ALASKA Tideline

Vol. II, No. 7 A University of Alaska Sea Grant Publication for Alaska Schools. April, 1980

SPRING COMES TO THE SEA

1. What is he fishing for?

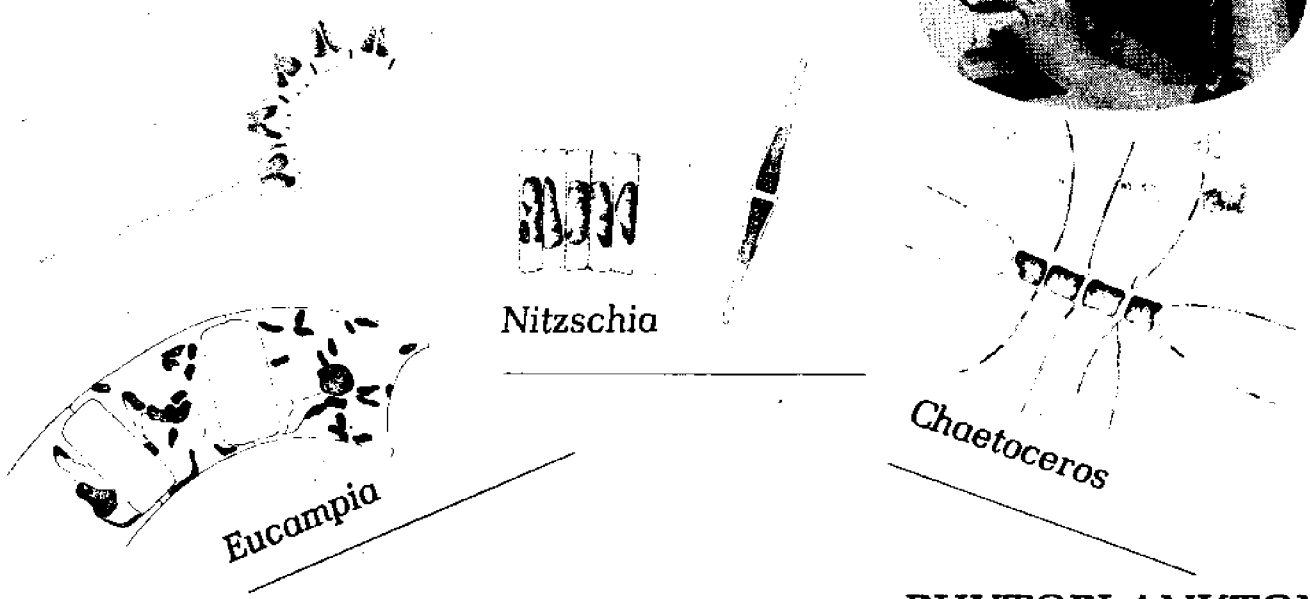
2. What are they looking at?

Photos by Rod Brown

1. CLUE: What Jeff Jennings of Wrangell High School is after won't win any salmon derbies. But without it, there wouldn't be any salmon either. It is the basis for all life in the water, just as green growing things are on the land. And as it makes its way up the food chain of the sea, about five tons of it will be used for a salmon to gain one pound.

2. CLUE: Marine biology students (left to right) John Emde, Steve Merritt, Yvonne Taylor and Michelle Easterly won't know for sure what they're looking at until they get it back to the school lab and put it under a microscope. But with the coming of spring, it grows and multiplies like mad. And in that small test tube of water there could be more than a million of them.

What They Caught



Sketches by Darleen Masiak

PHYTOPLANKTON

They caught a plant—well, a whole lot of tiny one-celled plants, so small you can't really see them unless you look through a microscope. But there you would find a fascinating world of far-out forms, from feathery chains to lacy loops to flying frisbees.

These plants are the smallest species of the green growing things in the water called *algae* (AL-gee), which is the Latin word for "seaweed." (The "weed" part of seaweed is the wrong word—but we seem to be stuck with it.) Scientifically, the only difference between those microscopic plants the Wrangell kids are catching and the slippery masses of seaweed you skid around in on the beach is size. One kind of alga is big enough to see and the other isn't.

Like land plants, algae are small factories that use the sun's energy to make their own food. This process is called *photosynthesis* (photo = "light" + SIN-thuh-sis = "putting together"). They have no true roots, stems or leaves *(see page 4)*. They get the nutrients they need directly from the water, and they stay near the surface where the sun can reach them.

All algae, large and small, play an important role in the marine environment. But the tiny plants pictured above make up 95 percent of the vegetation in the sea. They are *phytoplankton* (FI-toe-plank-ton), from the Greek *phyton*, meaning "plant" and *planktos*, meaning "to wander." As their name suggests, they are rootless wandering drifters that move with the tides and currents. Like the blades of grass on the land, they form the great floating pastures of the ocean. From them all water creatures, either directly or indirectly, get their food.

Alaska waters are especially rich in this basic food. They are nourished by minerals washed from the land by rain and melting snow, and carried into the sea by rivers and streams. In addition, the combination of our dark cold winters and long light summer days has a strange kind of mixmaster effect in many areas which works something like this:

Warm water is lighter than cold water (just as warm air is lighter than cold air—remember the soaring seabirds' secret?) During the summer months, the sun-warmed waters float like a blanket over the cold waters beneath. Migrating whales and seabirds and all sorts of marine life feast on this plankton-rich soup and the fish it attracts.

By late summer most of the goodies are eaten up. Growth slows down because the sea-bottom nutrients are trapped in the cold water zone below.

But in the fall when the sun hangs low on the horizon, the surface waters are chilled by cold winds and—in some places—the creeping pack ice. Then this layer becomes colder than the waters beneath it. It sinks down, and in a kind of churning action, it forces the nutrient-rich waters to the surface.

The names of marine algae tend to be tongue-twisters. Most don't have common names because they aren't exactly common plants. That leaves only the Greek or Latin scientific names that were given to them by algologists. (There's another one—it means scientists who study algae.)

Do a little scientific naming of your own. On the blank lines, write the word or words you think best describes these species of phytoplankton. Then turn to page 7 and see how your names compare with the meaning of the scientific names. (That's Dean Barker of Wrangell High manning the microscope).

Photo by Rod Brown

That sets the stage for the coming of spring when the warm sun returns and touches waters now filled with nutrients. The phytoplankton explode into life and increase at an incredible rate—up to 50,000 times in some Alaskan waters. Like the land, the sea blooms with growing things of its own. And that's when the students in Rod Brown's marine biology class at Wrangell High School grab their plankton nets and head for the docks.

"You can actually see the 'bloom,'" Mr. Brown says. "It makes the water look quite cloudy.

"We collect plankton during the fall and winter months, too, so that we can study the seasonal changes. But during this period we take samples about once a week or so. We identify them and make plankton counts and watch them under the microscope to find out how they work."

The two main types of phytoplankton the students find are:

1. *Diatoms* (DIE-uh-toms, meaning "cut in two"). These plants have crusty two-part shells of many shapes that fit together like tiny pillboxes. The shells contain silica, a glassy mineral that doesn't dissolve in water. When the plants die the shells sink to the bottom and contribute greatly to the nutrients. Diatoms are quite clear, sometimes colored with traces of green and gold.

2. *Dinoflagellates* (DIE-no = "spinning" + FLA-ju-late = "whip"). These phytoplankton really fall somewhere between plants and animals. They produce their own food with the help of the sunlight. But they also feed on tiny particles of other food in the water, and use their tail-like legs to move around a bit, like animals. The "red-tides" or reddish-brown drifts in the sea are caused by this type of phytoplankton.

But plankton isn't all just plants. There are animal drifters as well, called *zooplankton* (zoo means "animal," of course). These also are divided into two basic types:

1. Microscopic animals that spend their whole lives as plankton, mainly the copepods (COE-puh-pods).

2. The larvae or young of many sea creatures that are plankton only for a time before they grow up and either learn to swim or sink to the bottom and take up life on the ocean floor.

So when you say just "plankton" you mean both kinds—the whole floating plant and animal world that provides the basic groceries of the sea. Creatures as large as baleen whales feed exclusively on plankton, with giants like the bowhead, the fin, and the humpback gobbling up as much as two tons a day.

But most important, phytoplankton are the beginning of the what-eats-what food chain of the ocean, in which mini-organisms are eaten by tiny creatures, which are eaten by small fish, which are eaten by bigger fish, and on and on. And by the time it finally turns into a pound of derby-winning salmon, 10,000 pounds will have been consumed. (There's the five tons from page 1.)

Way back at the beginning, it is the tiny zooplankton that is usually the first feeder on the phytoplankton. And in their studies, the students at Wrangell High often get a glimpse of this fascinating first step in the food cycle of the sea. Through their microscopes, they can look right inside the zooplankton and identify what kind of phytoplankton it had for lunch.

Teacher Rod Brown reports some difficulty in finding good resource material for plankton study. But these are two relatively inexpensive books that have been helpful:

"A Guide to Marine Coastal Plankton and Marine Invertebrate Larvae," by DeBoyd L. Smith. Kendall/Hunt Publishing Co., Dubuque, IA. 1977

"The New Field Book of Freshwater Life," by Elsie B. Klots. G.P. Putnam's Sons, 1966.

Marine biology teacher Rod Brown (left) looks over Steve Merritt's drawing of the phytoplankton he has seen through the microscope.

Photo by Jeff Jennings

SEAWEEDS OF ALASKA

Late-comers to Alaska are learning what its Native people have known for centuries—that seafood includes plants as well as fish.

At least 350 species of seaweed are found along our coastline. Nearly all of them are edible, but at least 70 species are used regularly for food, either here or in other parts of the world.

Like land plants, seaweeds, contain the green pigment (coloring matter) called *chlorophyll* (CLOR-oh-fill) which they use to manufacture food with the aid of the sun. But most have other color pigments as well, which tend to mask the green. On the basis of these various colors, seaweed species are classified into three major groups:

1. Green algae or *Chlorophyta* (CLOR-oh = "green" + FITE-uh = "plant").
2. Brown algae or *Phaeophyta* (FAY-oh = "dark").
3. Red algae or *Rhodophyta* (ROW-doh = "red").

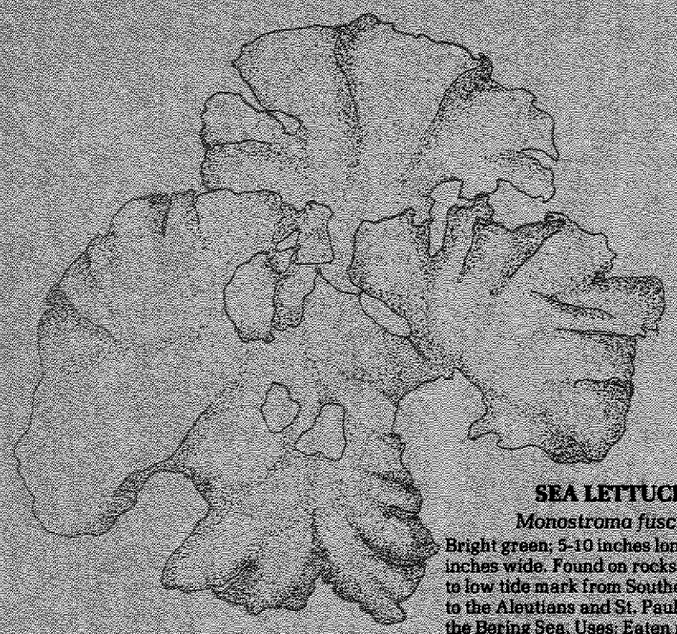
If you think that sounds too simple for a science as complicated as the study of marine algae, you are absolutely right.

Red algae, for example, can be dull red, rose red, brownish red, purple, or even yellowish green when bleached by the sun. And the other groups are just as tricky. So in making their classifications of individual species, scientists rely less on actual color and more on chemical and cell structure.

Chemical substances from these seaweed have long been used in many food and non-food products. Algin from the brown seaweeds, and agar from the reds, are used as binding and thickening agents in ice cream, candy bars, salad dressing, jellies and instant puddings, as well as in medicines, soap, paint, ink, cosmetics and cloth.

But the whole plant is rich in all the elements—vitamins, proteins, minerals, sugars and starches—that make land plants an important part of our diet. And many people are beginning to recognize these marine plants for what they really are—delicious, nutritious vegetables of the sea.

Pictured here are some of the many sea (plant) foods you can find on Alaska's beaches. The shopping is fun, the price is right, the cooking is easy *(see pages 6-7)*, and the taste is great!

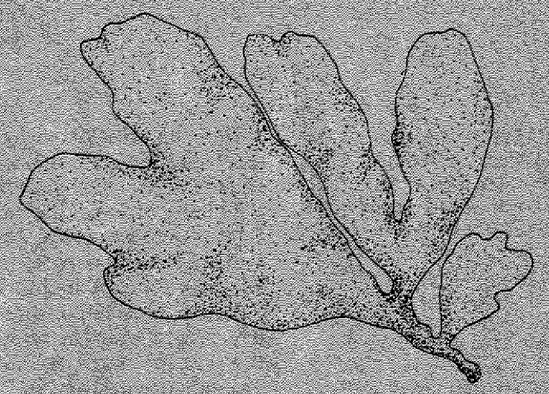


SEA LETTUCE

Monostroma fuscum

Bright green; 5-10 inches long, 7-9 inches wide. Found on rocks from mid to low tide mark from Southeast Alaska to the Aleutians and St. Paul Island in the Bering Sea. Uses: Eaten raw, alone or in salads. Dried and crushed, it is cooked with meat or fish or as seasoning in soups.

Sketches by Darleen Masiak

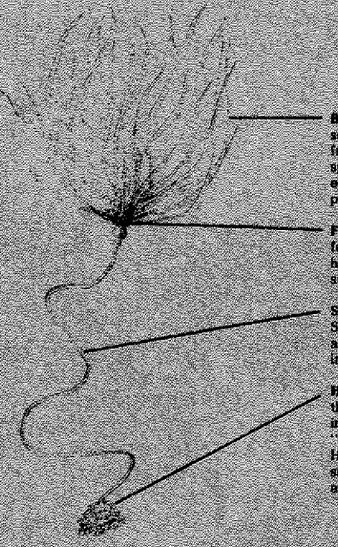


DULSE

Palmaria palmata

Dull red, rose red, or reddish purple; 2-7 inches high, 1-5 inches wide. Found in clusters on rocks from mid to low tide mark from Aleutian Islands and Bering Sea to Southeast Alaska. Uses: Eaten fresh in salads; dried and added to soups and stews; quick-fried and eaten like potato chips. Slightly salty or nutlike taste.

PARTS OF SEAWEED



BLADE—Leaf-like part which absorbes light from the sun and food from the sea. May also produce spores (like seeds) that are released into the water to form new plants.

FLOAT—Hollow gas-filled bulb found on some seaweed which holds blades near the water's surface.

STIPE—Like a stalk or stem. Some stipes are quite solid, some are hollow, and some are almost invisible.

HOLDFAST—Anchor with which the plant fastens itself to rocks, pilings and such to stay within the "sunlight zone" of the sea. Holdfasts may look like roots or small button "suction cups." Some are very small and hard to find.

BULL KELP

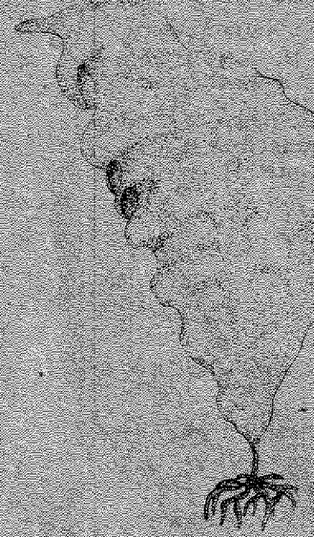
Nereocystis lutkeana

Olive green to dark brown; up to 50 yards long. Found below the low tide mark, and often floating or washed up on the beach throughout the Gulf of Alaska. Uses: Herring spawn on the long thin blades. The bulb and stipe often are candied or pickled (recipes in most Alaska cookbooks). To make a horn, cut off a two-foot length of hollow stipe at the bulb end, and trim off the blade and about half the bulb. Blow hard through the stipe end, keeping your lips tight as in playing a trumpet. It makes a mellow sound, and with practice you can even play a tune.

RINGED or RIBBON KELP

Alaria marginata

Olive or yellowish brown; 3-9 feet long, 7-10 inches wide. Found near or below the low tide mark in rocky areas exposed to the surf along Gulf of Alaska coast from Southeast through the Aleutians. Uses: Stipe eaten raw like celery, or chopped and added to salads. Dried and cooked in soups or stews; also fried and tossed with sugar, honey or soy sauce and eaten as a snack.



SUGAR WRACK (KELP)

Laminaria saccharina

Yellow-brown or rich brown; 3-9 feet long, 6-9 inches wide. Found near or below the low tide mark from the Chukchi Sea to Southeast Alaska. Uses: One of the best species for herring roe (eggs) on kelp, a delicacy. Sweet sugary taste. May be eaten raw, cooked in soups or stews, or quick-fried for a snack.

Linda Schandelmeier, seaweed taxonomist, University of Alaska, provided much of the material and assisted in the preparation of this issue.

Tips for Gathering Sea (plant) food

WHEN: On a good low tide. Check the Tide Table for your area, and get to the beach a little early so you can have an extra hour or so of prime-time gathering.

WHERE: Rocky beaches with a scattering of big boulders are best. (Skip the mud flats and sandy beaches because it is difficult for seaweed to attach themselves there.)

WHAT TO WEAR: Warm clothes. Hip boats are best; otherwise, heavy shoes with soles that won't slip, or tennis shoes.

EQUIPMENT: Large bucket and a net bag or a canvas bag. (A pillowslip will do, with a string to tie it shut.) If you are collecting specimens, plastic bags are handy for separating different species. Take along a notebook, too, to record the location and description of plants for future reference.

TOOLS: Putty knife for scraping plants from rocks (particularly if you are collecting and want the whole thing). Sturdy knife for cutting seaweed. The whole plant is edible, but the blade is usually the most tender and tasty. Some species, like ribbon kelp *(Alaria)* will regrow if you harvest just the blade and leave a piece of stipe and the holdfast.

METHOD: Growing plants taken directly from their attachment are freshest, of course. But floating or cast-up plants are all right, too, if they're not damaged or wilted. A good time to gather cast-up plants is right after a strong wind or a storm which may pull seaweeds loose.

CARE: Swish them in seawater to remove sand and other debris. Keep them cool and moist, but not soaked. If you rinse them in freshwater, do it under the tap as quickly as possible. Soaking in freshwater removes vitamins. Sealed in plastic, seaweeds will hold fresh in the refrigerator for several days. They also can be frozen.

TO DRY: Outdoor drying is best, especially if you are lucky enough to have a sunny, breezy day when the drying can be completed quickly (usually in about 12 hours, depending on the size). Hang them on racks or clothesline. Turn them every half hour or so. When crisp, grind, chop or cut in pieces, and store in sealed containers or plastic bags.

WARNING: Don't get yourself trapped by an incoming tide, and never turn your back on the ocean.

How to Cook Seaweed:

OLD WAYS...

Frank Johnson was born near Kake in Southeast Alaska in 1894. He is a former Grand President of the Alaska Native Brotherhood and served in the Territorial legislature from 1947 to 1957. Now retired and living in Ketchikan, he enjoys sharing his vast knowledge of the life and history of the Tlingit people. The following article is adapted from his book, "Tlingit Survival Practices and Stories," and is reprinted with permission of the Ketchikan Indian Corporation:

TOASTED BLACK SEAWEED

This type of seaweed is just right for picking during the big low tides in the month of May, except in a few places like Baranof Island where the waters are cooler from snow water running off the steep mountains. There it is possible to harvest as late as the first week in July.

Pick the seaweed early in the morning. Choose convenient bare rocks in a place where they will get plenty of sun. After allowing the rocks to warm up, spread the freshly picked seaweed in squares about 30 inches wide and 2 inches thick. When one side is dry, loosen where it might stick to the rock and flip it over. Let it dry as much as possible.

Meanwhile, build a large bonfire. Let it burn till it creates a good large pile of live coals. Put trimmed straight white alder branches in the ground in a circle where it will receive plenty of heat—say, about 4 to 6 inches from the fire. Lean the sticks towards the fire so as to hold up the dried seaweed squares.

When toasted right it will turn dark green. Take a small amount to see if it will crumble in the hands. Then put the squares in cotton sacks, they crumble easily. Hit with wooden two-by-fours till it is reduced to powder, not too fine. It works best when the sun is shining and not too windy. It is, I think, easier and quicker than grinding. Store in tight containers, like jars or clean 5-gallon cans with tight covers, not in open containers as they will tend to absorb moisture and spoil the taste.

To eat, simply add boiling water in a bowl and seal oil or whatever you prefer—canned salmon, clams, salmon eggs. It needs no cooking; toasting cooks its. The older generation took the red eggs of gumboots (chitons), crushed them, and sprinkled on the drying seaweed to flavor.

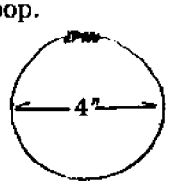
How to Make a Plankton Net

By Rod Brown
Marine Biology Teacher
Wrangell High School

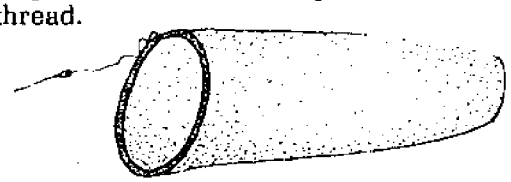
MATERIALS:

Coat hanger or similar wire.
Old pantyhose or nylon stocking.
Test tube or screw-top vial, preferably plastic.
Rubber band.
Needle and thread.
String. (I use gillnet hanging twine.)
Lead sinker or any weight, about 2-4 oz.

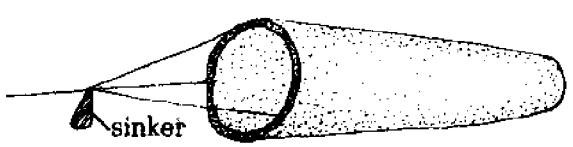
1. Bend coat hanger or wire into a circle about 4 inches in diameter. Secure ends by twisting them around the formed loop.



2. Cut off a 9- to 12-inch length of pantyhose or nylon stocking from the largest section. Sew the largest end to the wire hoop with a needle and thread.



3. Cut three pieces of string about 12 inches long. Attach one end of each piece to the rim of the hoop at equadistant points. Tie the other ends together and attach the lead sinker or weight. (The weight helps keep the net from skipping along the surface of the water.) Tie on the long length of string.



4. Attach the test tube or screw-top vial to the other end using the rubber band.

The plankton net also can be attached to a wooden handle. This is especially useful for taking samples from small (muskeg) ponds.

1. Drill two holes at one end of a broomstick or similar stick.
2. Bend the wire into a 4-inch loop as before, but run the ends through the holes in the broomstick and secure by wrapping with plastic tape or string.
3. Finish as in #2 and #4 above.

...and NEW WAYS

Jeanne Culbertson is the University of Alaska's education coordinator for the Aleutian Chain, and teaches courses on seaweeds and Aleutian history at the Adak Extension Center. She has lived at Adak for the past seven years, where she has kept her family and adventurous dinner guests well fed with all kinds of seaweed specialities.

On Adak in the Western Aleutians where I live, a quick trip to the rocky shore provides plenty of sea vegetables for all types of dishes. It is easy to identify the most useful species. The graceful ribbon kelp, alaira, and the palm leaf-shaped laminaria grow rapidly into huge plants that are at their best from February through June. The thin dark sheets of porphyra aren't fully grown until late summer and are easily gathered from the rocks at low tide.

In the early spring months, crisp tender seaweeds (especially alaria) can be chopped and served raw in a salad with dressing. It is even better if you have cucumbers and sesame seeds to mix with it. At this time of year the seaweeds grow about an inch a day and make a good salty snack as you climb on the rocks.

Harry Hale, a senior at Adak High School and also an Eagle Scout, spends a lot of time tundra-stomping and exploring the beaches. With a couple of hot dogs and some dried lightweight spaghetti in his pack, he gathers seaweeds and some wild celery and cooks up a tasty filling lunch in about 20 minutes. If he catches a fish, he cooks it with seaweeds, rice and a chicken boullion cube for a good supper.

Seaweeds can be cooked alone as a vegetable, or added to all sorts of stews, soups and chowders. Here's one of my favorite recipes (and one of the easiest):

Put whatever meat you have (beef, pork, chicken, etc.) in a heavy pot with ½ teaspoon onion salt and enough water to cover. Cook slowly until almost done. Then add a couple of cups of chopped seaweed, a sliced raw carrot for color, some diced celery and whatever starchy food appeals to you (rice, potatoes, noodles). Cook about 30 minutes more and presto! A complete delicious dinner.

To serve as a side dish, pour 6-8

(Continued on page 8)

May Issue: How to Survive on the Beach.

Dear Spout,

Our class certainly enjoyed your March issue on the Puffin. We learned a lot about Alaska seabirds. But we wished there had been a photograph of a real puffin. Please put one in the next issue.

Pam Smith
Mr. Goerisch's 6th Grade Class
Susitna School, Anchorage

Dear Pam,

That puffin picture on the cover was a little hard to believe. But here's a photograph of the real thing to prove it.

Another thing: The murre sketch on page 5 should have been identified as "Common Murre," instead of just "Murre." (Like the "Common Puffin," it is just one species in the family of murres.)

And another thing: The Alaska Seabird Teaching Guide, by Duff Wehle *(March issue, page 7)* is on its way to the printer but may not be ready for another month or so. Your requests will be filled, however, just as soon as it's available.

Spout

Dear Spout,

We read the letter in your column about how the University of Alaska's Institute of Marine Science might be able to make marine life specimens available for school biology classes. Our school would certainly be interested. If you decide to do this, we would like to be on your list.

David Baker
McGrath School

You're on, David! Any other schools interested? *(See Tidelines, Dec. '79-Jan. '80 issue, page 8.)*

Spout

MEANING OF DIATOM NAMES (from page 2-3): *Eucampia*—beautiful curve. *Nitzschia*—shining sections. *Chaetoceros*—hairy horn. *Asterionella*—little star.

Photo by Duff H.S. Wehle

cups of hot water over 4 cups of chopped dried seaweed so that it turns green. Drain as dry as possible. Chop fine. Heat 3 tbsp. of sesame oil until very hot (use frying pan or wok). Stir fry seaweed with 1 tsp. Accent and add 4 tbsp. soy sauce. Turn off burner, cover, and let set until seaweed is tender.

Seaweed snack: Cut dried seaweed into 1½-inch squares. Cook in very hot oil in deep fryer for just 1 second. Drain and sprinkle with sesame seeds or a tiny bit of sugar. OR: bake seaweed squares in 200 degrees oven for 15 - 20 minutes. Meanwhile, combine ½ cup soy sauce and ½ cup honey and mix well. Remove seaweed squares from oven, toss in the mixture to coat, and return the squares to bake for another 20-30 minutes, turning occasionally, until crisp.

READ ON:

"Seaweeds at Ebb Tide," by Muriel Guberlet. University of Washington Press, Seattle. 1956.

"The Seavegetable Book," by J.C. Madlener. Clarkson N. Potter, Inc., New York. 1977.

Harry Hale, Adak Eagle Scout, and Jeanne Culbertson look over some young alaria. The fast-growing seaweed may reach a length of 13 feet or more—and one plant can feed a gang of people.

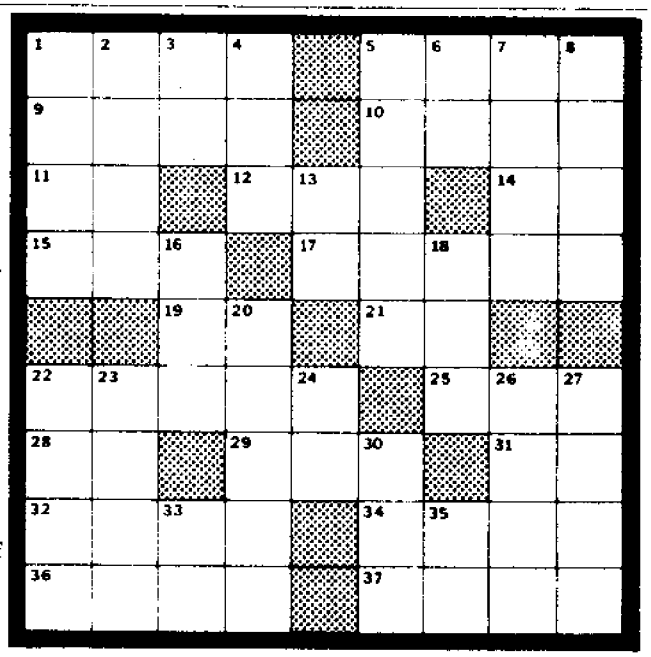
SEA GARDEN

ACROSS

* 1. Sea _____ is really a plant, not a _____.
* 5. The root-like part of a (1 across) is called a _____ fast.
* 9. Substance from red seaweed which is used to thicken ice cream, jellies and such.
10. Midwestern state (round at the ends and HI in the middle).
11. Right guard (in football) (abbr.).
12. Me and _____.
14. Volkswagen, the "little beetle" car (abbr.).
15. Mountain Standard Time (init.).
*17. Chlorophyll is a _____-colored pigment with which plants manufacture food.
19. National League (init.).
21. South America (init.).
*22. Most marine algae have only scientific names, usually in Greek or _____.
25. Small child.
28. Island (abbr.).
*29. Bull kelp has a hollow _____-filled bulb which holds its blades near the water's surface.
31. Six (Roman numeral).
*32. Seafood includes plants as well as _____.
*34. The sun's energy must be _____ in the process of (17 across).
*36. Wrangell is _____ of Adak.
37. Not any.

DOWN

* 1. Cold water is heavier than _____ water.
* 2. The Tlingit people often cooked salmon or chiton _____ with their seaweed.
3. Each (abbr.).
* 4. A good way to preserve seaweed is to _____ it.
* 5. Phytoplankton multiply at a very high rate with the coming of spring and long daylight _____.
6. Exclamation.
* 7. Phytoplankton _____ in freshwater as well as saltwater.
8. Up and _____.
13. Ophir Gulch (init.).
16. A strong explosive.
*18. In the food chain of the sea, large creatures _____ smaller creatures, and so on down the line.
*20. To grow and multiply, marine algae must stay within the sun _____ zone of the water.
*22. Phytoplankton is the basis of all _____ in the sea.
23. The continent to our west.
24. The continent we are on (init.).
*26. For a snack, you can either deep-fry dried seaweed or bake it in the _____.
*27. Pick a low _____ for gathering seaweed.
*30. The source of energy for plant food factories.
33. Social Security (init.).
34. Sixth note of the musical scale.



Answers in May issue.

March X-Word Answers

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