

# Aquatic Habitats

See if you can solve this magic squares puzzle! Match the lettered words with the numbered phrases. Then place the matching numbers in the squares below. Add each row across and each column up and down. All of these totals should be the same if your magic squares are correct. The magic number is \_\_\_\_\_.

A. tide	B. erosion	C. current	<ol style="list-style-type: none"> <li>1. Always on the move carrying water across the land.</li> <li>2. Area of land that feeds a river with water.</li> <li>3. Wearing away of the land.</li> <li>4. A temporary, watery part of the landscape continually filling with sediment.</li> <li>5. Great stream of moving water that flows through the ocean.</li> <li>6. Big ripple made by the wind.</li> <li>7. Periodic change in sea level.</li> <li>8. A wetland more productive than any corn or wheat-field.</li> <li>9. Sphagnum moss heaven.</li> </ol>
D. watershed	E. lake	F. bog	
G. wave	H. estuary	I. river	

10. List five reasons why each of the following habitats is important:

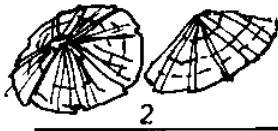
seas	rivers	wetlands

11. On another sheet of paper, draw a local pond or stream and at least eight invertebrates, one amphibian, five mammals, five birds, five fish, and five plants that live in or around it.

## Marine Invertebrates

Adaptations enable an organism to survive in its environment. Write the correct name next to each illustration below, and draw a line to the description of each animal's major adaptation.

Discuss additional adaptations of the organisms and those of other marine animals.



- A. Byssal threads prevent these creatures from being washed away.
- B. Strong, muscular "foot" enables it to dig into ground rapidly.
- C. Pointed spines ward off predators.
- D. Everts (sticks out) its stomach and inserts it between shells of bivalves to obtain food.
- E. Adults secrete glue to permanently attach themselves to rocks, pilings or boats.
- F. Defense from its predators is to eject (throw up) its insides.
- G. Stinging cells in tentacles are used to capture food and fight away predators.
- H. Radula with sharp points are used to scrape food off rocks.
- I. Operculum protects it from predators and from dehydration at low tide.
- J. Body colors change to match surroundings to camouflage itself.

# Mollusks

7D

Directions: Fill in the blanks with the correct word chosen from those listed below. Some words must be used more than once.

bivalve	limpets	clams
octopi	squid	foot
snails	chitons	cockles
mollusks	univalves	siphons

The shell-bearing animals of the sea are called \_\_\_\_\_. In every case, these animals have soft bodies and they usually have a large muscular foot on which they move. Their bodies are usually protected by a limy shell that the animal makes. Sometimes, however, the shell may be internal, or it may be absent. Four kinds of \_\_\_\_\_ are found in shallow Alaskan waters. They are described below:

1. Animals with one part to their shells are called (a) \_\_\_\_\_. These include such animals as (b) \_\_\_\_\_ and (c) \_\_\_\_\_. (d) \_\_\_\_\_ are animals with coiled shells, found in many shapes and sizes. (e) \_\_\_\_\_, which are sometimes called Chinamen's hats, have cone-shaped shells and feed by scraping microscopic material from rocks or other surfaces.



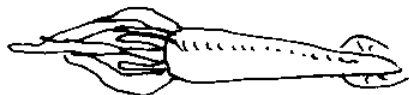
2. Unlike (a) \_\_\_\_\_, which have one part to their shells, (b) \_\_\_\_\_ have shells with two parts or valves. Many of these animals, such as (c) \_\_\_\_\_ and (d) \_\_\_\_\_, live buried in the sand or mud. They have a large (e) \_\_\_\_\_, which is used to dig deep beneath the beach surface, and two (f) \_\_\_\_\_, which are often part of a neck that reaches to the sand or mud surface. Thus, the animal can take in sea water and remove from it the tiny food particles it needs to live.



3. Animals with eight plates or parts to their shells are called (a) \_\_\_\_\_. The plates are usually visible, but sometimes they are partly or entirely covered by softer parts of the animal's body. (b) \_\_\_\_\_ usually live in rocks, often in areas of heavy waves. Because they can cling tightly and shape to the rocks, they can withstand strong seas.



4. (a) \_\_\_\_\_ and (b) \_\_\_\_\_ are called cephalopods or "head-foot" animals because these two parts have become joined. (c) \_\_\_\_\_ have eight arms, but (d) \_\_\_\_\_ have ten. Although these animals do not have a hard, outer shell, both belong to the large group called (e) \_\_\_\_\_.

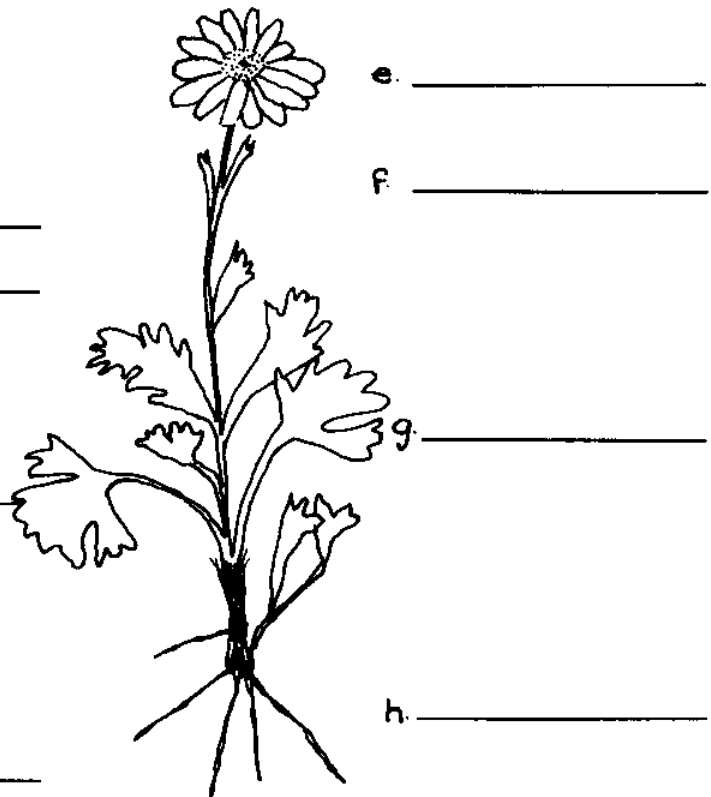
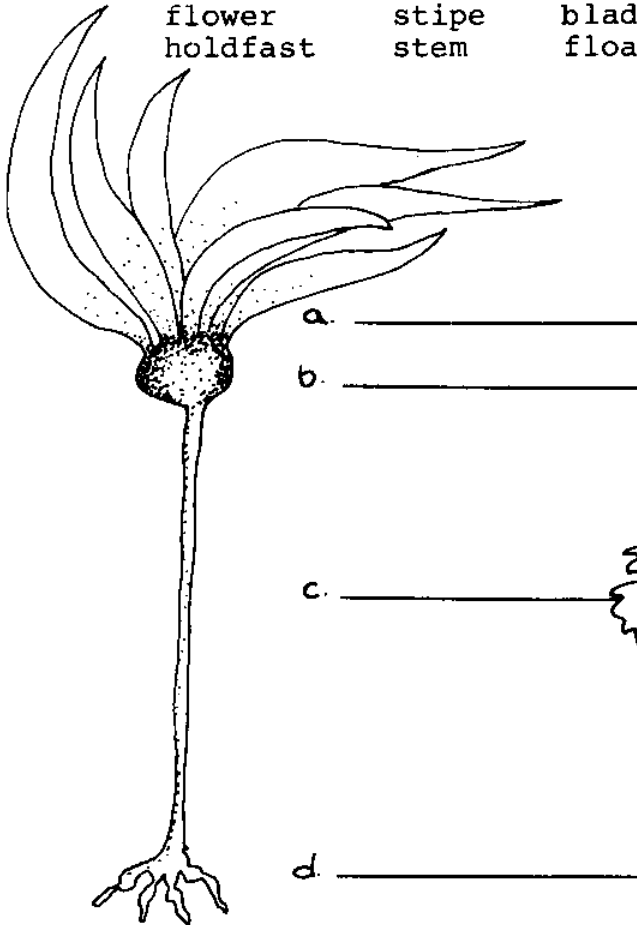


7E

# Seaweed

1. The three different types of seaweed are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. (Hint: Think color!)
2. Another name for seaweed is \_\_\_\_\_. (Hint: It starts with an "A".)
3. Label the parts of the seaweed and land plant illustrated below. Use this word bank:

flower      stipe      blade      leaf  
holdfast    stem      float      root



4. Two ways that seaweeds are similar to land plants are that they \_\_\_\_\_ and \_\_\_\_\_.
5. Two ways that seaweeds are different from land plants are that they \_\_\_\_\_ and \_\_\_\_\_.
6. In Alaska, seaweeds are most common in which of the four seasons? \_\_\_\_\_ and \_\_\_\_\_ because \_\_\_\_\_.

## Intertidal Zonations

7F

Intertidal animals and plants have to be very hardy to survive exposure to air, fresh water (rain and snow), summertime warmth and dryness, wintertime freezing temperatures, and predators from both the land and the sea. On the outer coast, they have to be able to hang on in pounding surf. Even in the more protected bays and inlets, fierce storms and waves occasionally flare up. But there are benefits, too--the tide brings a fresh supply of rich food and nutrients twice a day. And each of the predators can reach them only at certain tidal stages--so there are periods of rest and recovery. Also, these tough intertidal conditions make it difficult for some species to compete for food and space. Each species of marine plant and animal has a particular tolerance to the hazards of being out of salt water. By looking at the beach in a section from its highest high water mark down to the water level of a low, low tide, you can quickly begin to see major differences in plant and animal populations.

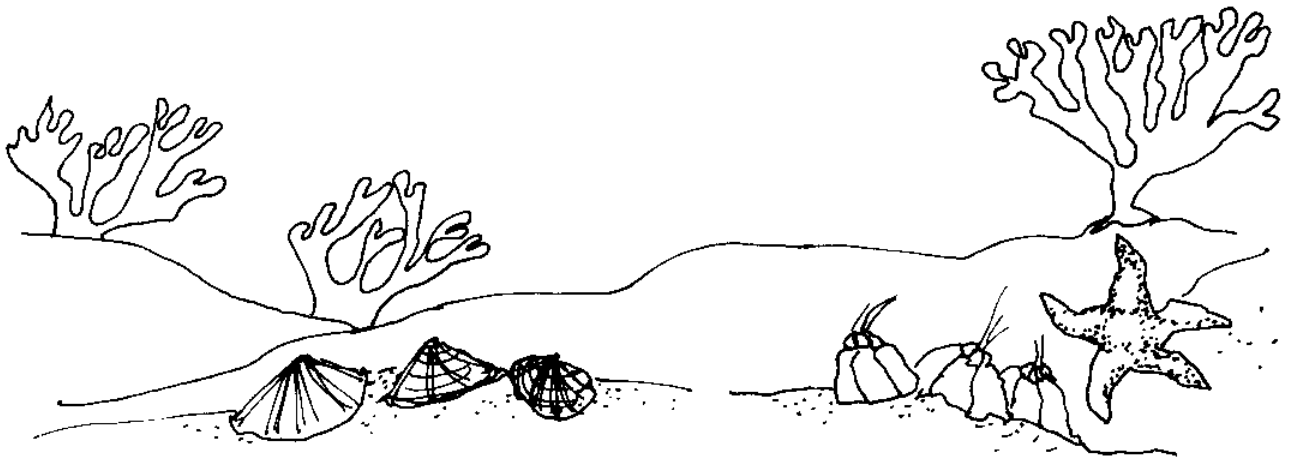
### The Highest Fringe

At the upper limits of the intertidal zone, the fewest life forms are evident. You may notice that the rocks appear black here. This is because they are covered by a black encrusting lichen or by a blue-green alga that makes the rocks treacherous and slippery when wet. In these upper reaches, too, may be found the common tiny periwinkle--a fat, ridged snail that sometimes seems to pepper the rocks.



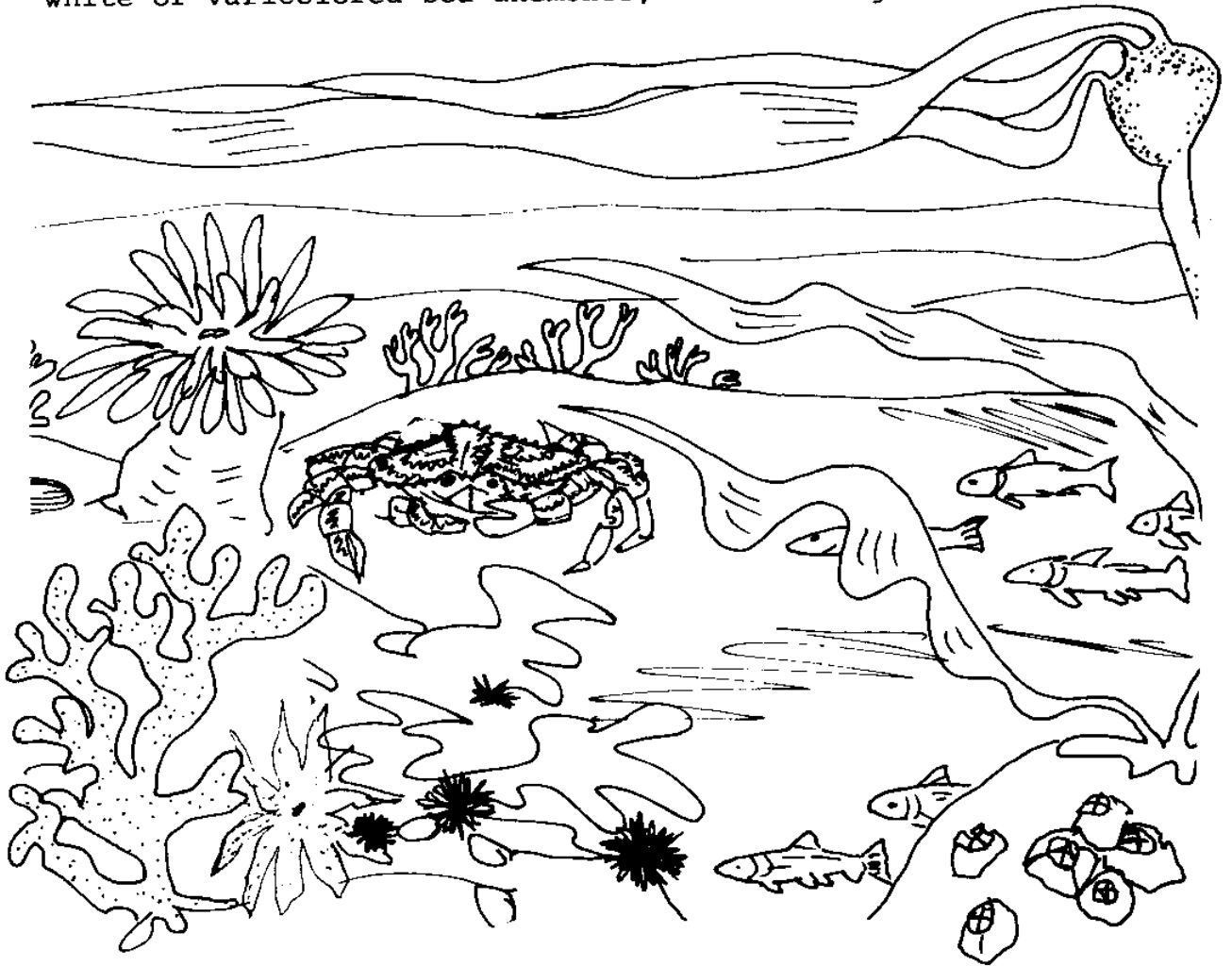
### The Middle Zone

As you move toward the water's edge at low tide, you will be aware of obvious color bands or patches on the beach. There may be banding of *Fucus*, the common brown rockweed, and of blue-black mussels (the intertidal and subtidal bivalves that attach themselves by tiny threads to rocks, pilings and other surfaces), and barnacles. Here too, you will begin to see limpets, amphipods, various sea stars, tiny black sea cucumbers, and other forms of life not in evidence at higher levels.



### The Lowest Zone

Approaching the water's edge, you will not find some of the plants and animals evident at higher levels. In general, however, the lower you go in the intertidal zone, the greater the diversity of life forms. Here you will find sea urchins, a wide variety of large sea stars, perhaps juvenile king crabs, large white or varicolored sea anemones, and the larger snails.



So...as you look at any particular beach for the first time, there is a great deal to think about. Remember that the location on the beach, the type of surface, the height from the water, and the kind of topographical variation all make a difference in what life forms may be found. In general, it is advisable to spend the lowest part of the tidal cycle closest to the water's edge, the area of the beach that is revealed to us least often, and which tends to harbor the greatest diversity of plants and animals.

Answer these questions:

1. What are five reasons why is it difficult for marine plants and animals to live in the intertidal zone?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
2. What are two life forms you could find at the upper limits of the intertidal zone?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
3. What are six life forms you could see in the middle zone?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
  - f. \_\_\_\_\_
4. What five marine life forms could you see at the lowest zone?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

7F

d. \_\_\_\_\_

e. \_\_\_\_\_

5. Make up a riddle about your favorite intertidal creature.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Here is a sample riddle (yours can be shorter).

*Sometimes red  
and sometimes green  
when the tide is high  
I'm seldom seen.*

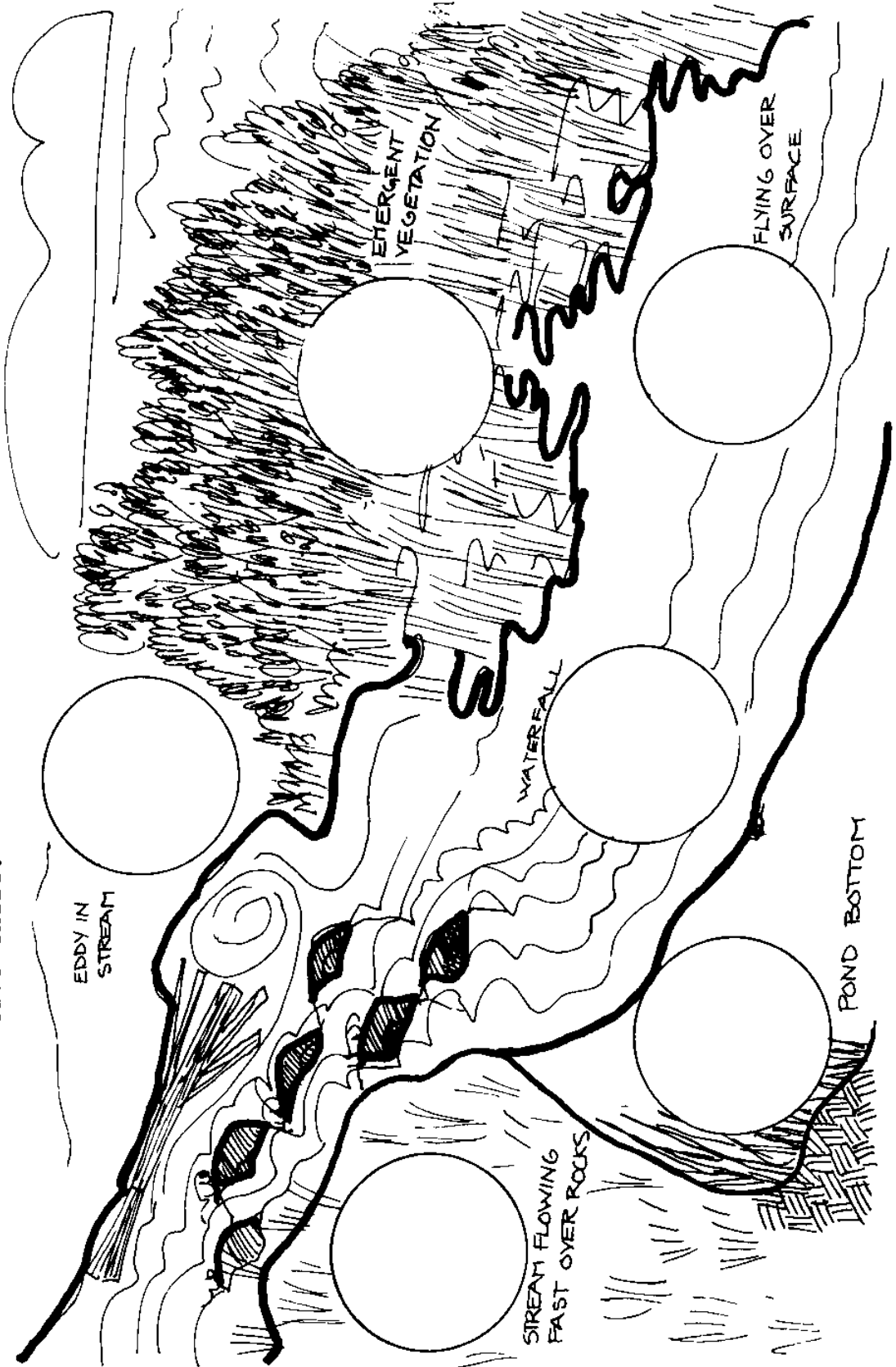
*Tiny plants  
I like to eat  
I move them towards my mouth  
with tube feet.*

*Find my round shell  
on the seashore  
but my many spines  
aren't there anymore.*

*Who am I?*

by Karen Stomberg

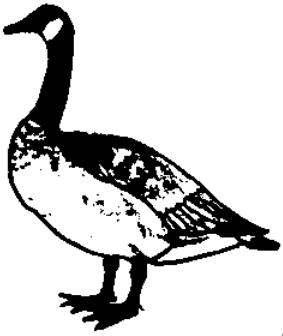
Draw a picture of an actual insect or crustacean which lives in the spot indicated or invent an animal that has adaptations (characteristics which help it survive) that would allow it to live there.








# Birds in the Field

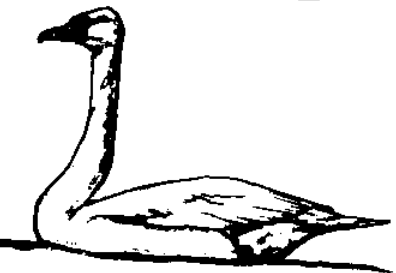
Use a bird field guide and write the name of each bird under the illustrations.


a.  \_\_\_\_\_

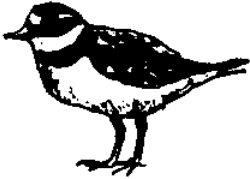
b.  \_\_\_\_\_


c.  \_\_\_\_\_

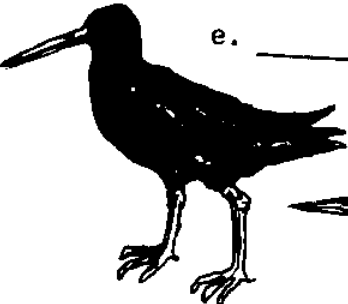
d.  \_\_\_\_\_


e.  \_\_\_\_\_


f.  \_\_\_\_\_


g.  \_\_\_\_\_


h.  \_\_\_\_\_

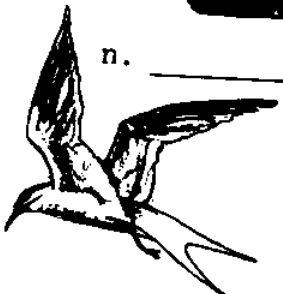
i.  \_\_\_\_\_

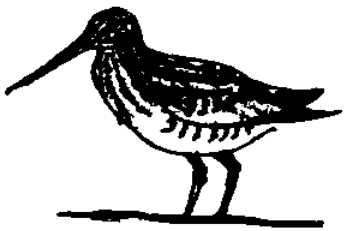
j.  \_\_\_\_\_

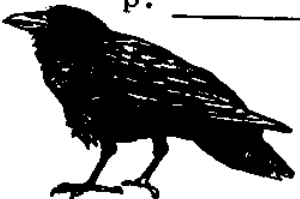
k.  \_\_\_\_\_


l.  \_\_\_\_\_


m.  \_\_\_\_\_

n.  \_\_\_\_\_


o.  \_\_\_\_\_

p.  \_\_\_\_\_

q.  \_\_\_\_\_

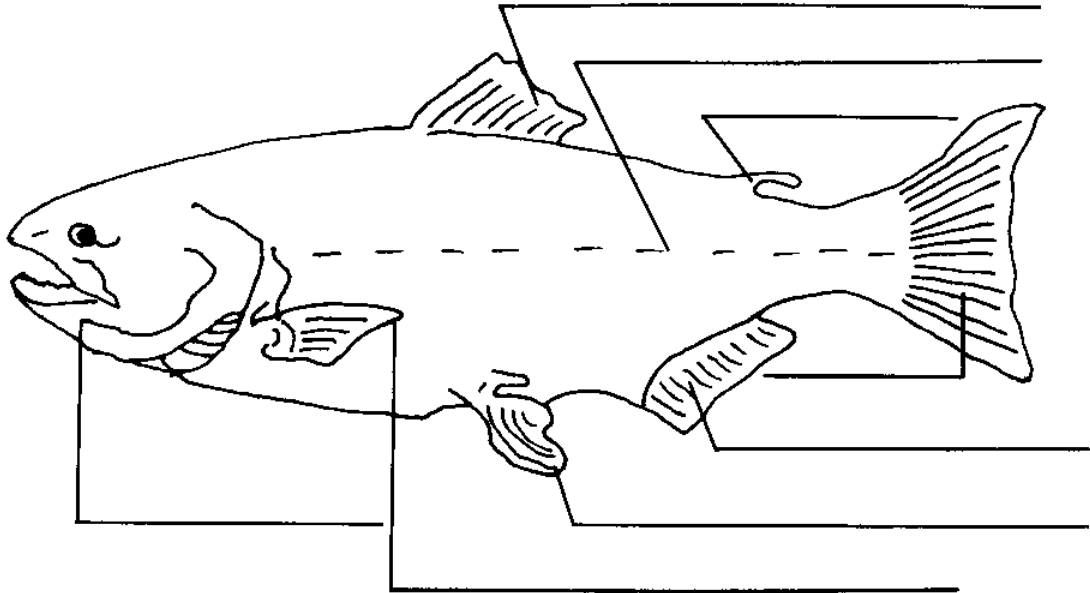
r.  \_\_\_\_\_

s. \_\_\_\_\_

t.  \_\_\_\_\_

# Fish

1. Label the following diagram.



2. What are the five kinds of salmon found in Alaska waters?

---

---

---

---

---

3. Draw simple pictures with labels showing the four stages of a salmon's life cycle.

4. Why are wetlands important for salmon? \_\_\_\_\_

---

---

---

5. Name five freshwater fish and tell something interesting about each one.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_

6. Why are halibut called masters of camouflage?

\_\_\_\_\_

7. List four ways that halibut can escape from predators.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

8. Draw a picture showing how herring fit into the ocean's food web.

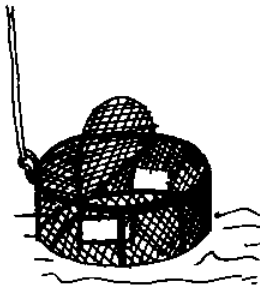
7K

# Fisheries

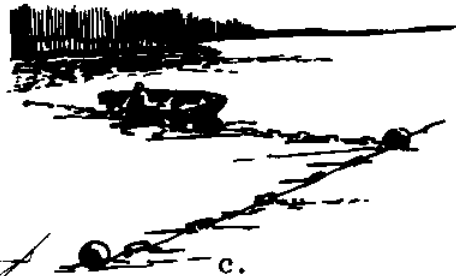
1. List three traditional fishing methods that are still used today.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

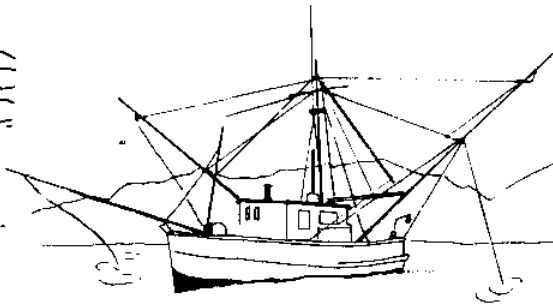
2. What are each of these fishing methods? What is being caught by each?



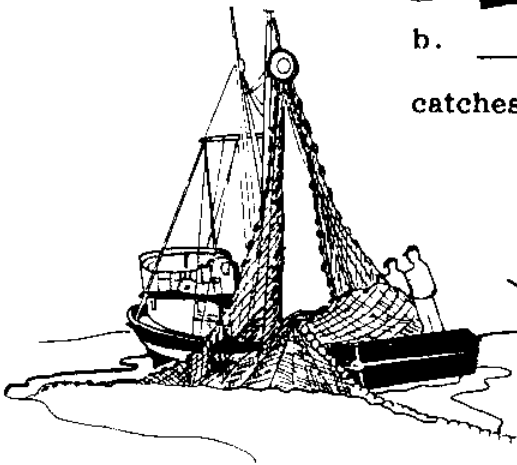
a. \_\_\_\_\_  
catches \_\_\_\_\_



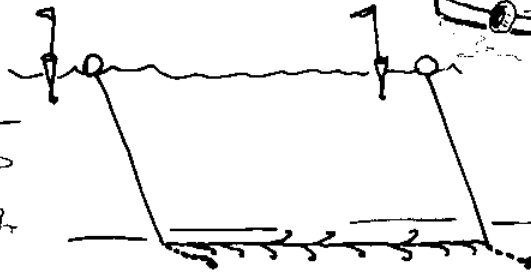
c. \_\_\_\_\_  
catches \_\_\_\_\_



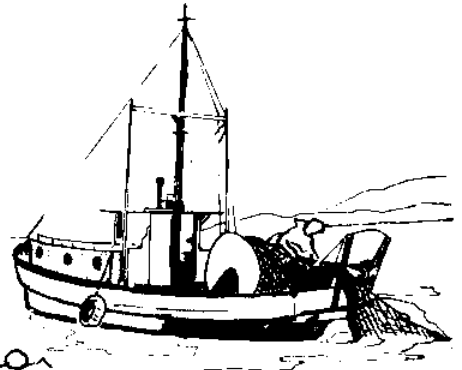
b. \_\_\_\_\_  
catches \_\_\_\_\_



d. \_\_\_\_\_  
catches \_\_\_\_\_



e. \_\_\_\_\_  
catches \_\_\_\_\_



f. \_\_\_\_\_  
catches \_\_\_\_\_

3. What are some ways of assuring that there will always be fish to harvest?

---

---

---

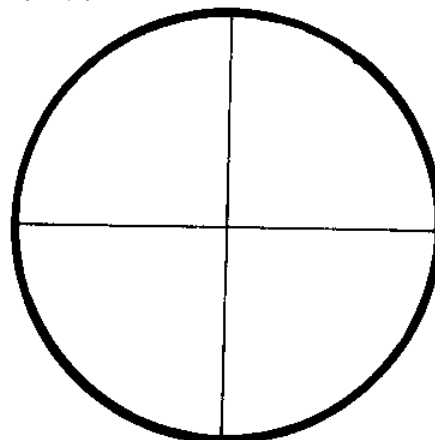
# Marine Mammals

7L

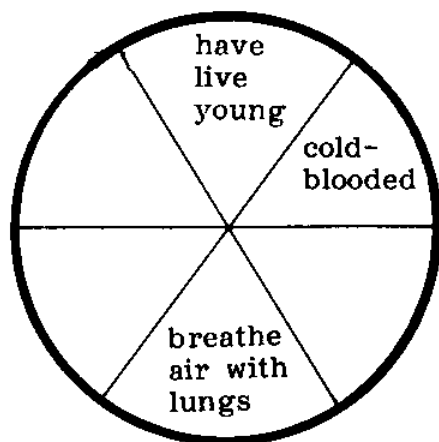
1. Group the following animals into four groups by writing each name in one of the sections of the chart.

dolphin  
whale  
porpoise  
seal

manatee  
sea otter  
sea lion  
walrus



2. Block out the area that is not a trait of mammals and fill in the blank areas with additional traits.



Mark these sentences true or false.

- \_\_\_\_\_ 3. Marine mammals are descended from land mammals.
- \_\_\_\_\_ 4. Manatees are plant eaters.
- \_\_\_\_\_ 5. The worst enemy of whales is the killer whale.
- \_\_\_\_\_ 6. Whales and dolphins have very poor hearing.
- \_\_\_\_\_ 7. All whales have teeth.
- \_\_\_\_\_ 8. The largest animal that ever lived on earth is the brontosaurus.
- \_\_\_\_\_ 9. Large size is a disadvantage to life in cold water.
- \_\_\_\_\_ 10. Whales are considered to be of average intelligence.

**7L**

11 and 12. What are two ways a land mammal would have to change in order to survive in the ocean?

---

---

---

---

13. Explain what echolocation is and how it is used by some marine mammals.

---

---

---

---

---

14. Describe a marine mammal in five different ways without naming it.

---

---

---

---

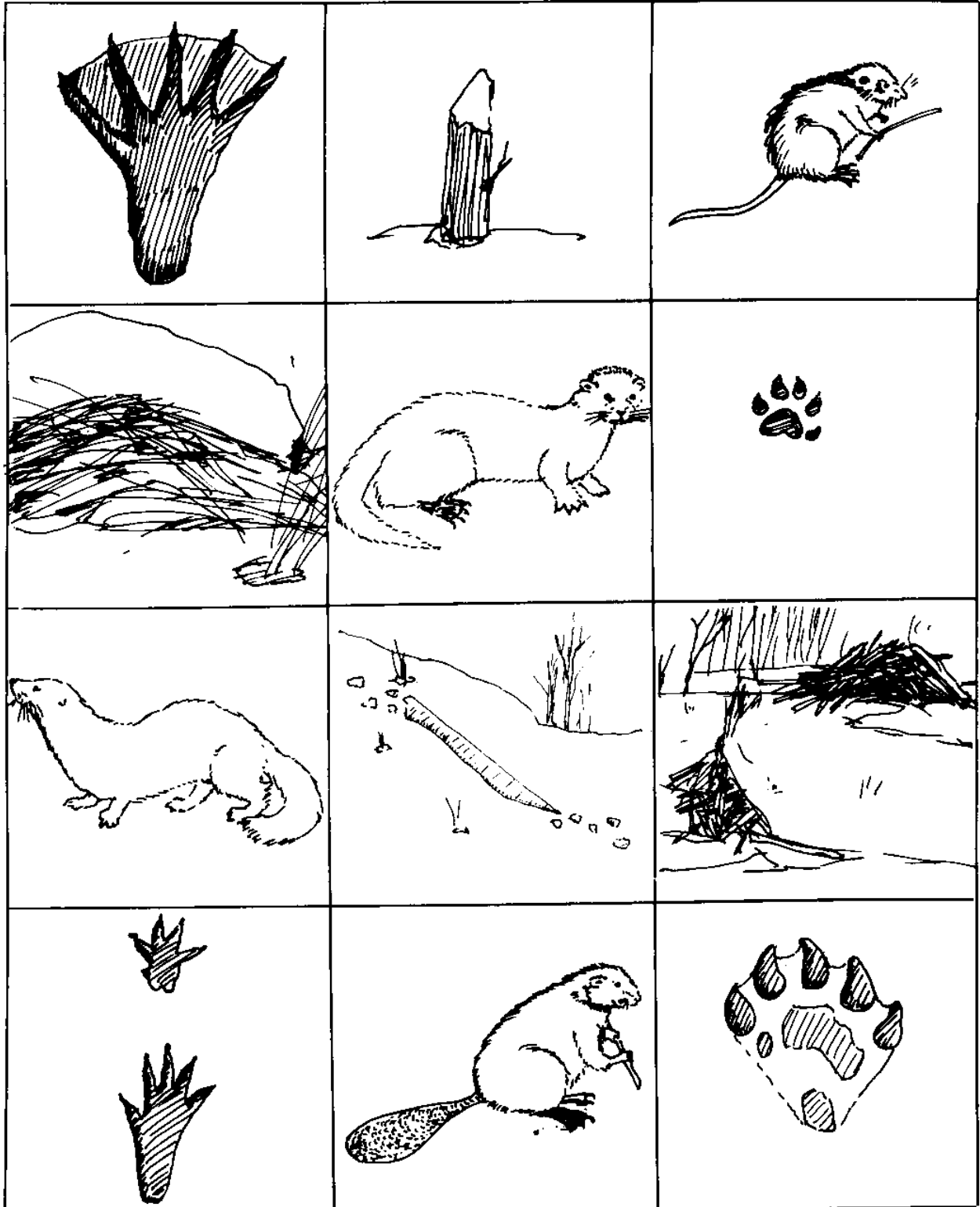
---

Now see if your friends can guess what it is.

# Freshwater Mammals

7M

Here are four freshwater mammals, their tracks and some signs of their activity as seen in winter. Cut out the squares and match the ones that go together. Hint: there may be more than one sign for some animals.



## Glaciers and Sea Ice

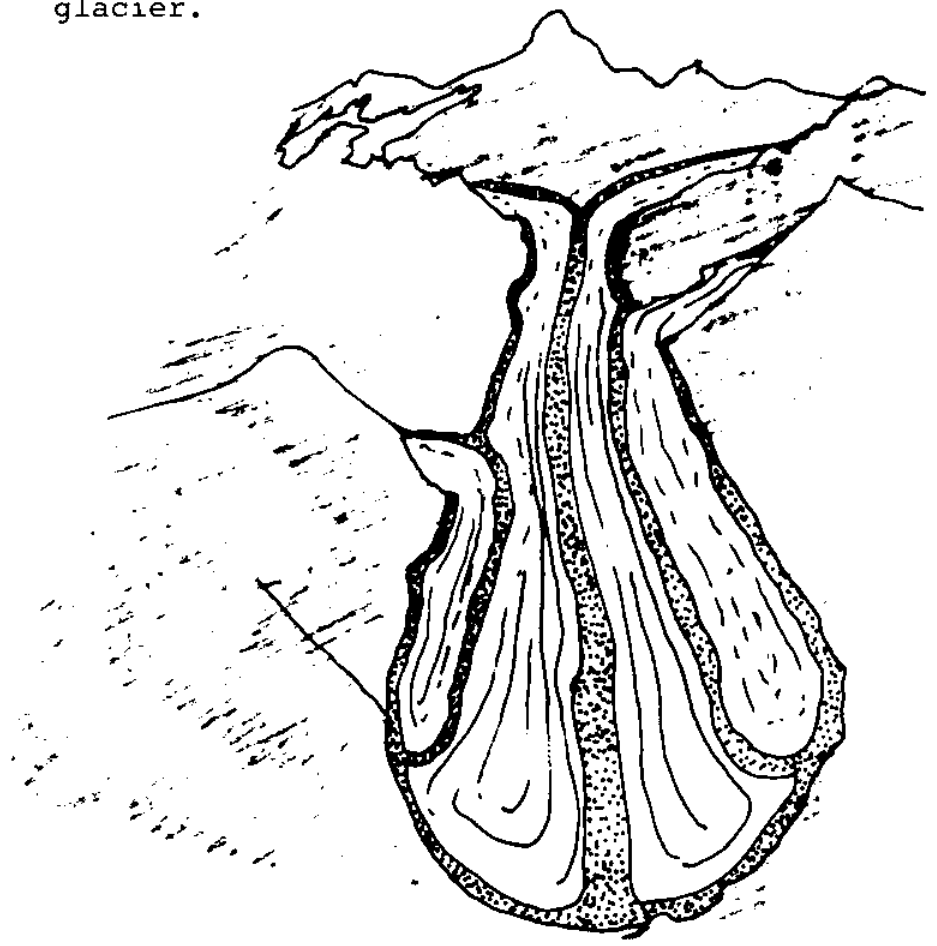
Fill in the blanks. Use these words:

rocks  
blue  
motion  
snow  
gray  
black  
silt  
ice  
leads

1. Glaciers are rivers of \_\_\_\_\_.
2. Glaciers are formed when, year after year, more \_\_\_\_\_ falls in winter than melts away in summer.
3. Glaciers gather up \_\_\_\_\_ and earth from the land they cross.
4. Glaciers grind up rocks to make "glacial flour" or \_\_\_\_\_, which has many nutrients for marine life.
5. Sea ice is dangerous because of its constant \_\_\_\_\_.
6. Large cracks that open up in sea ice are called \_\_\_\_\_.
7. Unsafe, young sea ice is usually \_\_\_\_\_ in color.
8. As sea ice thickens, it rises higher in the water and is \_\_\_\_\_ in color.
9. Both glacial ice and old sea ice are \_\_\_\_\_ in color.
10. Put an "x" next to the valley carved by a glacier.



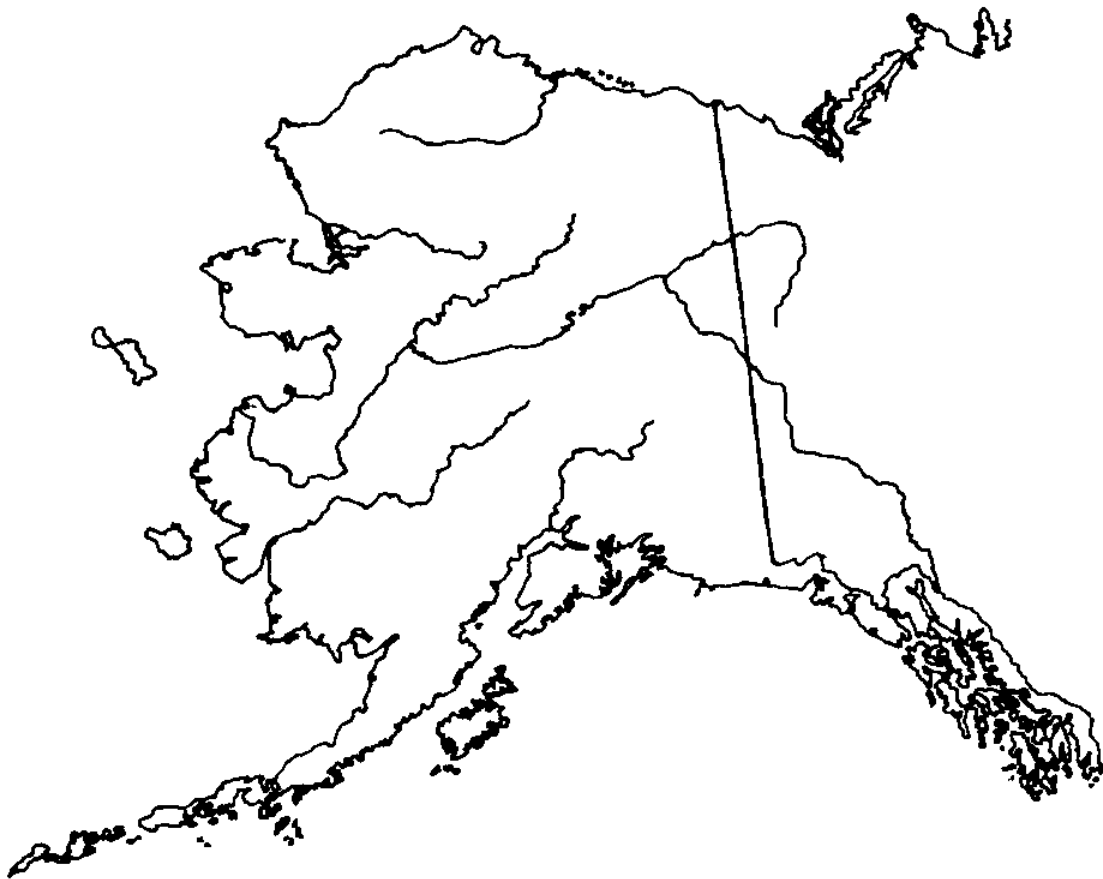
11. Put an "x" on all the moraines you see in this drawing of a glacier.



12. Put an "x" on the landfast ice and a "y" on the pack ice.



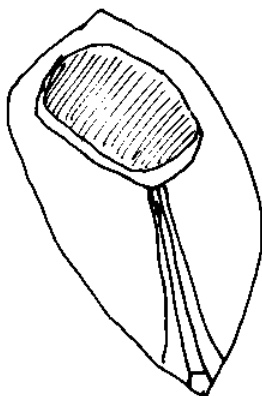
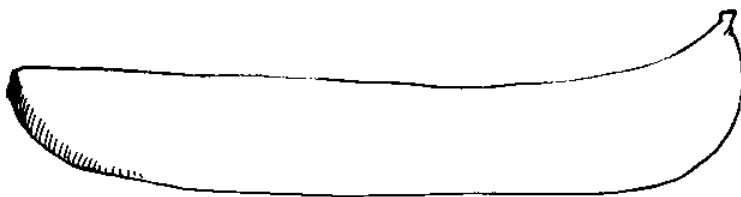




- 1 - 6. Write the names of nine Native groups on the map above, showing their traditional areas.
  
7. Describe one of the Native groups in your area.  
They are called \_\_\_\_\_.  
How did they use the seas and rivers traditionally? \_\_\_\_\_  
Now? \_\_\_\_\_  
In times long ago, they lived in \_\_\_\_\_  
and hunted with \_\_\_\_\_.  
They used \_\_\_\_\_ for transportation on the seas and rivers.  
One word in their language is \_\_\_\_\_.  
It means \_\_\_\_\_.
  
8. Compare the ways two of Alaska's Native groups, \_\_\_\_\_ and \_\_\_\_\_ depend on the seas and rivers.



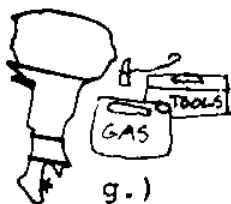
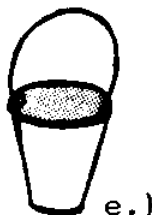
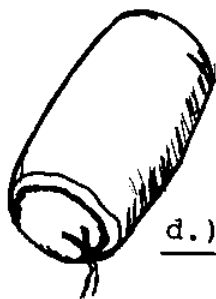
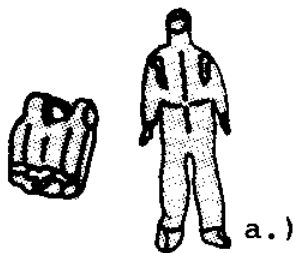
10. Below each drawing write the name of the boat and where it was used (northern, western, central, southwest, south-central or southeast Alaska).



7P

# Safety and Survival

1. Equip your skiff for a day-long fishing trip. What do you need to take in order to be safe?





7P

- \_\_\_ i. Take off your clothes and wring them out.
- \_\_\_ j. Eat a little of your survival food for some quick energy.
- \_\_\_ k. Jump up and down to warm up.
- \_\_\_ l. Set some snowshoe hare snares with the wire in your survival gear.
- \_\_\_ m. Roast your fish over the fire along with your spruce tea.
- \_\_\_ n. Try to dry your clothes over the fire.

4. Now describe what you would do in a survival situation if you had only what was available in your pockets!

My pocket contents are: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

I would \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Putting on Your PFD

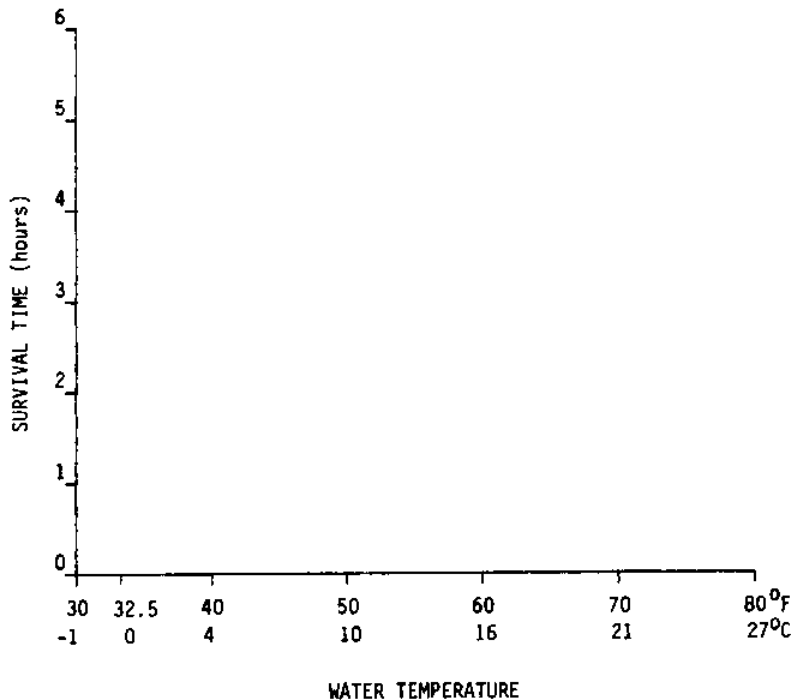
If you fall in the water, you can easily protect yourself from drowning by wearing a personal flotation device, or PFD. But protecting yourself from impending hypothermia is not so easy. "Hypothermia" means lowered or subnormal deep-body temperature. If you fall in the water most anywhere in Alaska, your body starts chilling rapidly. You will start shivering intensely in an attempt to increase your body's heat production. If the condition is allowed to progress, you will become unconscious and eventually die, either by drowning or from hypothermia.

Hypothermia can easily strike on land, too, especially if you are caught in the rain or cold without raingear or warm clothes. In any event, whether you are on land or sea, even a slight increase in survival time could mean the difference between being dead or alive when rescuers arrive.

1. Based on this chart, graph the results of hypothermia at various water temperatures for people not wearing life jackets.

Survival Times without Life Jackets

Water Temperature (°F)	Exhaustion or Unconsciousness	Survival Time
32.5	Less than 15 min.	Less than 15 to 45 min.
32-40	15-30 min.	30-90 min.
40-50	30-60 min.	1-3 h.
50-60	1-2 h.	1-6 h.
60-70	2-7 h.	2-40 h.
70-80	3-12 h.	3 h. to indefinite
Over 80	indefinite	indefinite

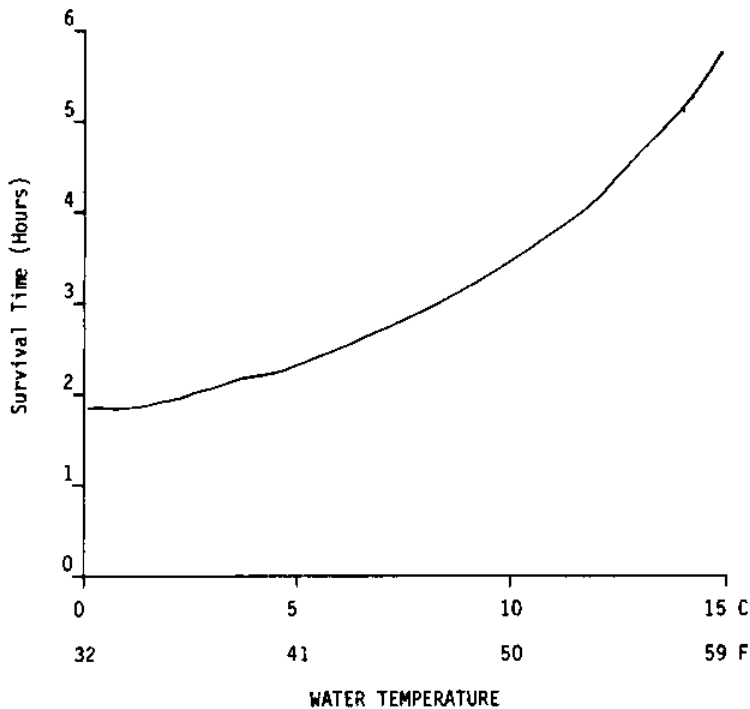


**8A**

2. What is your local water temperature? \_\_\_\_\_
3. How long would you survive at that temperature according to the chart? \_\_\_\_\_

(Hint: These chart figures are for normal adults. People with more fat would last longer, and smaller people would have shorter expected survival times. Because of smaller body mass and relatively little fat, children cool much faster than adults.)

4. Here is a graph of average predicted survival times of normal adults wearing a standard life jacket and light clothing and holding still.
- a. How much would wearing life jackets increase adult survival time in your area? \_\_\_\_\_
- b. Predict your increased survival time. \_\_\_\_\_



5. To conserve body heat in cold water, don't swim. Your body will produce three times the heat when swimming, but that heat is all lost to the cold water. The average person swimming in a life jacket cools 35 percent faster than when remaining still. Use your estimate in question 4b and figure out what your survival time would be if you swam in your life jacket. \_\_\_\_\_

6. Tests conducted on adults swimming in 50°F ocean water with standard life jackets and light clothing showed that the average person can cover only .85 mile before being incapacitated by hypothermia. Remember also that it is difficult to judge distances in rough, cold water. The distance a person can swim is affected by his swimming ability, the amount of insulation, and water conditions. Estimate the maximum distance you could swim in your local waters with a life jacket. \_\_\_\_\_ (Don't forget it is almost always best to stay with your boat. Not only do you lose lots of body heat by swimming but staying by a boat--even an upside-down or broken boat--makes it easier for rescuers to spot you.)

7. If you are in the unfortunate situation of not having a life jacket or anything to hang onto, you will be forced to tread water or try drownproofing. Treading water involves continuous movement of arms and legs in various patterns to keep the head out of the water. By treading water, people cool off 34 percent faster than in a life jacket holding still.

Drownproofing involves restful floating with lungs full of air, interrupted every 10 to 15 seconds by raising the head out of the water to breathe. Even non-swimmers can thus avoid drowning for many hours. Unfortunately, in cold water (50°F) drownproofing results in a cooling rate 82 percent faster than when holding still in a life jacket! This is mostly due to putting the head (a high heat loss area) into the water. So keep your head out of the water! Tell in your own words why wearing a PFD is important.

---



---



---



---



---



---



---



---

8. Large amounts of heat are lost not only from the head but also from the sides of the chest (where there is little muscle or fat) and the groin (where large blood and lymph vessels are near the surface). So, to conserve heat, assume HELP (the Heat Escape Lessening Posture). Your PFD will help you hold your head out of water. Tuck the inner side of your arms against your chest. Press your thighs together and raise them to close off the groin region. This body

position will increase your survival time by 50 percent. Take your predicted survival time in 4b and increase it by 50 percent. My survival time if I use HELP is \_\_\_\_\_ . Practice HELP in your seat until you can do it automatically. Then practice it in the water.

If there are several people in the water, buddy together to help conserve heat. And keep a positive attitude. Don't panic.

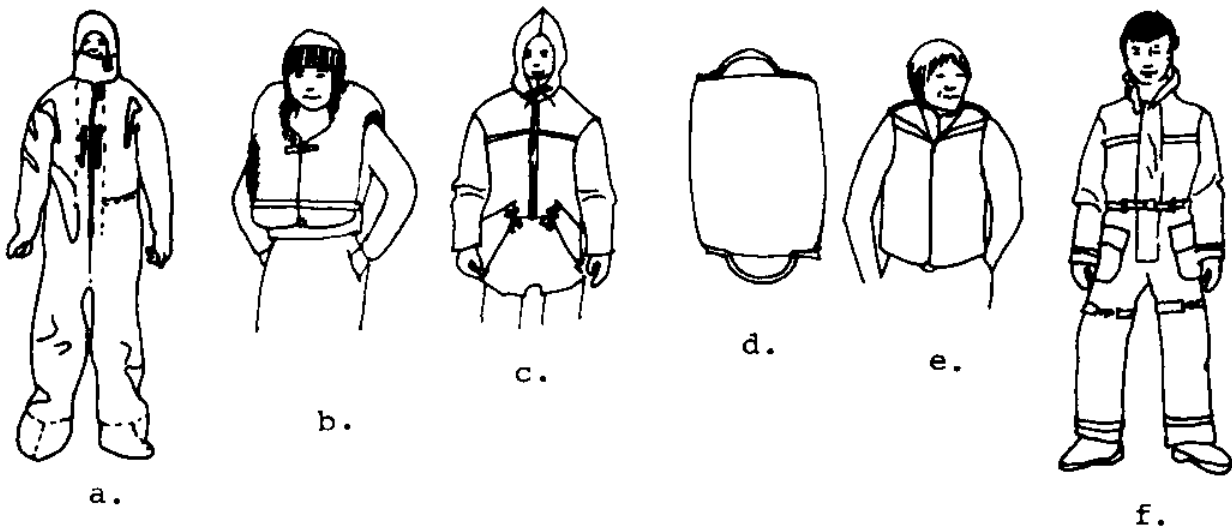
9. Different styles of PFDs offer different amounts of thermal protection. Label the pictures with poor, fair, good or excellent after you read the descriptions.

Poor - All loose-fitting PFDs and float cushions offer no significant protection from the water.

Fair - Foam vests and float coats that possess good adjustability for close fit to the chest increase survival time 50-70 percent.

Good - Float coat (with closed-cell, foam-rubber beaver tails that snap up and over your groin) and float coveralls increase survival time more than 2½ times as long as a standard PFD.

Excellent - Survival suits cover everything except your face with closed-cell foam rubber. These suits are designed to be worn in rough weather or when you are in danger. Other than a raft, they are the best survival gear available. In contrast, the PFDs mentioned above are designed to be worn continually when you are around water.





## Water Safety Cartoons

Directions: Draw cartoons to illustrate these statements.

Keep a survival suit handy and know how to use it.	Watch the weather for storms.
Always leave word of where you're going and when you'll be back.	Use lights when boating at night.
Keep track of the tide.	No fooling around in any boat.
Always wear a PFD.	Have tools, spare parts, extra gas, spare motors and oars along with you.
Step carefully into the center of a small boat and keep your center of gravity low.	Anchor your boat securely.
Don't overload the boat.	Watch for rocks, logs and debris in the water.
Avoid sharp turns in a small boat.	Don't drink alcohol or take drugs around the water.
Don't lean out or stand up in small boats.	Always carry survival gear in your boat.
If your boat capsizes, stay with it.	Know how to use a life raft.

## How to Survive On a Beach

8C

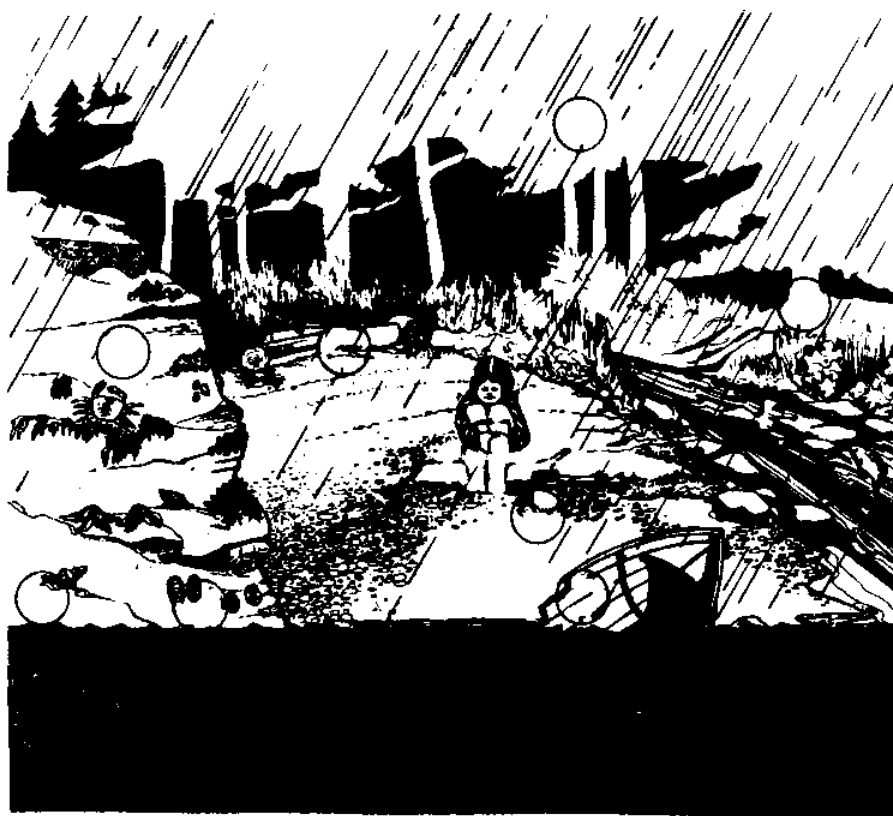
"HOW TO SURVIVE ON A BEACH" is excerpted and adapted from Alaska Tidelines, Volume 11, Number 8, May 1980. Published by the University of Alaska Sea Grant College Program, Copyright © 1980. Reprinted by permission.

You made it to shore. But it's the wrong shore--one of Alaska's thousands of uninhabited islands. Your boat's wrecked. Rain is pouring down. You're cold, wet and hungry. And since nobody knows where you landed, it looks as if you'll be here for awhile.

Well, don't just sit there. You're on your own now, and you must help yourself until other help arrives. Obviously, your basic needs are going to be:

1. Shelter and warmth.
2. Drinking water.
3. Food.

So take stock. Look around. Identify what you can use to fill each of these needs by writing its number in the circles on this picture. Now is the time that Basic Survival Kit you always carry will really come into its own. And if you follow the rules for outdoor survival, you'll come through in good shape.



## 8C

The word "survival" has a special meaning in a land like Alaska where the wilderness usually begins at the outskirts of town, and empty beaches may stretch for hundreds of miles on either side of your community.

Say your outboard conks out in the middle of a severe squall while you are fishing. Or you didn't figure the tides right, and find you are no match for the outgoing current. Suddenly, just a few miles from home, you are faced with a survival situation.

What do you do?

### FIRST THINGS FIRST

Take shelter under the trees from the wind and rain. Get out of those wet clothes, wring them out and put them back on again. If you are very cold, gather long grass and stuff it inside your clothes to act as insulation. Move around until you warm up.

The next step is inventory. Take a critical look around, taking stock of things that can either help or hurt you.

Sit down and relax. Save your energy and body heat. Now is a good time to go through your Basic Survival Kit and check out what you have. Then plan how you will deal with those three basic needs in the order of their importance.

### SHELTER AND WARMTH

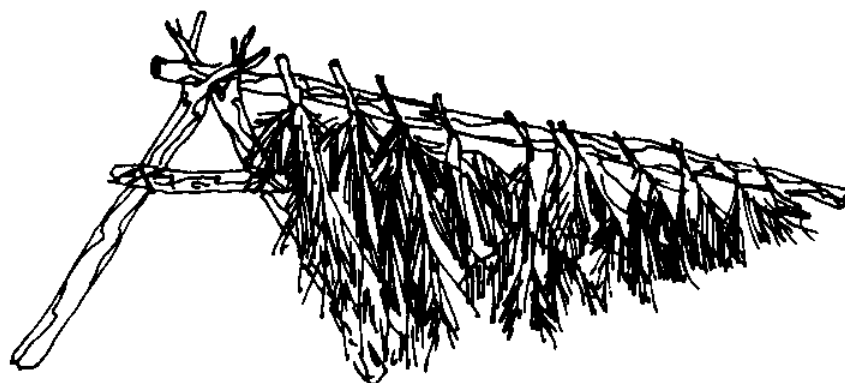
The first thing you need is a camp. Stay near the beach where you can be found. Don't start off on any long cross-country trips that will just wear you out.

**CAMPSITE:** Choose a campsite close to your food and water supply. Your best source of fresh water is a stream or spring flowing down across the beach. If it is a river and the salmon are running, you'll have plenty of food. But don't camp too close if you're in bear country. So far as beach food is concerned, shellfish are most abundant in areas where there is a mixture of gravel, big rocks and tidepools.

Look for a flat spot at the edge of the beach, well above the high tide line, where grass and weeds will give you a good insulating ground cover. (Beach sand or gravel is apt to be damp.) Camp under trees or in an area where there is good protection from the wind. If the site faces south, you'll get more sunlight to dry out your camp after a rain.

**SHELTER:** Rig up the plastic sheet from your survival kit between three or four trees to serve as a "rainfly" over your campsite. Keep it high enough so that you'll have some room to move around in.

Cut branches to build a small shelter to sleep in. Keep it as small as possible--just a little larger than you are--so that your body heat will warm it. Use evergreen boughs, leafy boughs, or long dry grass (dig down under the wet stuff) for both mattress and bed coverings. (Of course, what's left of your boat, turned upside down, will provide good shelter, too.)



**FIREWOOD:** Gather a good supply of firewood and pile it where it will dry. Avoid picking up wood from the ground because it is almost always wet. Instead, collect dead twigs or branches from trees or bushes. Standing dead trees are best. Newly fallen trees are good, too, since they still have enough sap to burn readily. If the bark is wet, peel it down to the dry wood inside. Spruce kindles easily and burns fast. Alder lasts longer and leaves good coals. Drift logs with creosote (tar) on them burn especially well. Driftwood found on the beach is usually dry inside.

Small sticks and branches can be broken into suitable lengths across your knee. Thicker pieces can be broken by making deep cuts or notches on opposite sides of the branch with your knife, and then banging the piece sharply against a large rock or log. For a warm, slow-burning fire, use larger logs. Put one end into the fire and move the log up as it burns. Or start the fire in the middle, so that after it burns through you will have two logs that are easier to handle.

**FIRE BUILDING:** Dig a small fire pit on the beach close to the front of your shelter. Line it with flat rocks and back it with a large log, if possible, to act as a windbreak.

Place the smallest, driest twigs you have collected in a criss-cross pattern on the flat rock. (For a sure fire when the weather is wet, start off with a piece of the cotton from your survival kit.) Build small pieces of kindling up over this like a tepee. Be sure there is enough air between the twigs for the fire to start.

## 8C

Check the wind direction. Then light a match and touch it down so that the flame blows into the center of your carefully arranged tinder. Let the fire burn for a minute, then gradually add larger pieces of wood as the flame builds up. Once it's going well, put on larger logs or driftwood to hold it, and pile wet wood around the sides to dry out.

Always keep your fire small, especially if it's under your rainfly. A small fire will provide all the heat you need, save you the hassle of gathering wood, and is best for cooking.

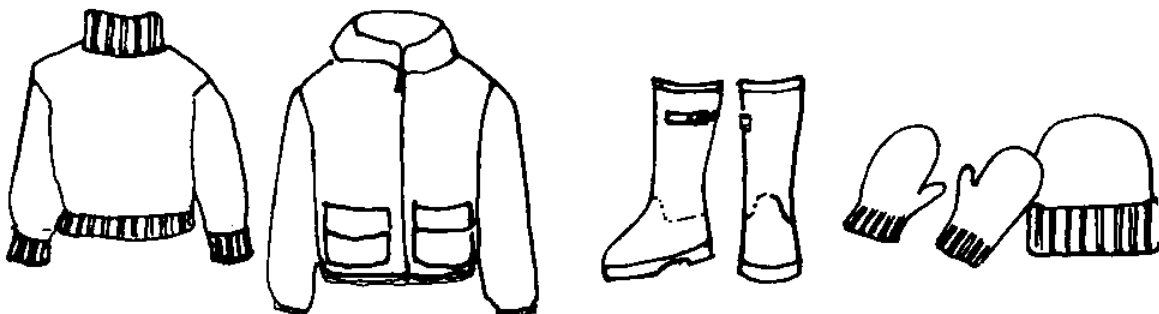
**COOKING:** Fish or shellfish can be wrapped in damp seaweed, skunk cabbage leaves, or foil, and cooked in the coals of the fire. And of course, there's the time-honored hot dog/marshmallow way of roasting food over the fire on a stick.

Heavy pots can be placed right in the fire, but if you're making do with the coffee can from your survival kit, it would be better to rig up a spit and hang it over the fire.

**NOTE:** You can't really prepare for a survival situation--because you can't know when you'll be in one. But here are some precautions you should take on any boat trip:

- Always let someone know where you are going and when you expect to be back.
- Federal law requires that every boat carry a personal flotation device (life preservers, called PFDs) for each person on board. For boats more than 16 feet long, these PFDs must be wearable. Wear yours.
- Loss of body heat--called hypothermia (HIGH-po-THER-me-uh)--can be as deadly in cold water as drowning. But with wet clothes in cold windy weather, hypothermia can also hit you on land or while you're still in the boat.

Dress to avoid it. In cold wet weather, wear rain gear and wool clothes. Wool keeps you warm and dry, because it resists moisture and insulates even when wet. Cotton soaks up moisture--so your cotton jeans just make you wetter and colder.



## DRINKING WATER

Lack of fresh water is harder on your body than lack of food. The loss of body fluids greatly reduces your survival time. Avoid moving around or working so hard that you sweat. Drink as much water as possible--more than you really want. Hot water is especially good because it also helps keep your body warm.

A source of fresh water is of vital importance. Freshwater streams or springs can be found flowing across most beach areas. Your plastic sheet can be rigged to catch rain water--usually in plentiful supply around Alaska at this time of year.

In coastal areas where cliffs drop directly down into the sea, soaks or springs are sometimes found at the base of rock cracks or faults. These are usually marked by clusters of green ferns or mosses.

If worse comes to worst, you can convert salt water into fresh water by soaking up the steam from boiling sea water in a thick layer of cloth (your shirt, if necessary). Rig the cloth horizontally over a pot of boiling sea water. The salt stays in the pot, and when the cloth becomes saturated from the moisture in the steam, it can be wrung out into a container. It's a slow process, but it speeds up a bit when the cloth is wet after being wrung out the first time.

## FOOD: TIME FOR DINNER

So it isn't hamburgers, fries and ice cream. But there's food on the beach that will keep you alive and in business almost indefinitely. Most of these foods have long been gathered and enjoyed by the Native people of Alaska's coastal areas--who claim that other people don't know what they're missing.

In survival situations, it is best to save your energy by starting out with the foods that are easiest to get. These foods can be found throughout the intertidal zone, clinging to rocks, hiding in shallow pools, or buried in sand and gravel only a foot or so below the surface of the beach. You just have to know where to look, and what you're looking for:

**SNAILS:** Many different species of snails are found on rocky beaches from the high tide mark on down; the larger ones live closest to the water's edge. All are edible, but watch out for the moon snail and Oregon triton, which eat clams and concentrate paralytic shellfish poison. Soak snails 3-4 hours in fresh water, then boil for 20 minutes or so, drain and cool, peel off the horny "trap door" at the opening, and pull out the white meaty muscle. (The intestines usually stay inside.)

**LIMPETS:** Shells look like small pointed Chinese coolie hats. Limpets are found in the high tide zone on rocks covered with a film of algae, on which they feed. Use your knife to pry them off, and cut out the white muscle meat on the underside. This can be eaten raw, simmered in water, or fried after pounding to tenderize it. Or if you find a flat rock loaded with limpets, do as the Native people sometimes do:

Cover the rock with damp seaweed and lay hot stones from your fire on top. The limpets lose their hold on the rocks as they cook, and may be eaten on the spot (along with the cooked seaweed).

**KEYHOLE LIMPETS:** These are found farther down the beach and look very much like true limpets except for the small hole at the peak of their "hats." They are closely related to the delicious abalone which, unfortunately, is found out-of-reach in deeper waters. Keyhole limpets are cooked in the same way as true limpets.

**SEA URCHINS:** Round spiny creatures that look like red, green or purple pincushions. They live on rocks or kelp in tide pools or shallow waters near the low tide mark. All sea urchins are edible. Their bright orange eggs are considered a delicacy and eaten raw. (Scoop out the eggs inside the shell with your finger.) Or you can throw the whole urchin into your campfire, cook it until the spines burn, then crack it open.

**CHITONS:** Chitons are oval-shaped creatures whose shells are made up of eight overlapping plates. They, too, fasten themselves tightly to rocks and must be pried loose. Chitons live in the middle to lower tidal areas and are often found on the underside of boulders or grazing in seaweed-covered rocks. The largest species are the Black Katy chiton and the gumboot chiton, which may reach a length of 10 inches or more. The big gumboot--so-called because of a tough, leathery reddish-brown covering which hides its plates--has long been a favorite food of southeast Alaska Indians. Cut out the smooth "foot" on the undersurface, scrape and wash. The meat may be eaten raw; or sliced, pounded with a rock to tenderize, and fried. Or the whole chiton can be roasted in the fire. But leave these creatures alone unless you are really starving, as they are becoming quite rare.

**SEA CUCUMBERS:** Another sea creature that is considered delicious--but doesn't look it. Actually, it resembles a very large, squishy, reddish-orange dill pickle. The sea cucumber usually lives in water below the low tide mark, but occasionally is found nestled between rocks or stranded on the beach. When relaxed, it may extend to its full length of a foot or more, but when disturbed it tenses up and becomes quite firm. And when extremely disturbed, it tries to startle and confuse its enemy (steady!) by expelling all its internal organs--intestines, the

works--and then slipping away to grow a new set. But if it does that, you won't have to clean it. Slice off both ends and slit open the body. Remove the five long, white muscles just under the skin and discard the rest. Slice the muscle into pieces and fry quickly, or cook as for chowder. The meat is tender and tastes much like clam meat.

**OCTOPUS:** Check around a low, low tide for an octopus den, marked by a litter of empty crab shells and other debris in front of a small depression under a rock (see Tidelines, October 1979). Cleaned and sliced and pounded to tenderize, a young octopus will provide several good meals.

**CRABS:** Keep an eye out for Dungeness crabs in shallow bays, or dug into the sand when the tide is out (see Tidelines, February 1980). Crabs usually are cooked alive in boiling seawater. But if you're making do with that coffee can, you'll have to butcher it first by pulling off the back of its shell and breaking off the legs and claws. Clean off everything but the shell and body meat. Cook as soon as possible after cleaning. Bring water to a boil, drop in the crab, and boil for 15 minutes.



Directions: Label this drawing with the names of the animals and plants that you see.

## WATCH OUT FOR THOSE FILTER-FEEDERS!

Clams and mussels are found in abundance on most of Alaska's gravel and rocky beaches. They are easy to gather and cook, delicious to eat, and are among the favorite standbys for survival food on the beach.

But there is a problem. Clams and mussels get their food by straining or filtering plankton from seawater. And sometimes they pick up a toxin (poison) from one of the dinoflagellates thought to be primarily responsible for the damaging "red tides."

This poison doesn't bother the clams or mussels, or the fish that feed upon them. But it is very dangerous to human beings and causes Paralytic Shellfish Poisoning (PSP), which can be fatal. It is doubly deadly because you can't smell it or taste it.

So before eating clams or mussels in quantity from a strange beach, check to be sure. Eat only the white portion of one clam (or the yellow portion of one mussel). Then wait an hour. If you feel any numbness or tingling in your tongue, lips or nose, don't eat any more. Stay away from all clams and mussels in the area. Each person should do this, as people have different levels of tolerance for the toxin.

The vast majority of Alaska's clams and mussels, however, are untainted and are very good indeed:

**MUSSELS:** Blue mussels are found clustered together, fastened to rocks in the high to mid-tide zone. Wash off the shells and remove the "byssal threads"--the silky filaments that they use to fasten themselves to objects. Roast or steam open, and eat from the shells with their juice.

**CLAMS:** Alaska has more than 160 different species of clams--butter clams, soft-shell clams, littlenecks, pinknecks--found in a mixture of sand, mud and gravel a foot or so below the surface of the beach. Dig where you see squirts of water coming up. Eat them raw or simmer as for chowder. For a real feast, build a fire in a pit with rocks at the bottom. After the fire burns out, load in clams and seaweed (any kind of seaweed), pour on some seawater, and let the clams steam until they open their shells.

## HOOLIGANS, BLENNIES AND GRUNTS

These are all real fish that can be found on the beach--or caught from the beach--without getting your feet too wet. Don't let their names (or their looks) throw you off. Guttled, cleaned, wrapped in seaweed or foil and baked in the coals of your fire, they taste as good as any other fish.

**HOOLIGANS** (their correct name is "eulachon": also called "candle-fish"): Small, smelt-like fish that run in large schools near the beach in late spring. When a good run is going, you can rig up a net and scoop them up in the shallow waters off the beach.

BLENNIES (also called "pricklebacks"): Found under large rocks in the intertidal zone. They look like eels, but they're not. Their heads are small and pointed and a narrow dorsal fin runs the full length of their bodies, which range up to 11 inches.

GRUNTS (these are bullheads, also called "singing fish" because of a grunting, hissing sound that they sometimes make when removed from the water): These can be found under rocks and in tide pools, in late spring or early summer. They have wide heads with bulging eyes and a long, tapering body, dark on top and white beneath. Never mind the grunts and hisses--their flesh is sweet and delicious. Cut off the head, and eat only the body. Slit, clean and toast by the fire, or bake wrapped in seaweed.

#### OR BUILD YOUR OWN FISH TRAP

If you yearn for fish that is a little more familiar, you can catch them even though you're stuck on the beach--by the age-old method of trapping them with the tide.

Select a deep tide pool that is covered by water at high tide, but left open at low tide. Build a wall of rocks around three sides of the pool, its top about six inches below the high tide water level; leave the shore side open. Bait the pool heavily with fish guts, crushed clams and such.

Fish feeding as the tide rises will be lured by the bait and--with luck--will be trapped by the rocks when the tide goes out.

Try eating your fish with seaweed. Almost all Alaskan seaweeds are edible and provide important vitamins and minerals. One of the most common is sea lettuce, a bright green algae that grows in the low intertidal zone and looks like limp leaf lettuce. Talk to a local expert about edible and inedible plants in your area.

#### HERE I AM!

You hardly need to be told to keep a watch for rescuers. But you should be prepared at all times to signal them as well, and to keep signaling as long as the plane or boat is in sight.

Lay wood for a large signal fire out in the open where it can be easily seen. Keep it ready to go at a moment's notice. But don't light it until you are sure possible rescuers in a boat or plane have a good chance of seeing you. The time to signal is when they are near you or headed in your direction. Build a bright fire (dry wood) at night and a smoky fire (wet wood, spruce needles, alder leaves, or grass) during the daytime.

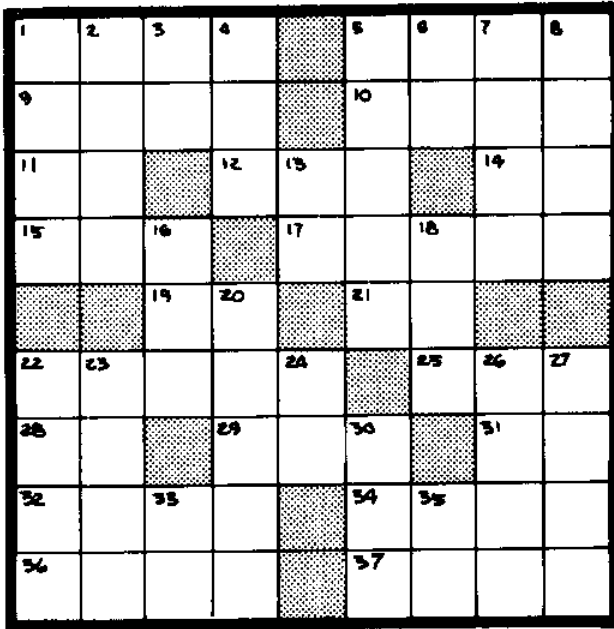
Put rocks, logs or stones in X or SOS shapes.

Have mirrors and orange clothing ready to shine and wave.

Most important, while you're waiting to be rescued, stay calm, but keep busy. Put yourself on a schedule. Move around. Gather wood and food. Don't let yourself get discouraged. And never give up.

## Survival Puzzle

"SURVIVAL PUZZLE" is reprinted from a crossword puzzle entitled, "PLAY IT SAFE," from Alaska Tidelines, Volume 11, Number 8, May 1980. Published by the University of Alaska Sea Grant College Program, Copyright © 1980. Reprinted by permission.



## ACROSS

- \* 1. Stay close to your food and water supply when choosing a \_\_\_\_\_ site.
- \* 5. Standing dead trees make the best fire \_\_\_\_\_.
9. \_\_\_\_\_, twos and threes.
10. Alaska Newspaper Publishers Association (init.).
11. Overtime (abbr.).
- \*12. In a pinch, a coffee can can double as a cooking \_\_\_\_\_.
14. East Yahtse (river) (init.).
- \*15. That survival \_\_\_\_\_ isn't going to do you any good if you leave it at home.
- \*17. In cold rainy weather, wool clothes are better than your cotton blue \_\_\_\_\_.
19. Latin word for "and," as in \_\_\_\_\_ cetera.
21. Rhode Island (abbr.).
- \*22. A good survival food on the beach, and a gourmet dish at home.
- \*25. The best time to hunt for shellfish is on a \_\_\_\_\_ tide.
28. Alaska Airlines (init.).
- \*29. A tried and true way of cooking over a campfire is to toast food as you would with a hot \_\_\_\_\_.
31. Virginia (abbr.).
- \*32. For plenty of heat with less effort, keep your \_\_\_\_\_ small.
- \*34. In a survival situation, stay \_\_\_\_\_ the beach where you can be found.
35. In Alaska, these antlered animals can be hunted only in the islands near Kodiak.
- \*37. While you're waiting to be rescued, keep busy but stay \_\_\_\_\_.

DOWN

- \* 1. Almost all the food you gather on the beach can safely be eaten raw, but you'll probably prefer to \_\_\_\_\_ it.
2. A part of a word meaning "against," as in \_\_\_\_\_ toxin.
3. You and \_\_\_\_\_.
- \* 4. The toxin that is sometimes found in filter-feeding shellfish (init.).
- \* 5. Fresh drinking \_\_\_\_\_ is more important than food in a survival situation.
6. Preposition meaning "upon."
- \* 7. A good way to cook clams and mussels is to steam them \_\_\_\_\_.
- \* 8. A signal fire should be bright during nights and smoky during \_\_\_\_\_.
13. Nickname for the great football running back, \_\_\_\_\_.
- \*16. For a good hot drink, carry powdered coffee, \_\_\_\_\_ or Tang in your survival kit.
18. To feel sick.
- \*20. The position of the \_\_\_\_\_ is important when you're looking for food on the beach.
- \*22. Play it \_\_\_\_\_: Always let someone know where you are going and when you expect to be back.
- \*23. You'll need some of these to rig up your rainfly.
24. Short for "Behold!"
- \*26. Chitons are \_\_\_\_\_ shaped.
- \*27. To avoid hypothermia, you must stay \_\_\_\_\_.
30. Great Northern Company (init.).
33. Rock (abbr.).
35. Each (abbr.)

Starred (\*) words are based on information in the preceding article.

## Beachcombing Trip

BEACHCOMBING TRIP TURNS TO STRUGGLE FOR SURVIVAL  
by Ward Sims

"BEACHCOMBING TRIP TURNS TO STRUGGLE FOR SURVIVAL" by Ward Sims is an Associated Press news story that appeared in the Fairbanks Daily News-Miner on Oct. 21, 1983. Reprinted by permission.

Stranded for four days on an uninhabited, wind-swept island in freezing temperatures, Clyde M. Dahle figures he beat the odds in surviving an ordeal that "only happens to the other guy."

The only memento is a slightly frostbitten toe that didn't require medical attention.

The 38-year-old Anchorage pilot was rescued on Wednesday after battling for survival on Hagemeister Island in Bristol Bay, some 400 miles southwest of Anchorage.

He took off from the tiny village of Togiak in his wheel-equipped, single-engine plane on Sunday to do some beachcombing on the island, and trouble barged in on him only moments after he touched down.

He had picked as his place to land the sloping, wave-pounded shore of a five-mile sand spit that stabs into Hagemeister Strait from the island.

While he was taxiing to the top of the spit where it was flat but covered with rocks and beach grass, winds to some 20 or 25 miles per hour picked up the wing of the Taylorcraft and flipped it into the water.

"Because of the steep drop-off of the beach, the airplane started to sink immediately," Dahle recalled on Thursday.

He said he grabbed his emergency locator transmitter and

a bag of emergency gear, but the cabin of the plane had already filled with seawater and waves were pushing the plane farther off shore.

"In attempting to get out of the door of the airplane and out from underneath the wing to reach the surface of the water, I lost the bag of survival gear," Dahle said. "I came to the surface carrying only the emergency locator transmitter and the clothes I was wearing."

At the time, he was only about 50 feet from shore, but he said he was almost to the point of exhaustion before he was able to swim close enough to the sand spit to touch bottom.

"My first attempt was to get out of the wind," Dahle recalled.

He struggled down the spit to the island and crawled into a crevice between some rocks, lying there shivering and half-conscious for several hours.

His clothes--wool thermal underwear, rubber-insulated pacs with wool socks, denim pants, cotton shirt, fiber-filled parka and one glove--were soaked.

"What I was wearing and the two pocket knives in my pocket were all that remained of my survival gear that I had stored in the airplane," Dahle said.

"All of my fire-starting materials, my big arctic sleeping bag, my extra rain gear, extra survival food, my large survival bag with all my flares, signals and mirrors that I always carry with me went down with the airplane."

He said he spent Sunday night in a small cave, shivering and shaking uncontrollably from hypothermia.

On Monday morning, he tried to get his emergency locator transmitter to work, but the circuitry had been damaged by seawater and it would not operate. He scratched out an "SOS" in a patch of black sand on the spit and dried his clothes as best he could by hanging them on bushes.

Then he went to work hauling white rocks to the distress sign he had scratched out.

Late Monday, an Air Force C-130 search plane flew over the island about two miles inland, but its crew apparently did not spot his SOS, or the waving white flag he had fashioned from a garbage bag found on the beach.

He also cut beach grass to insulate the cave.

By noon Tuesday, he had fashioned an SOS sign of white rocks with letters some 20 feet high. He also made a rock sign showing the number of his aircraft.

Late Tuesday he found an old tracked vehicle. He salvaged a foam rubber seat cushion

which he cut up to insulate his body from the ground while sleeping and as a pillow. He also found a can of oil, and a large bottle with which to carry water from a small stream to his cavern.

Just before dark on Tuesday, a light plane flew high over the island and vanished.

That night, the temperature dipped to about 20 degrees, and Dahle said that while he slept better than on the previous two nights, he would awake often to find himself shivering and shaking from the cold.

On Wednesday morning, he found a handful of lingonberries, his only food, a can of charcoal lighter fluid, and a .22-caliber shell.

At about noon on Wednesday, a Coast Guard C-130 swept over the spit at an altitude of about 1,000 feet and someone aboard spotted his distress signal and his waving white flag.

The Coast Guard crew dropped a radio by parachute, and minutes later a float-equipped light plane from Dillingham landed on the water, taxied to shore and picked him up.

Dahle, who came to Alaska from Salt Lake City about 10 years ago and is now employed by the State Division of Aviation, said it was his first accident in 14 years of flying light aircraft.

"I never even scratched the paint on a plane before this one," he said.

RECEIVED  
NATIONAL SEA GRANT DEPOSITORY  
DATE: APR. 16 1985

NATIONAL SEA GRANT DEPOSITORY  
PELL LIBRARY BUILDING  
URI, NARRAGANSETT BAY CAMPUS  
NARRAGANSETT, RI 02882