifica*

obvious misidentification and association with this seaweed. Elbert and Pukui (1957) associate this name with *Padina* species, but we have not been able to verify this.

Plants with matted base and 2-3 inches tall, or in small bushes up to 10 inches tall, branches slender, abundantly branched again on all sides, pinkish to yellowish to light green and very variable in shape and color.

Where found: Common on all islands except Hawaii, usually growing on sandy and eroded coral rock (Kapaa, Kauai; Hauula to Kaneohe, Oahu; Maalaea, Maui).

Collection and preparation: Young plants should be collected as they are more tender and the peppery taste is sharper. Remove pieces of coral and entangling seaweeds, wash and salt.

How eaten: Used with raw fish, raw liver, or mixed with other seaweeds of mild flavor such as limu manauaea.

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