PART 1

LIVING OFF THE
WEST PACIFIC TROPICS

LIVING OFF THE LAND

PART 2

OFF THE ARCTIC

Prepared for the

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PART I

LIVING OFF THE SOUTHWEST PACIFIC TROPICS

I. INTRODUCTION

Your greatest fear of the jungle is fear itself. Snakes, ferocious animals and wild tribes, bent on your destruction, do not roam the jungles. If you keep your head, plan your actions and act calmly, there is no reason why you cannot live in the jungles for weeks, even months, and get back to your base safe and sound. Others have done it - so can you!

If you have crash-landed your plane, stay with it for a day or so or until you have decided on a plan of action. It can supply you with shelter, fuel for signals and cooking, material and implements that will make your return trip much easier. If you have bailed out, make a temporary camp overnight. The next day will be soon enough to start for your plane if it is not too far away.

Emergency Kits Whether you crash-land or bail out, it is to be hoped you landed with at least part of your emergency kit. And make it a habit, *now, before* you need the equipment, to check over your emergency kit *personally* before every takeoff. Small articles are often borrowed from a kit, and if something is missing it is you who will suffer.

The make-up of your emergency kit may be determined for you, but be sure it includes matches dipped in wax or ordinary ones in a waterproof box, and a machete or any other similar knife. A cutting edge may be your most valuable single tool if you are forced down in the jungle. Emergency food which is nourishing, compact and needs no cooking is much better than ordinary undried foods which consist mostly of water.

Your first aid kit should have sulfanilamide powder, salt tablets, quinine or atabrine for malaria, halazone tablets for purifying water, gauze, bandages,, and iodine for small wounds. A compass and lightweight emergency fishing kit will also be more than useful.

Travel If you think you will not be found where you have landed, remember that travel in the jungle is slow. And before you leave the plane burn all papers and restricted data, smash and bury all secret instruments. Disable the entire plane if you are in or near enemy territory. Be sure to salvage all emergency equipment, food, water and anything else that will make your trip more comfortable.

The most important point to remember in making your way out of the jungle is *always head toward the coast.* On the coast additional travel will be easier, food and water are plentiful and easily available and your chances of rescue by natives or your companions are much greater. When you are ready to leave the place where you have landed, and if you have a compass and map, plot a course to the nearest stream and follow it downstream. One stream will flow into

another and eventually lead you to the coast. Lacking a map and compass, travel downhill or follow the swampy hollows until you find a stream. It's a good idea to blaze or otherwise mark your trail to prevent your going in circles.

Use your head in traveling. Don't try to force your way through thick jungle - part it and pick your step. Of course you won't go over mountains or through bogs if you can go around them. Start your journey early in the morning and begin looking for a place to camp about three or four in the afternoon, because darkness comes quickly in the tropics.

When possible, pick a camp site on open ground where you will get a breeze which helps to drive mosquitoes away. You will also have less trouble with insects if you make camp away from the banks of rivers and marshes.

When you reach a river you may be able to build a raft and float downstream, but watch for rapids! You can hear them far enough away to enable you to land and detour around them.

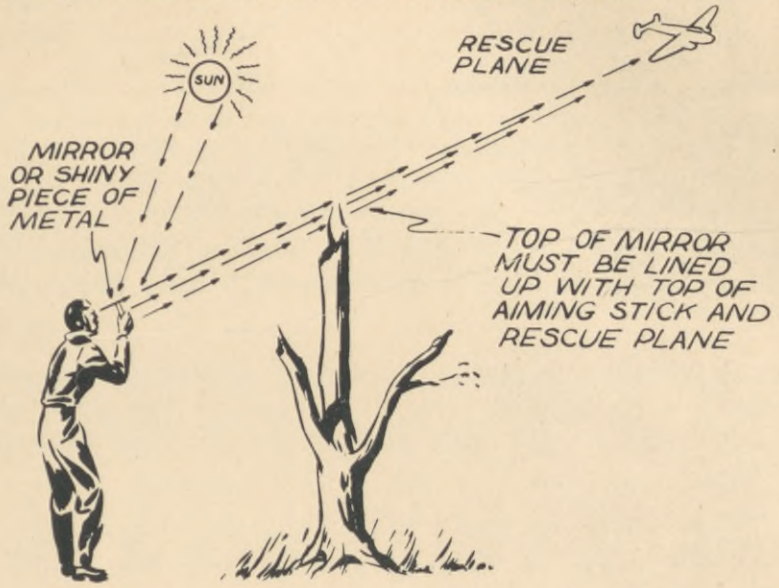
Natives Look constantly for clearings, gardens, or any other sign that indicates the presence of natives - they are your best life insurance! The chances are any natives you encounter will be more than friendly; many of them are anxious to help you and may well save your life. Probably they will be more shy or afraid of you than anything else. You must try to win their confidence. You can do this by appearing confident but *not aggressive*, and *never look down on them*. After all, while you can drive an automobile that would frighten them, they can live and travel in the jungle, which may be a pretty important accomplishment at the moment! Treat them with respect, smile at them, court them with motions and small presents such as insignia, razor blades, tobacco, or parachute cloth. Use sign language to make your wants known. Eat native food only when well-cooked and drink only water that has been boiled or otherwise purified. And stay away from their women!

Never forget that finding natives and securing their cooperation will be your best chance of getting back to civilization. The great majority of those persons who have escaped from the jungle did so because of the help of the natives.

Signaling If you have not landed in enemy territory, you may decide to stay where you are and depend on signals to disclose your location rather than attempt to beat your way back to base. However, it's difficult to send up signals from a jungle - the trees disperse smoke so much it can't be seen. So if you are in the jungle attempt to find a small clearing nearby and be ready to send up your signals when a plane is overhead. A dense smoke can be made with damp leaves, moss, or rotten wood added a little at a time after

your fire is going. Water doused on a fire will send up clouds of steam. Engine oil also produces a dense black smoke. Have your fires all laid so you can touch them off immediately. If you are fortunate enough to have rockets or smoke bombs, use them only when a plane is headed toward you and not all at once.

If your kit includes the special steel mirror with a hole, learn to use it while at your base - it's quite an art. An ordinary mirror or shiny piece of metal can be used with the aid of an aiming stick, which can be a stake or tree four or five feet high. Hold the mirror so you can sight over the top of it as shown in the illustration.



Move around until the plane and top of the aiming stick line up, then reflect the beam of light from the mirror so that it just clears the top of the stick. It the plane and stick are kept in line your signal should be visible from the plane.

If your plane is on a beach or otherwise in the open try to make it as conspicuous as possible. Cowl panels from the engine nacelles placed up-side down on the wings will make good reflectors.

2. HINTS ON KEEPING WELL AND COMFORTABLE

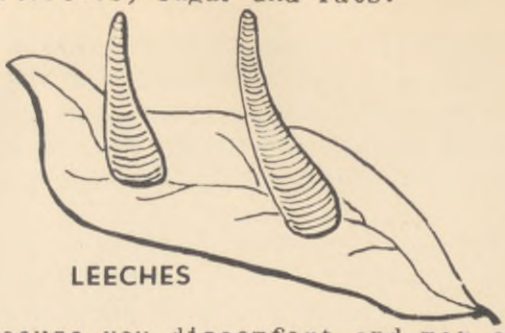
You want to keep well at any time and when you are stranded in the jungle your physical condition becomes paramount. Don't overlook the importance of proper sleep and food, the danger of malaria, sunstroke, wet clothes, and the many insect pests that can make your life uncomfortable, or worse.

Diseases Because of the prevalence of malaria it may well be your worst enemy. To avoid malaria, guard against night-flying mosquitoes. Camp away from marshes and stagnant water, sleep under nets or wear full clothing at night if you have no net. Take your quinine or atabrine religiously.

Dysentery is also common in the tropics and is caused by impure water or food. You can prevent it by boiling, or otherwise sterilizing all drinking water and milk, and eating only food which has been freshly and thoroughly cooked. If you do get dysentery, fast for twenty-four hours, then take only liquid foods, Avoid starches, sugar and fats.

TICK

LOUSE



LEECHES

Ticks, body lice, and leeches will cause you discomfort and may carry diseases. Examine your body and clothing once or twice a day for these pests. Ticks should not be squashed as their blood may be full of fever germs. Pick them off carefully and if they have buried themselves in your skin a covering of saliva will generally cause them to loosen. Apply iodine to the bite.

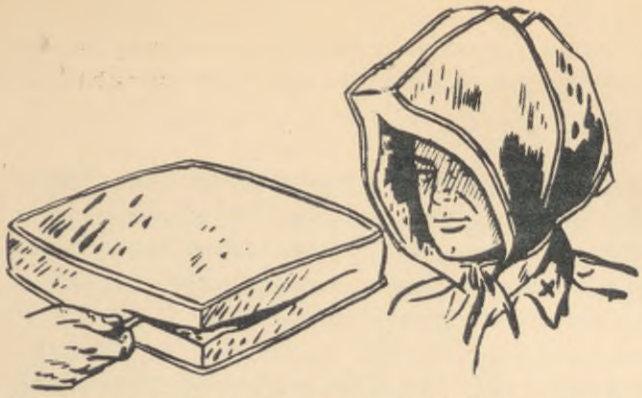
Leeches can be removed by applying a drop of iodine, a pinch of salt or tobacco juice. A burning match, cigarette or hot coal will work, too. Don't pull them off as the tear can cause an infection. Apply iodine after removal.

Do not bathe in fresh water. Many tropical streams and ponds are infested with the germs of various fevers that may cause you months of illness. For the same reason you should not wade through fresh water when it can be avoided.

Clothing "Wear the shoes you intend to walk home in" is good advice. Avoid wearing wet clothes any longer than necessary, and in the rainy season you may be wet most of the time unless you do something about it. Don't discard your clothes for any reason. They are your best protection against sunburn.

Sun Protection The search for food and water, along with perhaps a a tedious trek back to civilization, may keep you in in the sun for long hours, although you should avoid strenous work and should remain under cover in the middle of the day, particularly if you are along the coast or in open country.

If you wear a felt or fabric hat, fill its crown with fresh leaves when walking in open country. Without a hat or shirt, you must be doubly careful of sunstroke. Large leaves may be used to protect your head from the sun. You can also make a sun helmet from a seat cushion. Slit it open between the seams of two adjacent sides and mold a hollow for your head in the stuffing. A thin strap made of shroud line completes this headgear.



An emergency hat for sun protection made from a seat cushion.

Lacking a hat or seat cushion, cover your hair with powdered lime which is easily made by burning seashells or coral on an open fire. However, be careful handling live coral, because it can cut painfully. After the shells or coral have been burnt they are easy to crush into a a white powder. If you then plaster your hair with this powder, using oil or water as a kind of binder, you will have a good temporary protection. You can also use this powder on your skin to guard against sunburn.

As for the oil to use with the lime on your hair, try engine oil from your plane, or coconut oil which you can also prepare. Simply expose the meat of mature coconuts to the sun or heat over a slow fire. If the coconut is grated or pounded first, the oil will run more quickly. Coconut oil is also grand protection both against sunburn and seawater if you have to stand for any length of time in water while fishing.

You know, of course, that the hot sun of the tropics will cause you to sweat profusely and when you do your body loses not only water but salt. This salt must be replaced, or you will get muscular cramps and be subject to heat exhaustion. Salt tablets should be in your first aid kit and you should take two or three a day, preferably on a full stomach.

Water Protection

During daylight tropic hours, you may have to contend either with a glaring sun or a torrential rain. Beside your own person, you want to keep dry the food you have prepared or want to prepare, not to mention your cigarettes and matches, if you have been fortunate enough to salvage any.

Where banana trees grow *(see description on page 19)*, it is easy to make yourself a waterproof coat, or shingles for a lean-to. First gather some young banana leaves. Heap into a pile some stones the size of your fist or larger, and build a good fire on top of them. When the fire dies down, level the stones with a stick to form a kind of platform. Place the banana leaves one by one on the hot stones for a minute or two. The leaf will turn darker and become glossy. The heat makes the leaves pliable and impervious to rain. A number of leaves can be thus prepared before the stones become too cool to use. These, tied shingle-fashion and fastened on a lean-to, will keep you dry. And you can sew yourself a kind of raincoat out of them. Be sure to save one leaf in which to wrap your dried foods and tobacco.

If banana leaves are not to be found, other broad leaves may serve the same purpose although they cannot be fire-treated for durability as can banana leaves.

Shelter If you are in a wet forest or jungle, you must protect yourself from night dampness and frequent rains. You can make a lean-to thatched with broad leaves, or a tent from your parachute. Incidentally, your parachute will provide a substitute for mosquito netting and the pack can be converted into a knapsack.

Do not sleep on the bare ground because of the dampness and the small vermin that will bother you. A bed can be made of a layer of criss-crossed boughs covered by leaves and other plant material. Seat cushions and kapok from your plane would be excellent but probably too much bulk to carry any distance.

In a dry forest you can sleep in a tree, not comfortably perhaps, but with less danger than being on the ground. Make a small platform or bed in the crotch of a tree using vines or parachute shrouds for lashings. Wherever you sleep, have your bed made up and be under mosquito netting before sundown, if you can, because malaria-carrying mosquitoes begin to attack as soon as darkness falls.

Snakes The "snake-infested jungle" is largely the imagination of dime-thriller authors. Indeed, one scientist, who spent twenty-two years in the islands of Oceania, made this statement - "The chances of being bitten by a poisonous snake in any part of the Malayan region are very much smaller than in any part of the United States where the rattlesnake and the water moccasin occur." Just use common-sense precautions - do not put your hands under logs, into tree cavities, or rock ledges, etc. If it will help your peace of mind, wrap leggings can be made from parachute webbing.

However remote the chance, where there is a possibility of snakebite it is well to know how to treat it. Quickly apply a constricting band above the bite just tight enough to prevent absorption and not interfere entirely with the flow of blood. A cold, numb feeling means the band is too tight and should be loosened. In any event, loosen it every 15 minutes for a period of one or two minutes. Make deep X-shaped cuts ½ inch long through the skin at points where the fangs entered. Make additional cuts at the edge of the swollen area. Let the blood flow from these cuts and help it along by suction, with the mouth if nothing else is available. Make suction for about 15 minutes every hour for several hours. If possible apply cloths wet with strong salt solution between suction periods. *Do not* use potassium permanganate or cauterize the wound. *Do not* exercise or use any alcohol.

3. FINDING WATER

General To exist in the desert or in the tropics, as one author puts it, "All you need is wits and water. Retain the one and find the other." Indeed you could live for a week or more on accumulated body fats - and the pangs of hunger gradually diminish - but you can exist for only a short time without water. Hence the search for liquids to replace the large amount you would sweat out, even without exertion, becomes your first problem.

Generally speaking, rapidly running water in the uplands of tropic areas is safe to drink, unless there is reason to suppose that sections upstream are inhabited. Under no consideration should water flowing through inhabited areas be drunk without first boiling, because it is almost sure to be polluted. Standing water anywhere is dangerous. In the search for water it may help to follow the tracks of animals or the flights of birds.

The one other source of water which will surely be both safe and good to the taste is rainwater. So if you have been able to save your parachute, hang it between trees, and perhaps you can catch enough water in it to last you for days, because rainfall in most of the Pacific Islands is abundant. Even after the rain has stopped, water can still be caught by wrapping a clean cloth around a sloping tree with one end of the cloth arranged to drip into a container of some kind.

On many of the small islands of the Pacific, water can be found by digging for it. Many coral islands rise to a height of some feet above the level of the ocean and the lagoons. By digging near the foot of the inner or lagoon slope, water usually may be found at a depth of from three to five feet. But if you fail to strike any there, or you lack the equipment to attempt such a well, start digging a hole in the sand on the ocean side, just above the tide mark. Stop digging as soon as you have struck water because fresh water, being lighter than salt water, has a tendency to remain on the surface of salt water when rain soaks down through the soil. Thus the water is fresh or nearly so, and drinkable. But if you dig further, the heavier sea water will be found. The natives thrive on water thus obtained and even on the poorer quality of water which you would locate just below the high water mark at low tide. Such water will be brackish and discolored, but usable. Drink little of such water the first day or two or you will become sick.

You no doubt have read of the effects of sea water on your system, so you may be afraid to drink even mildly salty water. But actually small amounts of salt water are decidedly beneficial because as has been previously stated, so much necessary salt is lost through excessive perspiration in the tropics. It is to replace such salt that you have been required to take salt tablets with your normal tropic diet. On a tropical island the food you eat will not be salted, so you will need even more salt than normally. Hence the actual desirability of some salt in your drinking water. One part sea water to six parts of fresh water may

be drunk without ill effects and will supply the salt you need.

Dew in usable quantities will collect on stones and leaves and should be carefully collected just *before* dawn. It can be mopped up with a piece of cloth and squeezed into a container.

Remember that alcohol in any form is no substitute for water in time of need, because alcohol promotes water loss through skin and kidneys. Drinking alcohol under conditions of water deprivation is well-nigh suicidal.

Still another warning - *don't eat unless you have water*, because in eating your body uses up its water reserve to digest the food. Every mouthful you eat helps to drain precious water from your body tissues. You won't starve. Be sure, also, in drinking that you don't gulp water - sip it. And when water is very scarce, simply rinse out your mouth with a small quantity before swallowing.

Wherever you get your water, boil or disinfect it by chemicals if there is any doubt as to its purity. It is better to be safe than sorry!

Water From Plants

As a source of liquid, no other tropic plant can comparewith the coconut *(see page 15)*. The green, unripe nuts contain nearly a pint of delicious, refreshing water, or milk as it's generally known. The water in the green nut will not keep, after picking, for more than two days or so husked, and over a week unhusked, so pick your coconuts only as you need them. The food quality of the coconut, discussed on page 15, in addition to the more necessary water supply it imparts, is such that a man can live indefinitely on an island where coconuts and fish are to be had.

Coconuts grow high in the coconut palms, so the first problem is to get at them. Choose a tree whose trunk has the greatest slope. If you have a heavy knife, notch the trunk and climb up barefooted, with the weight of the body on your feet while you hold on firmly, the body bent at the waist. Pick off the lowest bunch of nuts by the main stem, or pick them one at a time. If you are well up in the tree, give the nuts, as you drop them, a spin which will help prevent their being split on landing.

Another method of picking coconuts, in case you haven't a knife to notch the tree for toe holds, is by the use of a so-called "climbing bandage". It consists simply of a belt or rope or piece of cloth, which is a little larger than the circumference of the tree. Fasten it around the tree and then step on it with both feet. The loop will catch on the other side of the palm and will support your weight. Reach up with your arms and grasp the trunk with both hands. Pull yourself up, doubling your knees and then bring the bandage up to a higher position with your feet. By repetition of this method you can gradually climb to the fruit.

Getting at the nutritious milk and meat of coconuts, once they are

HUSKING COCONUTS

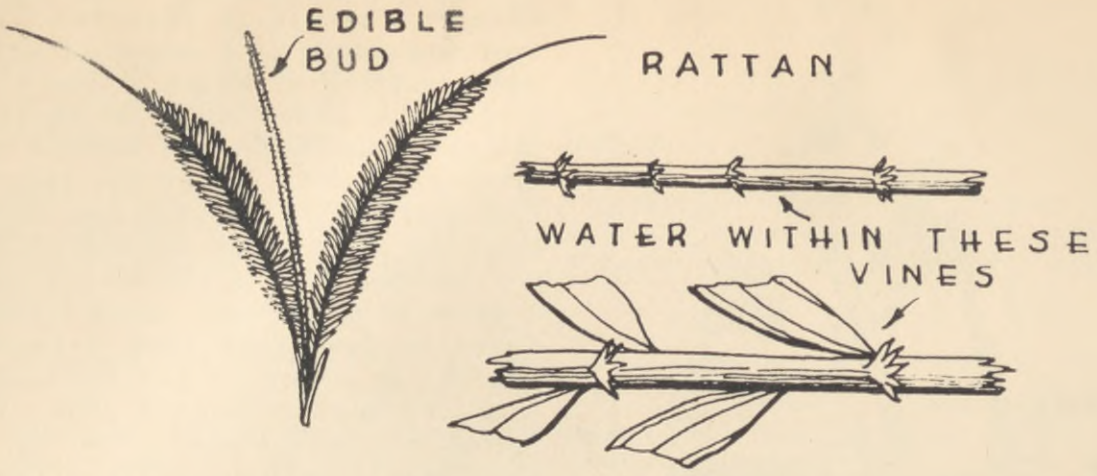
gathered, presents something of a problem to one unarmed with a knife, because the nut is enclosed in a husk consisting of a smooth exterior and a matting of tough fibres. If you have a heavy knife or an axe, you need not remove the husk of the green coconut to get at the liquid. Simply slice off the stem end of the husk and cut through the top of the nut inside. But if you do not have a knife or other tool, drive a stake three or four feet long into the ground, as shown in the illustration, so that it slants away from you at a slight angle. The top of the stake should be given a crude edge so that it will pierce the longitudinal fibres of the husk. Stand about a foot away from the stake, and then, holding the coconut as though you were about to punt it as you would a football, being it down sharply on the stake so that the entry point of the stake will clear the nut within the husk. As you do so, push down with your hands giving the nut a twisting motion to pry off a small portion of the husk. By such repeated blows the entire husk of either the green or mature nuts can be easily removed. This husking device is standard equipment in native villages.

However, you're still not at the nut meat and milk. To open a drinking coconut, hold it in one hand so that the eyes are uppermost. Strike the nut sharply with a stone just below each of the eyes. This will crack the shell and the top of the nut can be picked off without spilling the liquid. If the nut is mature, place it on its side on the palm of the hand. With a stone in your other hand, strike the middle of the nut. Revolve the nut a quarter turn and hit it again. Continue to turn and to strike the nut until it cracks in half.

In the forests of the old world tropics, one will sometimes locate the characteristic pitcher plants, and the water in these pitchers may be used, once the bugs are strained out.

Large, ropy vines hanging from trees contain a good deal of water that does not need to be sterilized. Notch a vine as high as you can reach, and then cut it off close to the ground and let the water drain into a container made, perhaps, from a hollowed-out section of bamboo. You should get close to a cup of water from each such vine. If this does not work, treat the vine as described below for rattan palms. Do not, however, attempt to draw water from a vine that has a milky sap!

In the high forests you may find the climbing rattan palms which generally have long or short sharp spines on their leaves and the growing face of the



stem. The long trunks or vines are perfectly smooth, from one-quarter to two inches in diameter and may be up to several hundred feet in length. Within these vines is an abundance of water. Merely cutting a stem to let the water out might seem to be the logical procedure, but if you do, nothing will happen. Instead, cut off a section of vine, six to ten feet in length, and hold it up vertically. For a few minutes a steady stream of water will run out and then stop. Then cut off a couple of feet more from the top of the section of vine and watch the seeming miracle of more water running out of an apparently empty vine. Then when the water stops for a second time, lop off still another two feet to reestablish the flow.

Explorers in the tropics have found pigweed or purslane, known also as portulaca, *(see page 20)*, to be an excellent source of liquid. They chew the fleshy, reddish-green leaves and stems. Purslane is readily recognizable since it is unlike any other atoll plant. It is fleshy with small yellow flowers, and covers the ground in patches. In much the same way, the aerial roots of the pandanus tree, *(see page 18)*, may be chewed for their moisture content.

A bamboo thicket may offer an additional source of water. Shake the stems to see if any of them gurgle. Having found one that does, cut a notch as far down as possible and catch the water in a container.

4. MAKING FIRE AND COOKING

Fire

Since many of the foods of the tropics need to be cooked, and a fire is often necessary for comfort and signaling, matches in a waterproof container should be carried with you at all times. Nevertheless, despite your best laid plans, you may not have them when they are needed most, so it is well to know how to make a fire without matches. While expert natives are able to make a fire of wet wood in thirty minutes or less, remember firemaking is one of the difficult feats of woodcraft and, without previous experience, should not be tried except as a last resort.

MAKING FIRE

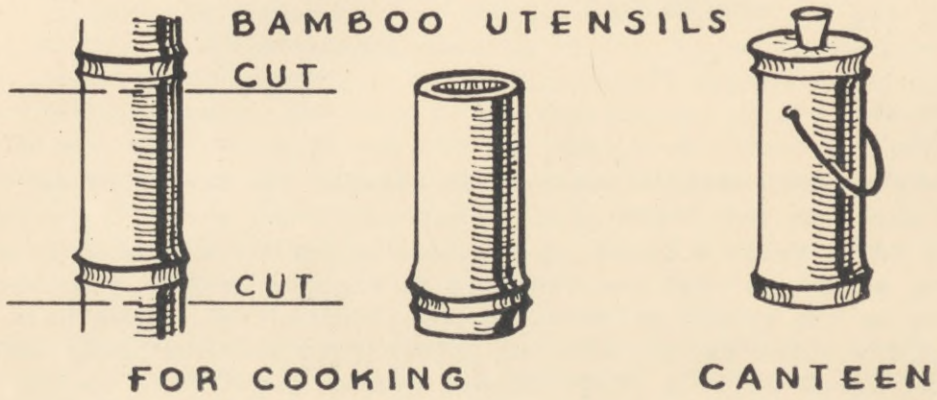
There are several methods employed in Oceania for making fires, - one of which, known as the "fire plough" method, shown above, is perhaps the best to try. Split a piece of dry wood about three inches in diameter and long enough so that you can hold it rigidly between your legs while kneeling on the ground as shown in the illustration. Then hold a flat, pointed, dry stick of the same or harder wood in both hands and rub it back and forth until a longitudinal groove about five inches long is formed in the base stick. The rubbing stick should be pointed away from your body so that it forms a sharp angle with the base. When a small groove has been formed, apply pressure as you move the stick away from you, but not on the return stroke. By this means a small pile of sawdust will form at the end of the groove. As you apply pressure and increase the rapidity of stroke the wood particles will begin to smoke and can be nursed into flame by careful blowing and use of a good tinder, such as the burlap-like material found at the base of the coconut tree. The beginner's great difficulty is carrying the stroke too far forwards, for obviously any accumulation of sawdust will be lost if the stick goes out beyond the end of the groove.

You might also try the American Boy Scout method of bow and spindle. A spindle is made from a piece of wood about the size and length of an arrow, and the bow can be cut three feet long from a flexible sapling. The bow cord (possibly your shoe-string) is looped once around the spindle which is kept in place with a block of wood held in the palm of the hand. Indent the block to hold the top of the spindle. A similar block should be at the base of the vertically held spindle, where the friction is created. Rotate the spindle very rapidly by "sawing" with the bow after the driest tinder that can be found has been bunched around

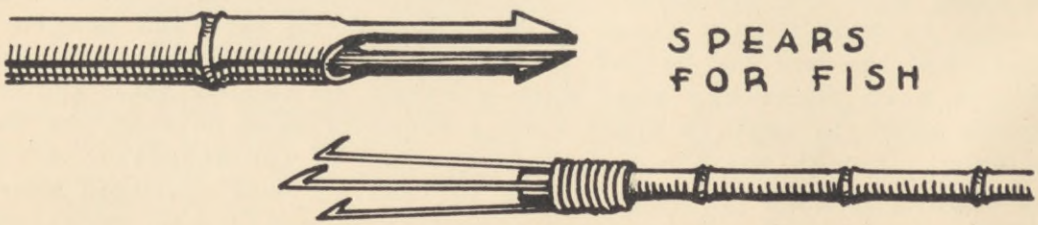
the spindle base. Natives can make a fire in less than a minute simply by rapidly rotating the spindle between the palms of their hands.

If your plane is available, a piece of gasoline-soaked tinder or cloth and a spark from the magneto or battery might turn the trick. Don't overlook the possibility of a burning lens made from a watch crystal or camera lens. In the sunlight you'll find this familiar method the easiest to employ.

Improvised Cooking Where bamboo is available, a section of green stem cut below two successive nodes, which occur at intervals along the stem, will furnish a container closed at the bottom and open at the top as shown below. This will make a suitable vessel for improvised cooking. The green bamboo is so durable that water may be boiled in it.



A coral stone, or porous lava stone, is very useful for grating foods and can also be used to shape wood. A splinter of bamboo makes a sharp knife for cutting up food. Incidentally, you can fashion a spear for fish from a bamboo, or by lashing pieces of bamboo or other wood to a handle with the fibrous bark of some tree. Remember a sharp flake of stone or shark's tooth will cut very well.



Of course, you can roast almost any food merely by placing it in hot embers, or broil by holding it on a stick over a hot fire.

Water can also be heated by dropping hot stones into an improvised container, perhaps of canvas or bamboo. Porous volcanic rock or hard beach pebbles are good heating stones. Use a fresh lot of stones each time. Tongs for handling hot stones can be made by bending the mid-rib or stem of a coconut leaf, or some flexible branch. Partly fill your container with water, add a few hot stones; as the water is heated add more water and stones, until the desired temperature and quantity of water is reached. To "keep the pot boiling", add additional rocks. Sometimes it is possible to dig a hole in the ground and line it with a clayey earth which will hold water long enough for the purpose.

The ground oven, widely used by the natives, is quite easy to make. Simply scrape out a shallow pit in the earth or sand, lay down kindling and some larger firewood, and lay stones on top of your firewood. When the stones have been heated as much as possible, place the food wrapped in green leaves, on them; then cover with leaves or coconut "cloth", and finally with earth or sand, and your food should be ready for eating within an hour. Food left in a ground oven until you are ready to eat it is safe from ants, flies, and other small pests. To preserve animal food, re-cook it every day.

5. FOOD FROM PLANTS

General Of the thousands of potential food plants in the tropics, the few described here were carefully selected with the advice and assistance of leading scientists who are intimately familiar with the plants of the southeastern Asiatic mainland and the islands of Oceania. The basis of the choice was their abundance, their simplicity of preparation for eating as well as the comparative ease with which they may be recognized. However, you are strongly urged to learn to recognize the plants used for food in the particular area to which you have been assigned. Certainly you will have time to wander a few miles from your base, preferably under native guidance, and learn first hand what plants are edible. Such a trip will not only be fun - it may someday save your life.

Do not worry too much about poisonous plants. With reasonable care, you should have no trouble at all. In the event that you are not positive of the plant you may wish to try, a few general rules can be of help:

1. Eat sparingly of *any* unknown plant until you see what reaction it has on you.

2. Avoid anything that has a repulsive or disagreeable taste.

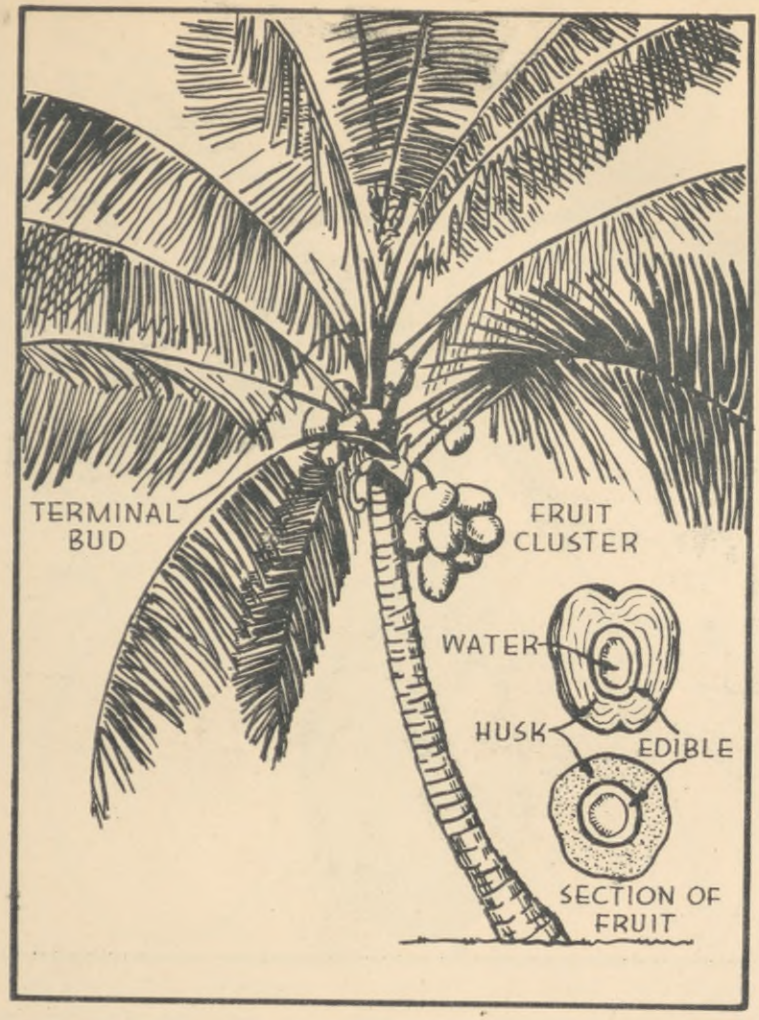
3. Avoid all plants with a milky sap except those few described in this booklet.

4. Anything the monkeys eat will be safe for you.

In these pages certain foods are indicated that must be cooked before eating, because if eaten raw they may be actually poisonous, while others contain minute, sharp, needle-like crystals, which are intensely irritating, but which cooking destroys. Some vegetables contain the deadly hydrocyanic acid, which you may remember from your course in elementary chemistry. Nevertheless, that chemical can be cooked out, though in some cases several changes of water are necessary in the process. Cassava, the source of tapioca; the seeds of cycas; and the seeds of a wild lima bean all contain hydrocyanic acid. The crystals referred to above are those of oxalate of lime, and they are intensely irritating because of their mechanical effect, though the chemical itself is not injurious. Many foods which contain them are relished when cooked, because cooking breaks down the injurious crystals. However, if after cooking, you should find a vegetable still has a characteristic acrid "taste" indicating that the crystals are still present, change the cooking water and boil again. Eventually, the food will be both edible and palatable.

Throughout the tropics all of the familiar garden fruits and vegetables such as cabbage, beets, corn, beans, squash, cucumbers, and egg plant are cultivated. These aren't described here, because you are familiar with them, and because where you find them cultivated you also find people. In addition, you'll find such fruits as pineapples, lemons, oranges, and limes, which you know well, though you may have never seen them growing.

Let it again be emphasized that you should make every effort to learn how to "live off the land" by field trips, talking to natives, and, if possible, visiting botanical gardens, museums, etc. People have been known to starve to death in the midst of plenty, simply because they did not recognize edible foods or know how to prepare them for eating.



COCONUT

Where Found: Commonly cultivated throughout Polynesia and Malaysia. May occur on uninhabited islands and the smallest coral islets. Grows best near the seashore.

Description: A tree that may be up to 100 feet in height. The leaves are heavy and large, sometimes as long as 20 feet. The nuts are borne in clusters.

How to Prepare and Use: See pages 8 and 9 for other uses of the coconut, as well as methods of collecting and husking. Green nuts are smaller but more nutritious because they contain more milk. In mature nuts the milk has been converted largely to meat which should be eaten sparingly because it is very rich. Nuts which have fallen to the ground and sprouted are filled with a spongy meat so highly nutritious it is particularly recommended eaten raw for invalids and those who have been without food for extended periods. The sprout itself, up to a length of six to eight inches, is edible raw or cooked. The terminal bud or cabbage, may also be eaten raw or cooked.

BREADFRUIT

Where Found: The breadfruit tree is found throughout Polynesia. The Polynesians brought it from its native Malaysia where it grows wild. Because the many varieties ripen at different times of the year, ripe fruit may be found virtually the year round, though in March and April the fruit is not as readily obtainable as at other times of the year.

Description: Breadfruit grows on a tree 20-40 feet high which has large sharply-lobed, dark, glossy green leaves. These leaves have an abundance of milky juice. The fruit itself is oval or spheroid in shape and 6-10 inches in diameter. Its surface is rough and warty and yellowish-green in color. It hangs from the branches by short, thick stems singly or in clusters of two or three.

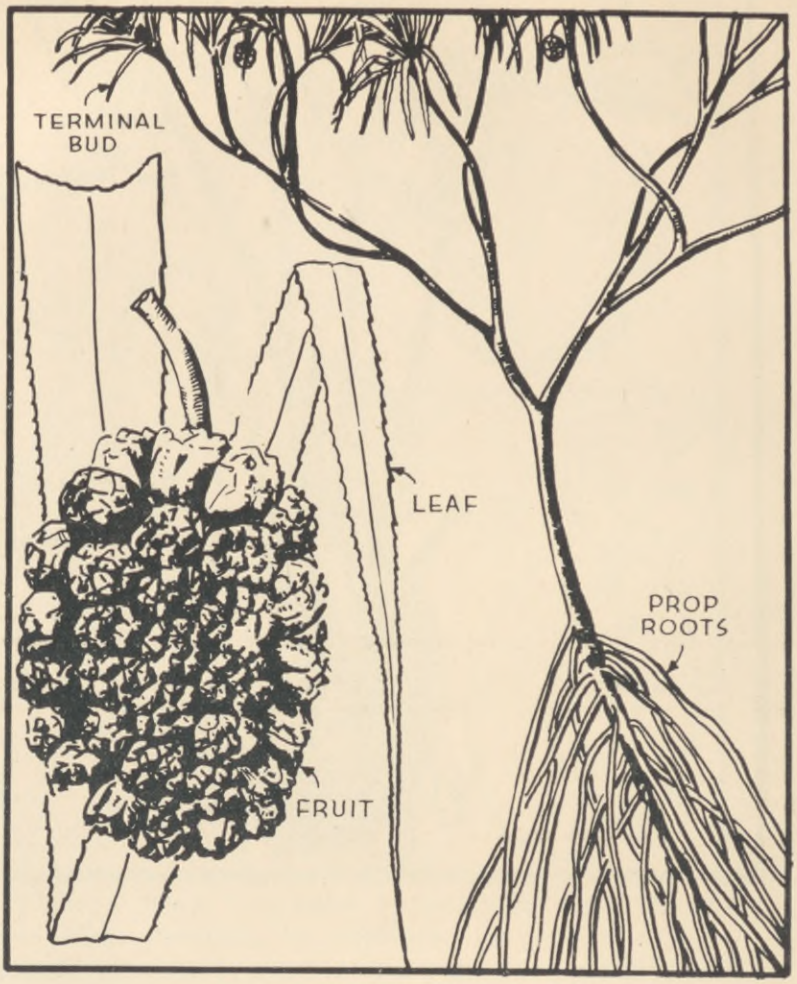
How to Prepare and Use: Breadfruit should be cooked before eating. The most practical way is to bake the entire fruit in hot embers for a half hour or so. Peel off the skin before eating. It may also be baked in a pit or boiled and cut into slices and fried. To keep for future use, boil, peel, cut into slices and dry in the sun. These slices may then be eaten without further preparation or ground up and cooked with other food. The seeds, if present, may be eaten if boiled or roasted.

TARO

Description: Occurs commonly throughout Oceania and Malaysia in marshy areas but some varieties are grown on uplands.

Where Found: A plant two or three feet long, with a large heart-shaped leaf closely resembling "elephant ears" which are grown as ornamental plants in the United States. Taro has thick, potato-like roots which vary considerably in size, depending on the variety. It is one of the staple foods of the natives.

How to Prepare and Use: The roots or tubers, as well as the young leaves and stalks are edible but all must be cooked, preferably by boiling or roasting. A burning or stinging sensation indicates that additional cooking is necessary. After cooking, the roots may be peeled, mashed, and kneaded into a dough-like mass with the addition of water. The dough will keep for several days if wrapped in leaves. In this form taro is the well-known "poi" of Polynesia.

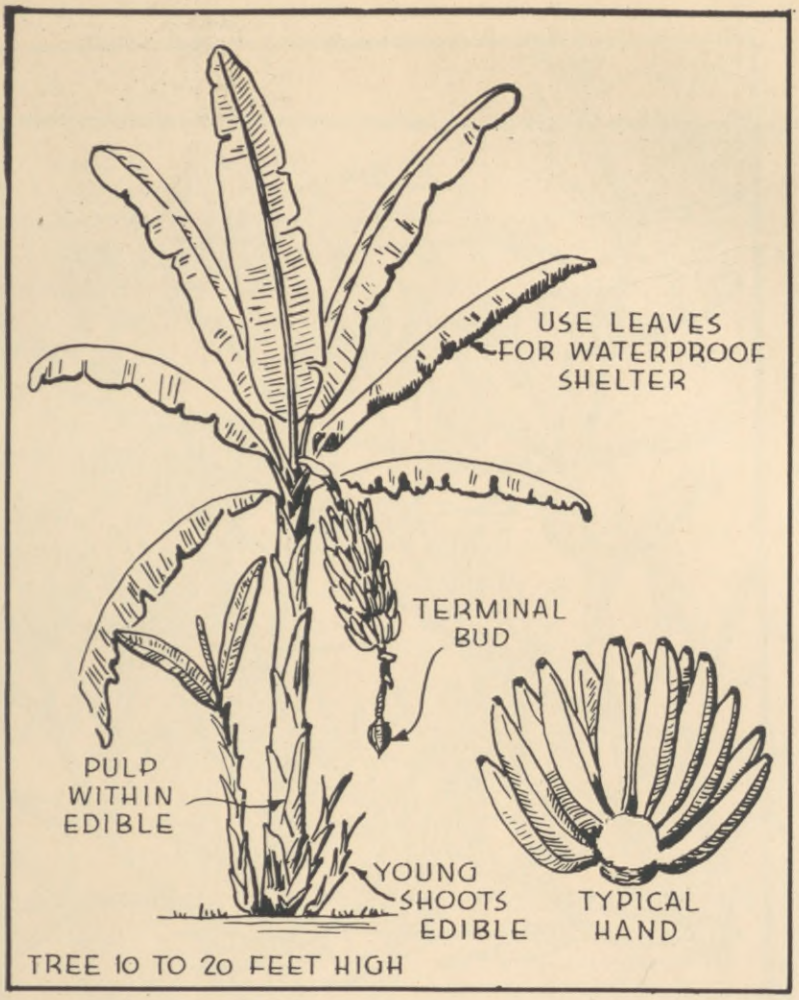


PANDANUS

Where Found: Very common in Malaysia and Polynesia. Found generally along the coast of semi-dry and wet atolls, but also in moist locations on volcanic islands. Frequently grows in dense thickets immediately back of the beach.

Description: A small tree with long, narrow, spiny leaves arranged spirally on the ends of the branches. Has stilt-like prop roots which support the trunk. The fruit resembles a pineapple in size, shape, and color, and ripens from June to October.

How to Prepare and Use: The fruit breaks up into segments or seed-bearing parts which may be chewed for nourishment. The seeds, too, can be eaten raw. Boil or bake the fleshy part of the fruit. If you experience a mouth irritation, boil, bake, or steam the entire fruit and scrape the yellow interior paste from the fibres and eat or dry in the sun for future use. The bud or 'cabbage' found in the center of the whorled leaves may be eaten if baked.

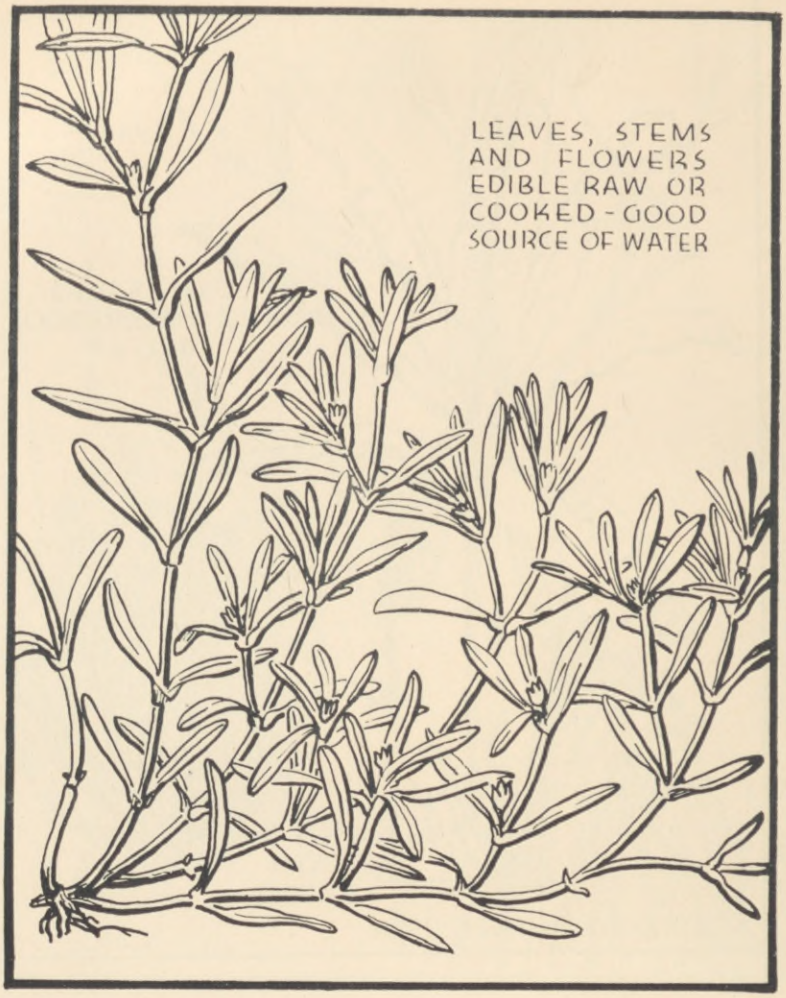


BANANA

Where Found: Along the coast and in the interior throughout most of the southwest Pacific and Malaysia. Not found on atolls unless cultivated and is not common in the New Guinea and Melanesian jungles.

Description: A plant generally 10 to 20 feet high but dwarf varieties may be much smaller. The fruit is familiar to everyone but cook any raw banana that does not have a natural taste, as some varieties must be cooked even when ripe.

How to Prepare and Use: Eat the fruit raw, fried, broiled or roasted. Green bananas can be eaten if cooked. The terminal bud provides good food but must be boiled in several changes of water until the bitter taste is eliminated. Tender young shoots and the tender interior of large trees can be eaten raw but are better cooked. Preserve ripe bananas for future use by cutting into slices which you can dry in the sun or smoke over the fire.



PURSLANE

Where Found: All over Southeast Asia and Pacific Islands. Grows in waste places, abandoned fields, and dry islands. Some forms grow in patches back of the beach or in brackish marshes near salt water.

Description: Also called pigweed or portulaca. A fleshy herb with crisp fleshy stems and leaves, a few inches to a foot or more in length. There are various forms which may vary somewhat from the illustration.

How to Prepare and Use: The entire plant may be eaten raw or cooked and the food value is quite high. All of the several different forms may be eaten in quantity. See page 10 for its use as a source of water.

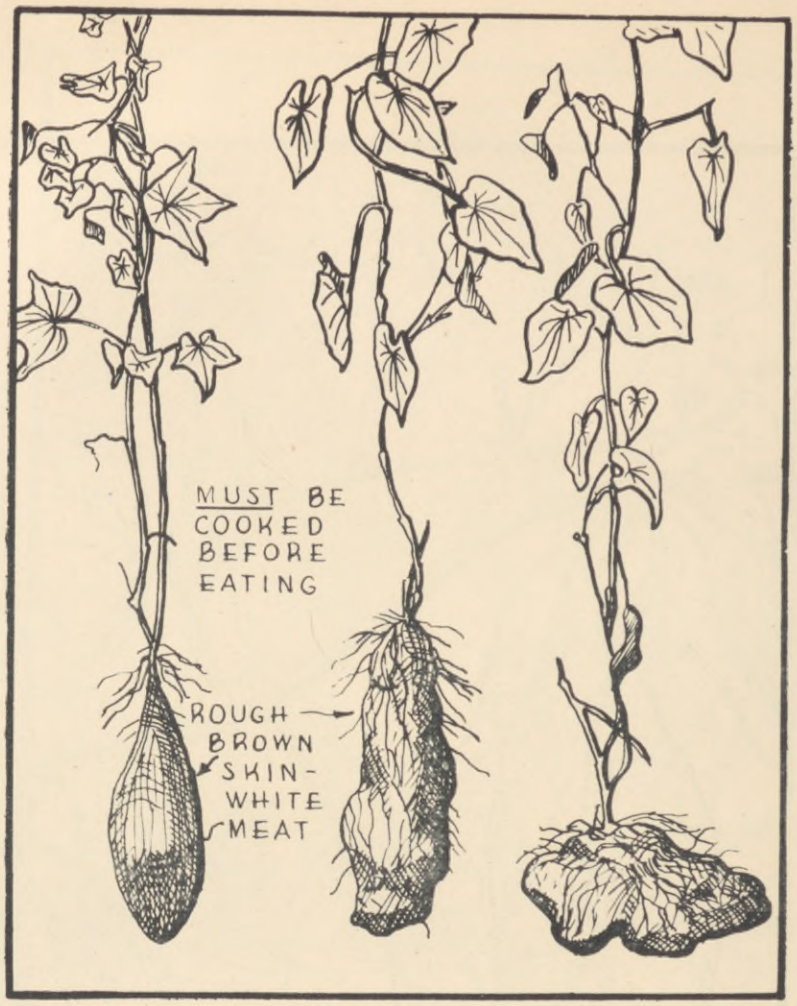
SWEET POTATO

Where Found: At high and low altitudes through Malaysia and the Pacific Islands. They are always planted and do not occur wild.

Description: Sweet potatoes have a vine-like growth with leaves and flowers that resemble those of the morning glory. The tubers, or potatoes, may have white or yellow flesh, purple or brown skin, and vary much in size.

How to Prepare and Use: The potatoes may be eaten raw but are much more palatable boiled or roasted in a ground oven. *(See page 13.)* Raw potatoes do not keep well after digging. In addition to the potato, the young shoots and leaves are delicious when boiled and make an excellent substitute for spinach.

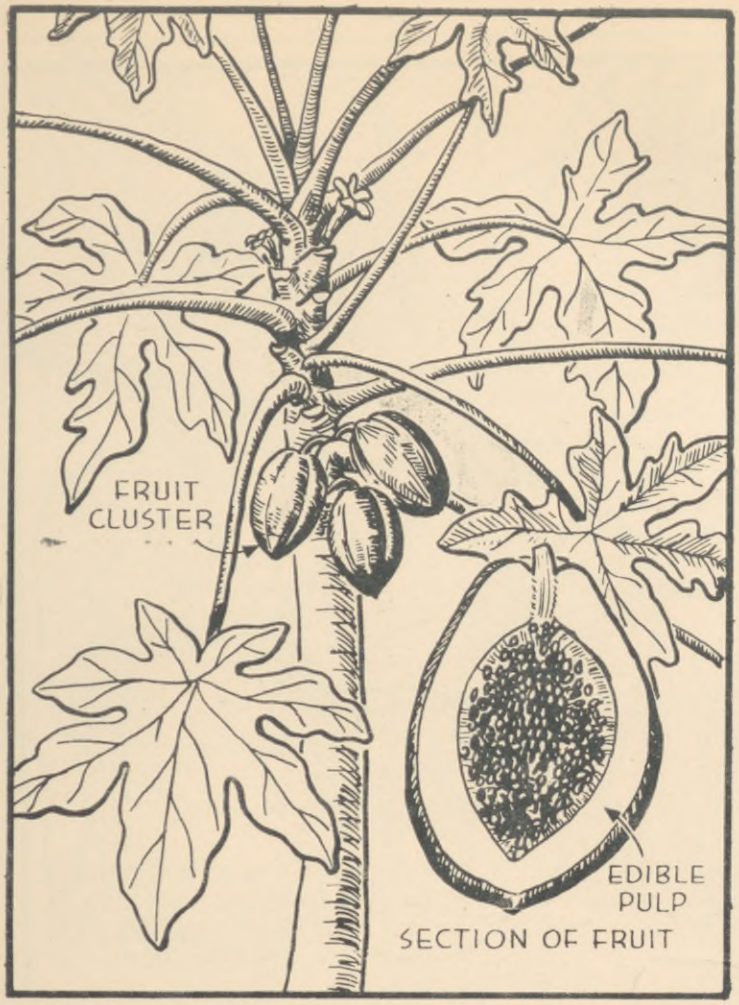
YAMS



Where Found: Widely distributed, both cultivated and semi-wild, throughout the southwest Pacific. They are found in forests and also in more open locations.

Description: Yams resemble sweet potatoes *(see page 21)*, but the yams are often much larger, sometimes weighing as much as 40 pounds. Yams have a rough brown skin and white to purplish meat. The stems are long, usually twining, reddish-green in color and have numerous small green flowers. One species of yam (Dioscorea hispida) which has a leaf made up of *three leaflets* and has somewhat spiny stems is definitely *POISONOUS*, unless properly treated before eating. Due to the difficulty of proper preparation, you should *avoid any spiny yam with three leaflets!* The edible varieties have either a single leaf or a leaf made up of five leaflets.

How to Prepare and Use: Yams must be cooked before eating. Boil or roast as you would an ordinary potato.



PAPAYA

Where Found: Throughout the Pacific Islands and southeast Asia, where it has been introduced. May be found growing semi-wild in cut-over forests, high places, abandoned settlements and waste places.

Description: A small tree, generally not over 20 feet high, with large, long-stalked, uneven-edged leaves at the tip of the trunk. Do not attempt to climb papaya trees--the wood is too brittle to support your weight! You can easily break down the tree or cut it with a single blow of your machete. The fruit resembles large muskmelons, yellowish-green in color when ripe and with many seeds in the interior cavity. Green fruit, and the tree itself, when cut, exude a milky sap which may cause a degree of skin irritation.

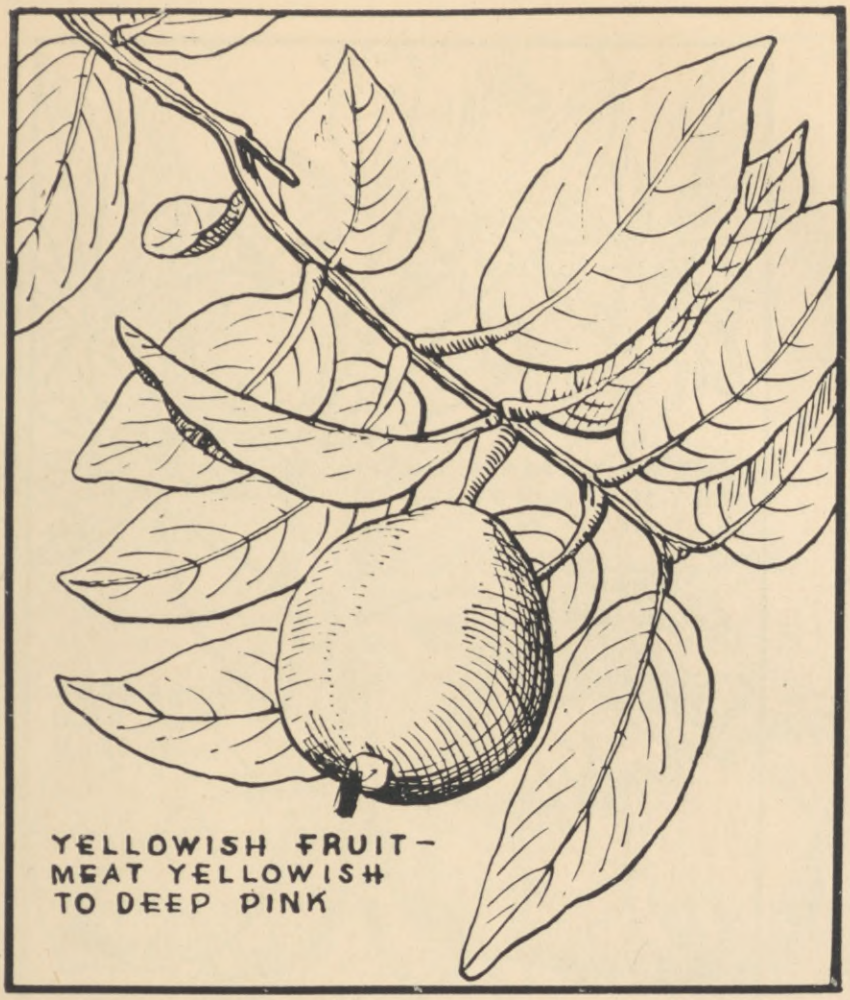
How to Prepare Use: Ripe fruits are eaten raw, but green or immature ones must be cooked. The young leaves and leaf stems, flowers and buds may also be cooked and eaten. However, be sure to change the water two or three times when cooking green fruits or other parts of the tree to remove the bitter taste present in all parts except the ripe fruit.

MANGO

Where Found: Generally planted, and, while some semi-wild trees may be found, these never occur in the forest but in more open locations in Malaysia and Polynesia.

Description: Usually a large spreading tree. The fruits, which hang on long stems, are two to six inches long, green when immature, and yellow or reddish when ripe. Some varieties have a distinct turpentine-like taste but are perfectly safe to eat. In very rare instances, an individual may be allergic to mangoes or to the sap of the stems and leaves, as some persons are to strawberries, and in such cases a skin rash may develop. Some of the wild species in Malaya, all with edible fruits, have a very irritating sap which affects the skin as does poison ivy. Therefore, care should be taken not to come in contact with it.

How to Prepare and Use: Mangoes are generally eaten raw, but may be cooked if you prefer.

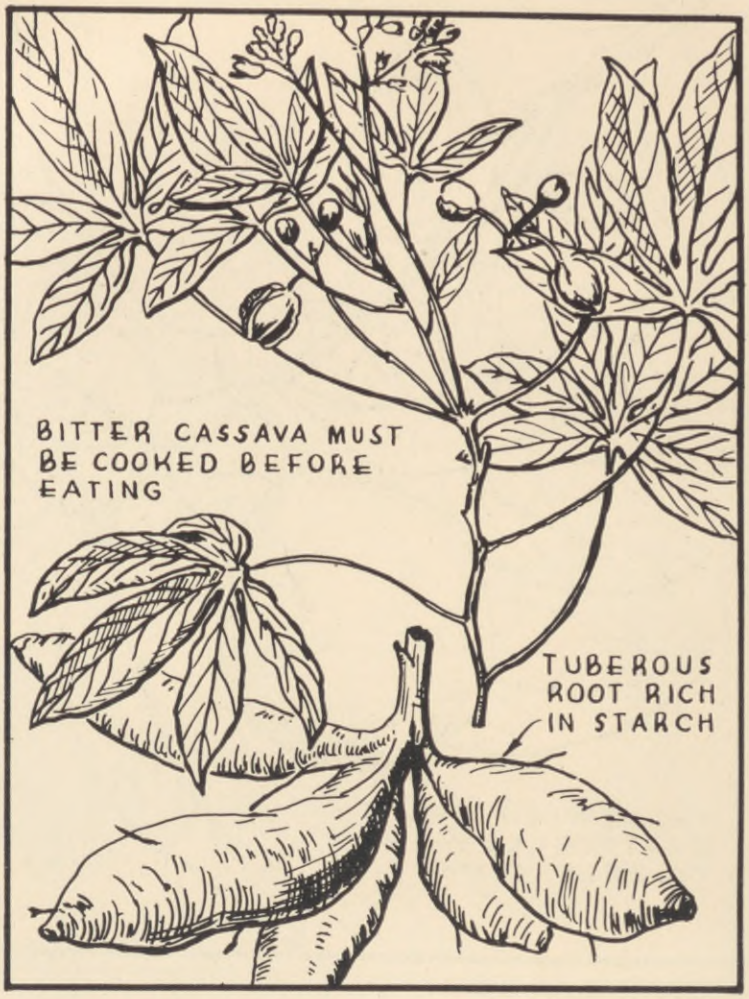


GUAVA

Where Found: The guava is not native to the old world but has been introduced into Malaysia and Polynesia where it is now widely distributed. It is often abundant in waste places, thickets, and second growth forests.

Description: A small tree ten to fifteen feet high. The many-seeded fruit, the size of a small orange, has a strong musky odor and is pale green or yellowish-green in color.

How to Prepare and Use: Generally eaten raw but may be cooked.



CASSAVA
or
TAPIOCA

Where Found: Occurs both planted and semi-wild in Malaysia and Polynesia, although less often in the latter area.

Description: Tapioca is also known as cassava or manioc. The plant is shrubby, three to seven feet high. The large tuberous roots, which are the edible portions, vary in size from six inches to two feet long. There are two kinds, bitter cassava and sweet cassava which are distinguished from each other only by taste.

How to Prepare and Use: *Never eat bitter cassava without cooking* because it contains the highly *POISONOUS* hydrocyanic acid! To prepare bitter cassava for eating, grate or mash the roots to a pulp, squeeze out the juice by hand, then pat the remaining pulp into thin cakes for baking. Sweet cassava, though generally eaten raw, may also be cooked.

INDIAN ALMOND

Where Found: Along the seashores of Polynesia, Malaysia, southern China, Burma, and India. Other less common species occur in the forests. Sometimes planted as a shade tree.

Description: A large tree, some of the leaves of which are usually red. The fruit itself is only an inch or two long and contains a single fair-sized seed. There are many different species with corresponding differences in appearances.

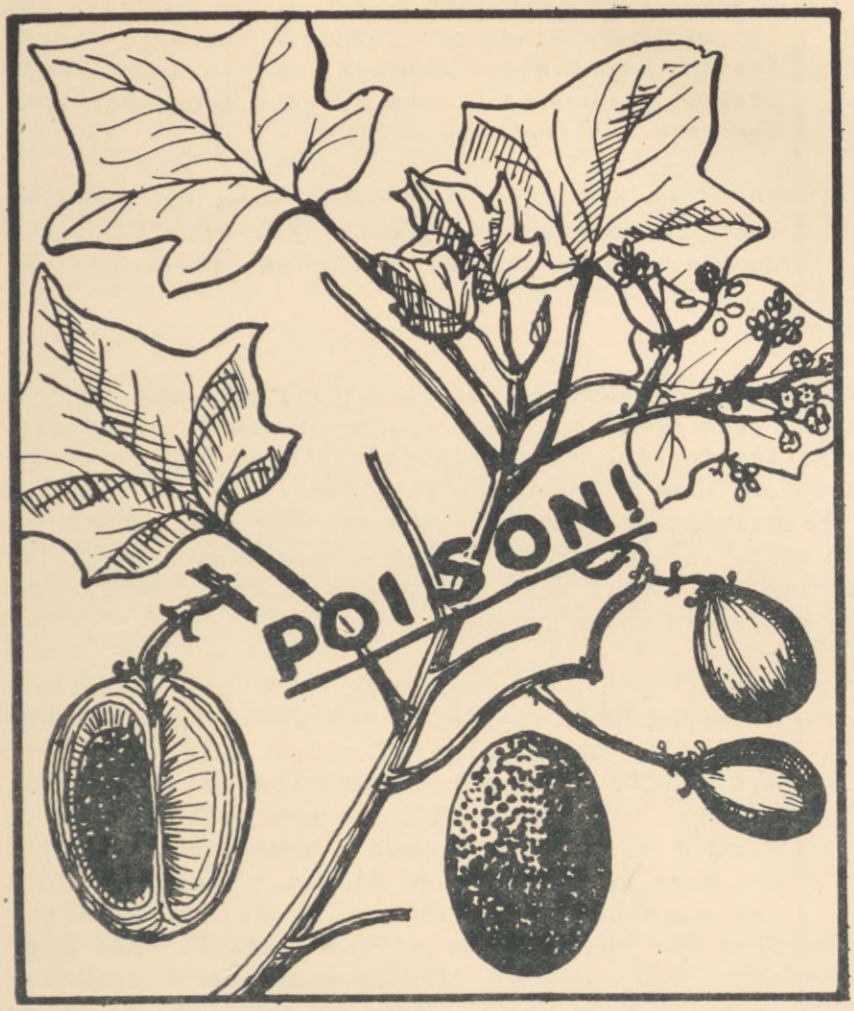
How to Prepare and Use: The seeds of all species have an excellent flavor and may be eaten raw in any quantity.

POLYNESIAN CHESTNUT

Where Found: Rather common in Polynesia and occurs less frequently in Malaysia. Generally grows near the seashore but it is also planted inland.

Description: A small to medium-sized tree. The pods contain a single large seed. While called a chestnut this tree actually belongs to the bean family. In tropical Asia and Malaysia, large trees occur that are allied to our ordinary chestnut and the seeds of all these are edible.

How to Prepare and Use: Boiled or roasted the large seed is very well flavored and is an excellent food.



PHYSIC NUT

Where Found: Very common throughout the entire area in hedges, fence rows, etc. It also grows semi-wild near native settlements and towns.

Description: A shrub with rather large seeds which are violently *POISONOUS*.

How to Prepare and Use: Do not eat under *any* circumstances! Cooking does *not* render the seeds of this plant safe for eating.

There are several other plants so familiar, or with such variation in appearance, that detailed illustrations would serve little purpose. In addition, they are of secondary importance as sources of food.

FERN

FERNS of several varieties are abundant in many areas. Tree ferns are found in the forests but the ordinary kinds are found in marshes, boggy fields, along water courses, and in damp, shady places in general. Some species grow near both brackish and fresh water.

The tips and shoots of most ferns are good to eat either raw or cooked. You will find the curled fronds or "fiddle heads" particularly good.

Because of their widespread distribution, accessibility and ease of recognition, they may serve as a most important source of diet, but if eaten in too great quantities for the first few days, ferns may cause diarrhea. The food value of ferns is probably relatively low and it might be well not to eat too much unless other foods are not available. If you find some of them taste too bitter or are otherwise unpalatable, try another variety. All the ferns will have a slightly "ferny" taste, even when cooked, but none are known to be harmful.

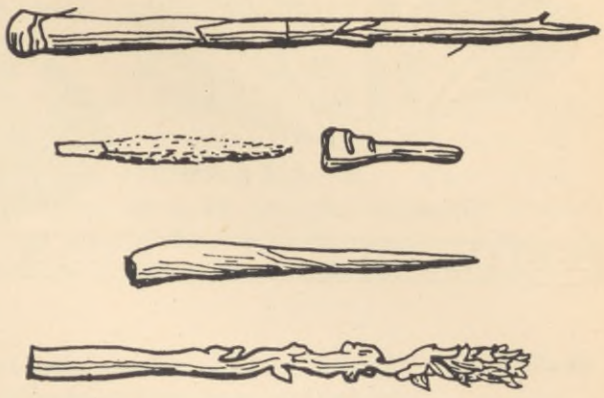
BAMBOO SHOOTS

BAMBOO is a good emergency food stuff familiar in appearance to almost everyone (remember the good old bamboo fishing pole?) It is widely distributed throughout tropical Asia and the Pacific Islands. The young shoots, up to a foot or so in height, can be eaten raw, but they are more palatable when cooked. Don't overlook the possibility of obtaining drinkable water from the thick stems of older plants *(see page 10)*. You can also fashion many useful articles or tools from bamboo, some of which are shown on page 12.

FIGS of many varieties are abundant in the forests over most of the region but are not found on the low islands. There are many forms, - some vines, some shrubs, some large trees - all of them with abundant milky sap. Figs often grow directly from the trunk or main branches of the tree. The fruits of all varieties are edible but are apt to be dry and bitter because of the presence of tannic acid. They often contain small insects which make the fig a poor emergency food. But uncontaminated, they may safely be eaten raw or cooked.

PALMS of many types grow in Malaysia and Polynesia, varying greatly in size and habit. Some are long climbers, like the rattan palm, while others are low and shrubby, and still others are gigantic in size. Some species, such as the nipa palm, grow along the seashore within the influence of salt water. Others grow in open country, many in the high

forests, and still others in the cut-over forests. The natives make starch from the trunks of some palms, particularly the sago, but the process is impractical and beyond the capacity of any individual to attempt.



Typical buds or "cabbages" found in the terminal crown of leaves of palms - edible raw or cooked

The rattan and coconut palms have been discussed in detail on pages 9 and 15. In general the terminal bud or "cabbage" of most palms is edible and may be eaten raw, boiled, or roasted. This "cabbage", except in those cases where it may be too bitter, is an excellent vegetable. It may be found deep in the crown of the tree among the bases of the leaf stalk. In addition, some food can be secured from the lowest foot or two of the rattan palm. This should be cut off, roasted and the starch chewed out of the woody tissues.

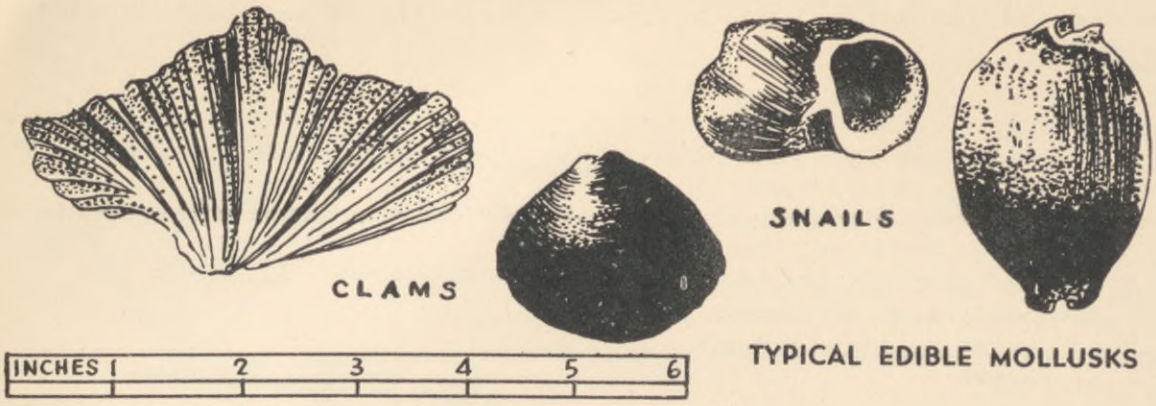
Except for the coconut palm, and a very few others, the fruits of most of the Asiatic palms are not edible. In fact, in a few species such as the fish-tail palm and the sugar palm, they are very dangerous because of the presence of stinging crystals.

SEAWEEDS are all edible. Strangely enough they are not very salty and their water content is fairly fresh. You may eat seaweeds raw. In general, the pink to purple, the reddish or the green seaweeds are best. The brown ones are too tough.

WATER LILIES which can be found in fresh water lakes and streams, also offer a food source. The seeds and the more or less thickened roots of all varieties may be eaten boiled or roasted.

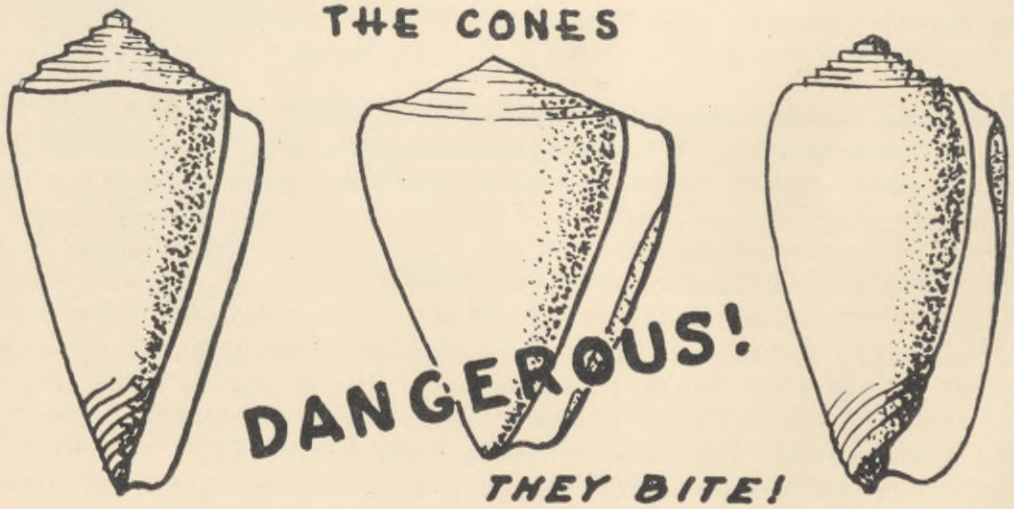
6. SEAFOODS

It is mainly because of the abundance of food to be found along the shores of tropical lands that you have been urged to make your way to the coast. Not only is there an ample supply of fish, but also of shellfish, crabs, lobsters, turtles, and their eggs. You will see on page 7 that water, possibly slightly brackish but good, is also easily available.



TYPICAL EDIBLE MOLLUSKS

Shellfish Small mollusks or shellfish, such as clams, oysters, and mussels, are undoubtedly the most easily obtained and the most abundant of all tropical seafoods. Throughout the Indo-Pacific area they form a large part of the natives' food supply. Because of their variety and abundance, your first question might be: "Which of the shellfish are edible and which, if any, should I avoid?" The answer is that only one group--the *cones* (and those are relatively rare), are dangerous because of their poisonous teeth. Actually, their bite is similar to that of a snake. The illustration below shows the general shape of cones. Others of the cone group are similar in appearance. The shells are of various colors and designs. Avoid any shellfish of this general type. *All the rest are safe.* It will be noted that the cones consist of a single shell and, while all shellfish with a single shell are not cones, it is best to be cautious until you are sure. *Any* shellfish with *two* shells (a bivalve) is not dangerous.



To collect shellfish, work along the beach when the tide is out and gather a supply. Salt-water shellfish can be eaten raw and their juice is not only nutritious but will alleviate thirst as well. The "meat" can be extracted by crushing the shell with a rock or piece of wood. They can be cooked in their own juices by covering a stack of them lightly with sand and building a fire over the pile. Or you can simply drop a lot of them into boiling water.

Many shellfish bury themselves in the sand, leaving small holes which bubble when lightly covered with water. Use a stick in digging them to avoid possible injury from the biting varieties. You may also find shellfish among the rocks or along streams hanging to the branches that dip in the water. Remember that while shellfish are far more plentiful in salt-water you may also be able to find some varieties in fresh-water streams.

The giant clam or tridacna is found on coral reefs, atolls, and volcanic islands. They average about eight inches wide and have a rough scalloped shell. Occasionally, however, they reach enormous size and even the smaller ones are capable of crushing a finger or toe. If lodged in coral they can be broken away with hard blows or with the assistance of a stick inserted between the jaws while still open. Most shellfish will keep for some time if cooked and the meat dried in the sun.

Don't overlook the land mollusks, commonly called snails, typical forms of which are illustrated on the preceding page. While rather difficult to obtain and seldom abundant, you may find them on hills, in valleys, recesses of the woods, and others in open meadows.

Be sure to boil all land and fresh-water shellfish before eating, because they may have lived in contaminated water, or they may have deadly lung parasites. Cooking them makes them both more palatable and safe.

Crabs and Lobsters Whether marine (salt-water), fresh-water, or of the land forms, crabs and lobsters are good to eat providing they are fresh. Wherever they occur they are easily obtained. Salt-water forms can be eaten raw with small likelihood of ill-effects, but all fresh-water and land varieties should be thoroughly cooked. The land crabs, particularly in Asia and adjacent islands, are often infected with a lung parasite which may prove fatal to humans if the crabs are eaten uncooked. Possibly the best way to cook crabs and lobsters is to drop them alive into boiling fresh or salt water. In this way there is no danger of decay before cooking and they become sterilized at the same time. The shells and pulpy gills are easily removed after cooking. Contrary to popular opinion, the gills, (dead-men's fingers) are not poisonous and may be eaten. However they are perhaps the first part to spoil, but all danger of poisoning from spoilage is removed by immediate cooking and eating.

Crabs and lobsters can best be caught at night because it is then that

they move about. You can stun them with a stick or stone, or you can improvise a trap. Look for them around the seashore rocks or on mud flats and on the beach at low tide. They may be caught by placing a dip net, made of interlacing plant fibers, behind the body and touching the antenna with your foot which will cause the crab to move backward into the net. When caught, pin it down with a forked stick. Be careful of the large pincers on some kinds and the spines on the backs of other types. Both pincers and spines can injure you badly.

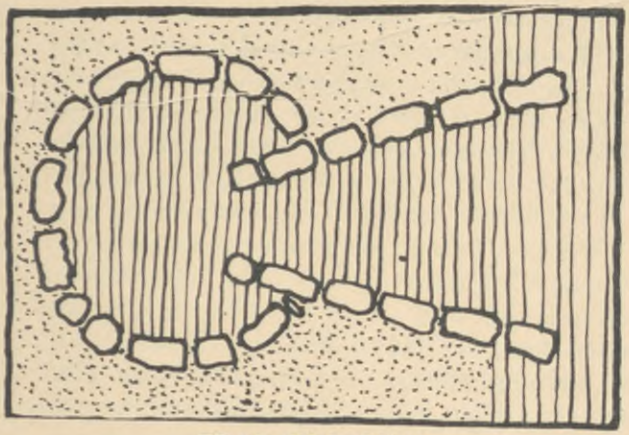
Crabs also occur in fresh water lakes and streams, and even on the trunks of trees, both in the mountains and the plains. They frequently travel on dry land. But again - be sure to cook the fresh water and land varieties.

Turtles Turtles breed on sandy shores and little islands. Others may also be found along river banks or in bays and shallow waters of the forest. They are all edible and their eggs are also an excellent source of nourishment. You can see the obvious double trail that the sea turtles make across the beach and back again to the water, and thus you can locate the place where the eggs will be buried in the sand. Of course, you will look for the trail above high tide and once the location of the eggs is roughly determined, use a stick to prod the sand. You will know that you have struck eggs by an egg yolk on your stick. Turtle eggs may be buried two feet deep and at a distance of about twenty yards from the water. They may be eaten raw but are much better boiled, although the white part remains watery. While spoiled eggs are, of course, to be avoided, those in an advanced stage of incubation may be eaten if necessary.

Turtles themselves are very good if you are able to capture one. Toss a noose around the neck of one which has stuck his neck out, then the head can readily be pulled out and the throat cut or the entire head severed. Most of the larger ones cannot escape if turned on their backs. Be sure to watch the claws - they can scratch deeply, and the head may bite even a considerable time after it has been cut off. Turtles are easier cleaned after partial boiling or cooking in a ground oven. Turtle steak and turtle soup are luxuries, and the blood, coagulated by heating, is good food.

Shrimps Crawfish or shrimps are found in both fresh and saltwater in the Indo-Pacific region, especially along the coasts of Burma and India and in all the streams of that area. Some freshwater forms attain a length of a foot and a weight of a pound or more. Shrimps are generally found in the mud flats or may be located under roots, rocks, and other debris. One of the best ways to collect them is to bail dry a natural or artificially made small pool or puddle and then dig the shrimps out of the mud. They are generally cooked by boiling, the small forms being cooked whole as soup or stew and eaten after the shells are strained out. Of the larger forms only the tail end, minus its shell, is eaten.

Fish Next to the shellfish and crabs, fish represent an important source of easily available food. If you haven't a fish hook and line, try making one from a thorn, a sharp piece of bone, or a sliver lashed to a long piece of wood. A rod can be made from any sapling or bamboo, with some strong vine for a line. You can even braid a usable line from many fibers found in tree bark and other plants if you are unable to salvage a parachute shroud line. Grubs, found in rotten logs, or shellfish are good bait. A light from a coconut leaf torch or flashlight reflected on the water at night will attract fish so you can spear or catch them in a net or stun them with a blow on the head. Nets can be woven of plant fibers or coconut cloth attached to a hoop of flexible sapling. In parts of New Guinea and the Solomons the larger spiders there may help you make a net. Fasten a branch into a hoop, pass it through a number of the heavy webs, bait it with a bug and then float the net where small fish can see it. In attempting to get the bait their teeth will become entangled in the web. Fish may be driven ashore or stranded in mud flats by dragging large leaves fastened together through the water.

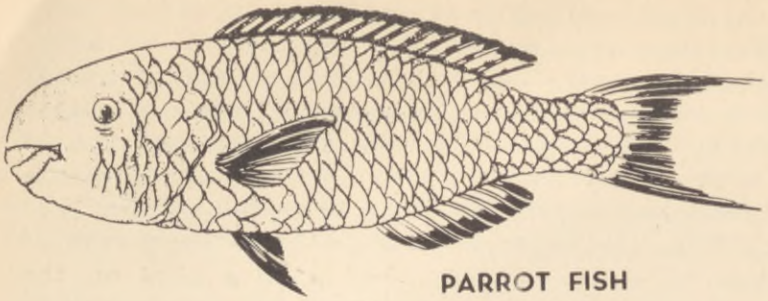


TRAP FOR FISH

You may also find fish in pools or reefs in shallow water or among rocks at low or high tide. The natives sometimes use stone traps, made by arranging numbers of stones in a semi-circle with two leading wings faced in the direction of the incoming current, on reef flats flooded at high tide. The fish will follow the wings into the circular portion and seldom find their way out. You can also block natural openings at high tide to strand fish as the water recedes.

To preserve fish for future use, cut the fillets in narrow strips and hang the strips in the sun. Fish thus dried will remain edible for several days. Smaller fish may simply be cleaned, the backbone removed and a large number of slits cut across the inside, and the entire fish hung in the sun for drying.

A word or two of caution about using fish; any fish not cleaned may spoil in half a day; the impurities of the fish stomach taint the flesh. In addition, it is believed some few types of fish may be poisonous to eat. These are the *parrot fish*, *puffer fish*, and the *porcupine fish*. The latter two are easily distinguishable because they will swell up like a balloon if you scratch them on the belly. The porcupine fish is very similar to the puffer fish which is illustrated on the following page along with the parrot fish.



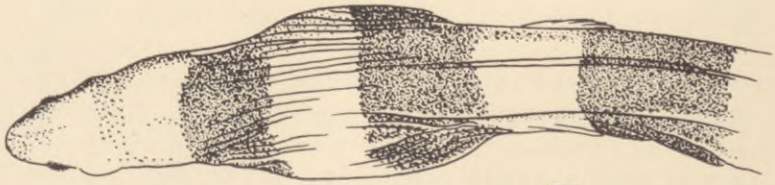
PARROT FISH

Two of the *POISONOUS* fishes of the tropics described on page 35.

PUFFER FISH

There is a possibility that most of the reef and lagoon fish in some of the Pacific Islands may become poisonous for part of the year when they feed on poisonous substances. Because of the fact that a certain species of fish may be poisonous in one locality and perfectly good in another, no distinguishing rule can be laid down. The natives can tell you which to avoid, but if this information is not available, eat only a small sample of any fish. If you feel ill-effects coming on, immediately drink enough salt water to make you vomit. The poison when present is quite deadly and cooking does not counteract it.

No freshwater fish are poisonous, except possibly for the spiny fins of certain varieties, so take care not to get "stuck". Be sure to cook all fish taken from fresh water because many of them contain parasites which will cause illness. You destroy the parasites by cooking. Fish from salt water may be eaten raw.



EEL

Be careful to distinguish between the eel and the *DANGEROUS* sea snake as described on page 37.

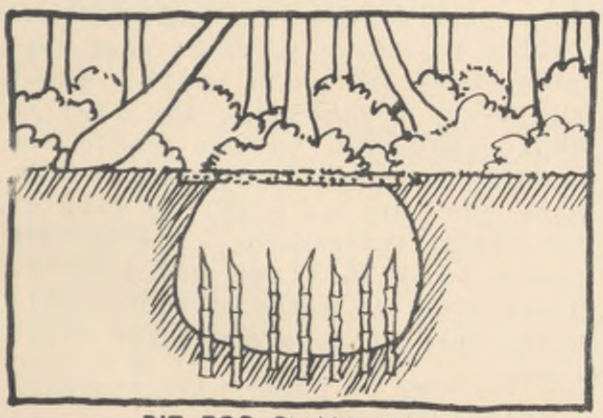
SEA SNAKE

Eels The various kinds of eels are edible. They are generally caught by a loop or noose of cord attached to the end of a stick. The eel is enticed from his hole, and into the noose, with a piece of bait. The larger varieties may give you a nasty bite if disturbed as they lie in coral crevices. Sea snakes, found in some tropical waters resemble eels but should be left alone as their bite is poisonous. These snakes have plates or scales, covering their bodies; the eels have a skin. In swimming, eels glide easily through the water, generally beneath the surface, while the snakes wriggle and swim mostly on top.

7. BIRDS AND ANIMALS AS FOOD

General Birds and animals are all edible and *you need have no concern about eating any* that you are able to catch. The same thing is true of birds' eggs, wood grubs, and many insects. You probably will not see a snake, but you can eat them too - even the poisonous ones, if the head is cut off immediately after capture. Snake meat, which is canned as a commercial article in southern United States, tastes like frog legs or chicken. A snake cut into chunks and broiled over a fire is delicious. So eat anything that comes along - snakes, rats, lizards, bats, frogs, or any kind of bird. It's true that some of the fish and carrion-eating birds are not particularly palatable but but even they should not be shunned in an emergency.

In the denser forests, particularly in the Assam-Burma-India area, few animals are found and most of these live in trees. Birds, monkeys, and squirrels are common, but on the ground, only reptiles, rats, and an occasional barking deer will ordinarily be found, Most of the animals live in the more open parts of the jungle and around the edges adjacent to cultivated areas.



PIT FOR SMALL GAME

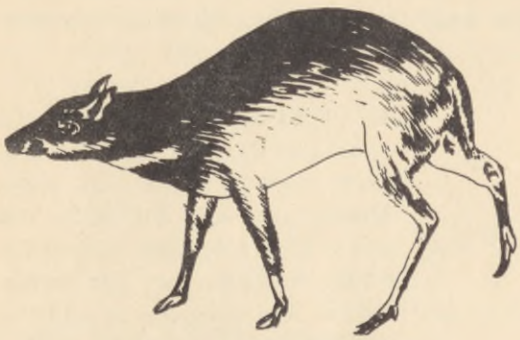
If firearms are not available, or if it is not desirable to use them, you may be able to kill the smaller animals with clubs, or to trap them by noose snares (natives near your base can show you how to make one), log dead-falls, or by digging pits. A favorite trick of the natives is to thrust sharpened split-bamboo sticks in the bottom of pits to impale pigs and small deer when they fall into them. Pits should be dug across trails made by pigs, deer, and other small animals. Their trails can readily be detected. In following such trails, it is advisable to keep careful watch of the ground to be sure that you do not yourself fall into a

carefully concealed pit prepared by the natives to catch animals. Having trapped your quarry - remember almost any animal can bite - handle it carefully.

Surplus meat, which you will be sure to have from any sizable animal, can be preserved for future use by drying. Simply cut the flesh into long, thin strips, not more than an inch in width and a half-inch thick. If possible, soak the strips in salt water and hang over a smoking fire until thoroughly dry. Where salt water is not available, sun drying will suffice.

As for birds, since all are edible and apparent, there is no point in describing types. Just remember that shooting a bird in the dense jungle may be simply wasting valuable ammunition unless you can see where the bird falls. Sea birds and the eggs of both sea and land birds may be eaten raw, but it is better to cook all land birds and animals because of parasites which they may be harboring. Some birds, particularly the parrots, are quite tough but will make a satisfactory stew.

Some of the more common animals are briefly described in the following pages.



MOUSE DEER

MOUSE DEER (Chevrotain) occur throughout the warmer parts of southeastern Asia, Sumatra, Java, Borneo and many of the smaller East Indian Islands. As their name suggets, they are quite small - about the size of rabbits - and live in dense thickets, in the jungle, or around clearings. And, like rabbits, they come out at night to feed in the fields and gardens. The natives catch them in traps and snares. Mouse deer, in spite of their small size, have long, sharp tusks which make them dangerous to handle when alive.

BARKING DEER (Muntjac), another form of miniature deer similar to mouse deer, are found in about the same regions. They are, however, considerably larger, weighing up to forty pounds. They are shy and secretive in nature, living in high grass and dense jungle thickets. They are called the barking deer because of a cry suggestive of the barking of a small dog. Their flesh is much preferred for eating to that of the mouse deer.

PALM CIVETS, which resemble foxes, may often be seen on river banks at night in India, Burma, the Malay Peninsula, Sumatra, Java, Borneo, the Celebes, and many of the smaller islands in that general area. The length of the head and body is about two feet and the tail nearly as long. They have scent glands that give off a strong but not especially unpleasant odor. Indeed, certain kinds of feminine perfume are developed from their scent-producing glands.

PALM CIVET

PHALANGERS are small opossum-like animals occurring in parts of Australia, New Guinea, Celebes, Timor, the Solomons and many of the East Indian Islands, but nowhere west of the Celebes. The head and body may be two feet long; the tail, which is about the same length, is covered with rasp-like scales. Their fur is dark-brown, black, or grey and so thick they are difficult to kill. However, natives catch phalangers easily by climbing into the trees after them. They usually remain curled up among the thick foliage during the day and move about sluggishly at night.

PHALANGER

PORCUPINES occur on the Malay Peninsula, Sumatra, Java, and Borneo, and related forms range over most all the warmer parts of Asia. They move about at night, staying under rocks and fallen trees during the day. They are easily killed with a club. The spines are much longer and stouter than those of American porcupines and, of course, should be avoided. At the end of the tail the spines are generally broken off so that only hollow bases remain; the animal makes a rattling noise by shaking them.

PORCUPINE

KANGAROO, known to all Americans, is, of course, an excellent game animal, but only the smaller varieties would be easily available to anyone having to live off the land. The type shown here grows about two feet high, with a tail of about equal length. Different species vary in color from black to grey or brown; all have a very heavy fur. There are several varieties which take to the trees when frightened.

KANGAROO

PANGOLIN

PANGOLINS are sluggish, ground-dwelling animals easy to capture. They, and related forms, occur on the Malay Peninsula, Sumatra, Java, Bali, Borneo, and adjacent small islands. Pangolins grow about three feet long and are covered with heavy, yellowish-brown scales. They are generally found in the lowlands and in the highlands up to 3000 feet in altitude. Pangolins move about freely and also dig burrows in the ground.

BABIRUSSA is a typical example of the various species of wild swine which occur on practically all islands from Borneo to the Solomons. They are much like other pigs in their habits, living in damp woods, swampy places, or along the banks of streams. When cornered or frightened, the babirussa, or any wild pig, becomes as dangerous as any animal you are apt to encounter.

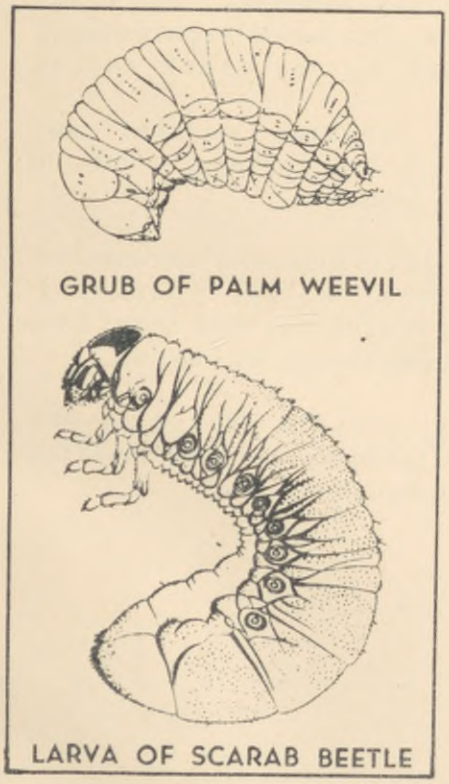
BABIRUSSA

Miscellaneous There is a variety of other animals, not illustrated here, which are easily recognized and make good food. Of course, there are still others which are not mentioned here, but the important thing to remember is that any and all are edible.

MONKEYS usually are numerous in those jungles where they occur at all. They are considered a delicacy by the natives, so if it is possible for you to get them, do not waste time or ammunition on poorer game. Monkeys live in the jungles of almost every kind of terrain and are frequently found along the seashores of Borneo, Celebes, Java, Sumatra, and all over Malaysia.

SAMBAR OR RUSA DEER are large animals, standing about four feet high at the shoulders. In common with many closely related forms, they range widely over southeastern Asia and on the islands of Sumatra, Java, Borneo, Celebes, and the Moluccas. They are hunted by the natives with dogs and killed with spears.

HARES OR RABBITS are found on Sumatra and Java. *SQUIRRELS* are found on Celebes, Borneo, Sumatra, and Java, giant forms occurring on Sumatra and Java. New Guinea has a variety of *OPOSSUMS*. Large fruit *BATS*, prized as foods by the natives, are found on New Guinea, Borneo, Java, and Sumatra. Smaller bats occur in the same area and also on the Celebes. *RATS*, which may be used for food are present on almost all the islands, and throughout the mainland.



GRUB OF PALM WEEVIL

LARVA OF SCARAB BEETLE

Besides birds and animals, there are other living things that may be used as emergency food. Most natives people prize for food the white *GRUBS* of the palm weevils and other wood-infesting beetles. Throughout the Indo-Pacific region there are many species of beetles whose larva or grubs are abundant. The illustration shows two common grubs - those of the palm weevil and scarab beetle. Almost all types of grubs are found in the ground, in rotting wood, or under rocks and fallen trees.

GRASSHOPPERS, with the legs and wings pulled off, toasted on the end of a stick or fried in coconut oil, are not at all displeasing to the taste. Certainly, many of the natives relish them. Winged ants or termites, particularly the queens, and the eggs of ants are usually difficult to collect but are edible. But don't eat any caterpillars - many are poisonous.

LIZARDS of various sizes are present almost everywhere, and all of them are edible. The meat from the hindquarters and tail is preferred. While no lizard is poisonous, the larger ones have good biting teeth and you should be particularly careful in handling them.

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THE GEOGRAPHICAL AREAS DEFINED

Malaya	The Malay peninsula, which includes British Malay, parts of Thailand, and the southern tip of the Asiatic mainland.
Malaysia	The largest of the Pacific Island group, otherwise known as the Malay Archipelago, between the Pacific and the Indian Oceans; includes the islands of the East Indies - Sumatra, Java, Timor, New Guinea, Borneo, Celebes and the Philippines.
Melanesia	Pacific Islands, northeast of Australia, including New Caledonia, New Hebrides, the Solomons, Admiralty Islands, Bismarck Archipelago, and the Fijis occupied by the black races.
Micronesia	Includes the Marianas, Caroline, Marshall and other islands east of the Philippines, occupied by both black and brown peoples.
Oceania	A collective name for the lands and islands of the Central and Western Pacific including Micronesia, Melanesia, Polynésia, and sometimes Australia, New Zealand, and Malaysia.
Polynesia	Islands of the Central Pacific including New Zealand, Samoa, Easter Islands, and the Hawaiian Islands occupied by the brown races.

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PART 2

LIVING OFF THE ARCTIC

I. INTRODUCTION

If you're forced down in the Arctic, you've got a good chance to come through safely, provided you stay calm and know how to deep dry and warm. Remember that rescue planes will be looking for you. Remember, too, that food and water are available. If you've come down along an open coast, you'll find clams, fish, and the like. If you're in bush country, you'll find hares, birds, and other game. Even in the dead of winter out on the treeless tundra, you can catch lemmings in their burrows or nests under the snow. There is plant life, too, that will give you the food you need. If you have a gun with you, so much the better - but even if you have only a pocket knife and a few other odds and ends, you can improvise the means for staying alive, if you keep your wits and use them.

Better stay with your plane. Travel is next to impossible in the Arctic winter without special clothing and equipment, and it's difficult even in summer. Searching parties will soon be looking for you, and from the air your plane will be more easily seen than yourself. If you've crash-landed, remove everything of value from the plane that you can possibly use - the ship may burst into flames long after landing. Be sure especially to take out your sleeping bag and all extra clothing. Keep them safe.

Before you Fly Check your emergency equipment *before* you go up. Make sure that everything you might need in an emergency is there and in good condition. Your life may depend on a single smoke bomb or a fish-hook. No matter what else your emergency equipment may consist of, be sure you have at least matches in a water-proof box, a compass, and a good, strong knife *on your person.* Regardless of what may happen to your plane or to your equipment, you yourself must be equipped with the minimum essentials that will enable you to survive. And remember, too, to fly in clothing that will see you through in the event of a forced landing emergency.

Signaling Smoke and fire are visible a long way in the Arctic, especially in winter, so the fire you make to keep warm will also help to attract rescue. If local materials are available for fuel, use them. If not, pour oil on rags and make a smudge of them. If there is snow, tramp out a big S.O.S. in some open place (make the design about 200 feet long to be visible from the air): fill the tracks you make with brush or moss if available; they'll stand out sharply. If you have a signal cloth, spread it out. Set out shiny metal panels taken from the plane. If you have smoke bombs or a Very pistol, keep them handy, ready to set off when you hear or see a searching plane.

Leaving the Plane

If you're in enemy territory, where help cannot reach you, you may have to abandon your plane. Or you may want to travel if you are finally convinced that all search for you has been called off. When you decide to move, travel light. Take only what you can pack on your back. *Matches, knife, maps, compass, gun, and ammunition, first-aid kit, food:* these items have priority. If you can, carry your parachute; it can be used as a tent, windbreak, or shawl. If it's not practical to carry the entire parachute, tear large sections of silk from it; they'll be useful. Don't discard any of your clothing; you will need extra clothing to replace wornout apparel, or as a change when you get wet. In summer, *be sure* to carry your mosquito net, if you have it along. Snow shoes and sleds (if you feel the need for them) can be improvised from engine cowlings, panels, and doors.

Start traveling in the morning. Walk slowly; take regular rests. *Avoid exhaustion and sweating* - or you may freeze. Try to prepare at least two cooked meals a day. If there is no known settlement in the vicinity, or if you are lost, follow down a stream to the coast and travel along the coast; here, sooner or later, you'll find habitations and natives. Make camp early so that you can cook and prepare for the night, before darkness overtakes you. In the spring and fall when the snow is soft during the day, travel at night. The lower night temperature produces a crust on the snow that will support you and make walking less tiring. Remember that cold, hunger, and fatigue will be your main worries, so prepare yourself to face them *before* you leave your plane, and use your head as you go along. Travel slowly; avoid deep snowdrifts, broken ice fields, and other rough terrain. It's easier to travel along ridges where the wind-blown snow is not deep. But always remember to *travel slowly and to avoid exhaustion.*

Natives

You'll find Eskimos, Aleuts, and other northern peoples friendly. If you can find them, you'll be safe. Be friendly; treat them fairly; show good spirit, and make your needs known to them as best you can. They'll feed you, show you how to stay warm, how to obtain food, and they'll probably help you back to "home base" if you ask them.

2. HINTS ON KEEPING WELL AND COMFORTABLE

Clothing and Shelter

The most important rule concerning clothing in the Arctic is this: put it on and take it off according to how cold or warm you feel. *If you begin to sweat, take something off.* Strip to the waist, even in zero weather, rather than allow your clothes to become wet with sweat. Uncontrolled sweating means freezing and disaster. Keep clothes clean too. When clothing gets wet accidentally, change immediately before it freezes on your body. If the wetting is superficial, roll in powder snow; the blotting paper effect will absorb much water.

PARACHUTE TENT

You can make a fair-sized tent from your parachute or a one-man pup tent from the engine's cowling. Get in a lee, but make sure that wind-blown snow doesn't cover your camp during the night. If you're in bush country, you can construct a lean-to from spruce boughs and the like. Set up a windbreak immediately adjacent to your shelter. If you can, camp near a boulder or cliff. If you're north of the tree-limit you can build a wall of snow-blocks or even an igloo, but for such work a snow-knife will be needed.

Get a fire going right away. If you're in bush country you can start a fire by using the lower twigs that are dead and brittle. Don't build the fire too close to the plane or under a snow-covered tree. Your fire may be put out by a sudden mass of snow falling from above. If you're north of the tree limit you'd better start the fire with materials from the plane. Animal fats are good for fuel if you can get them; oil will help too. Once such a fire is well-started, you can add moss, grass, roots, etc., that you will find under the snow. If the snow is very deep, build a foundation for the fire so it will not sink and extinguish itself.

If pine boughs are available, lay them on the ground inside your shelter so your clothes and sleeping bag don't get wet. Sleep with your feet nearest the fire; they are the parts of your body that get cold first.

Keeping Fit

If there are others in your party, watch for shock, especially among wounded men. The advance warnings are rapid breathing, nausea, chilly sweat, pale face and lips, and weak pulse. Treat by keeping the victim as warm as possible. If he is not unconscious or badly injured internally, give him a warm drink. Keep him on his back, with head low.

You need not worry much about diseases in the Arctic - the germs that cause the more common ailments do not exist there. The mosquitoes can bite you until their beaks wear out, without your being in the slightest danger of any sort of fever. But these mosquitoes can be hell, for unless you keep them off, they may bite your face until your eyes swell shut. A smudge will help. But the head-net from your emergency kit will help you most. If you have no head-net, cover up as best you can.

SNOW-BLINDNESS is a common Arctic affliction, especially in spring, when both the direct and the reflected rays of the sun hit the eyes. To prevent snow-blindness, wear colored goggles or improvise a mask of cloth, wood slat, or cardboard, with a narrow slit for each eye.

SNOW-GOGGLES

Blackening the cheeks and nose with soot or charred wood will help. Remember that you may become snow-blind even on a dull, gray day. If you become snow-blind don't rub your eyes, no matter how they may itch and smart. Stay in the dark or bandage your eyes. A bad case of snow-blindness may not clear up for several days and (once you have had it) it may recur again, unless you take proper precautions.

The Arctic sun can burn fiercely even though it may not feel very warm, so don't expose yourself for a long time stripped to the waist.

If it's very cold you must guard against frostbite. Wiggle your toes and move your fingers now and then to test them. If there is wind, check your nose, cheeks, and ears. If you're in a party, check each other for tell-tale white or gray spots on the face. If some part gets nipped, *do not rub it with snow,* but press it against your bare hand or warm it in your arm pit or crotch. Whatever you do, *don't rub frost-bitten skin,* for rubbing destroys the tissues and may lead to serious trouble. Never touch cold metal with your bare hands in cold weather. The skin will freeze to the metal, and forcible separation will tear the skin. Warm the point of contact before attempting separation. Urinating on the part may be resorted to in emergencies.

Don't become alarmed by drowsiness, unless you are numbed and thoroughly exhausted. It will be perfectly safe (and natural) for you to sleep if you are not completely exhausted. If, during sleep, your body becomes cold, you will awaken, conscious of the chill. Brisk jumping and arm-swinging will restore the circulation and make you feel better. Bear in mind that when wind is high, temperature is often high also, so resting or even sleeping during a blizzard will be sensible. Remember this, however; if you're in a fire-heated shelter that may be drifted completely over during a snowstorm there is real danger of carbon monoxide poisoning. Always provide ventilation in any shelter.

Food and Water

In cold weather, you need heat-producing foods, and especially fat meats. If you have some fresh meat and want to cook it over a quick fire made from parts of your plane, don't wait for a bed of ashes. Hold the meat in the flame, turn it slowly, and eat it before it loses all its juices or becomes thoroughly done. This will give you more nourishment and save fuel. Meat cooked just a bit on the outside will taste fine and you'll get the nourishment from the rare inner parts and juices. Do not hold a fat piece of meat in the fire and let all the fat drip away.

Don't boil meat for a long time in the Arctic. If you put fist-sized chunks of thawed-out meat in cold water they will be cooked by the

time the water comes to a boil. Drink the broth, of course. Don't waste a drop. The slightly cooked meat will be more nourishing than when thoroughly "done". And *do not throw away the fat.* Eat every bit of it. Your body needs the warmth fat meat gives. *Caution:* (Do not put frozen chunks of meat on to boil and expect them to be thawed out by the time the water gets hot. Thaw them out first.) If your meat is frozen make the chunks small (1 to 2 inches thick) so it will cook properly.

You can roast a fish by laying it on a hot stone near the fire and covering it with enough moss to keep it from being burned to a crisp. Or you can build a fire in a depression lined with flat stones, let the place get good and hot, then scrape away the fire and bury the fish (thinly covered with moss) in the embers and ashes. The fire will not continue to burn but the fish will cook rapidly.

In summer, water is plentiful nearly everywhere in the Arctic and even the brown "muskeg" water is safe to drink. In winter, you will have to melt snow or ice. River or lake ice can be chopped up and sucked (chewed) or melted. Along the seacoast you willfind two kinds of ice--old sea ice and young sea ice. The latter is hard, milk-white, and salty, so don't use it. The former is bluish, produces a glare, splinters easily and is not salty; it makes good drinking water. If you eat snow let it melt in your mouth, don't swallow it in lumps. When you are cold or hot and tired, go slow on eating snow. It will lower your body temperature and it makes some people more thirsty. Since the temperature of the snow approximates the air temperature, warm it up with your hands and breath before eating it. Otherwise you may freeze your mouth.

Don't forget that:

1. However large your supply of emergency rations may be, it may run out or be lost.

2. Fresh meat, especially fat meat, is good for any man living in a cold climate, and *some of this should* be eaten raw. The Eskimos, who are among the hardiest people in the world, eat some raw meat nearly every day of their lives.

3. *Virtually all Arctic animals are edible*--whales, mice, sharks, minnows, clams, owls, ravens, etc. There are only one or two exceptions to this rule, namely(1) a slender, blackish-brown shell-fish or mussel, that is occasionally poisonous, and (2) the polar bear's liver.

4. All *Arctic* plants are edible. None are deadly poisonous although one mushroom *(see page 73)* might make you sick. Several *sub-Arctic* plants--those south of timberline--are poisonous. As a precaution three of them are described on pages 77, 78 and 79.

Fish

There are no poisonous fish in the Arctic--either in fresh water or salt. But there are some odd-looking ones that you'll wonder about. Odd-looking or not, all are safe.

All fresh water fish should be cooked. Otherwise their internal parasites may endanger your health. Salt-water fish, on the other hand, can be eaten raw, straight from the water, with perfect safety.

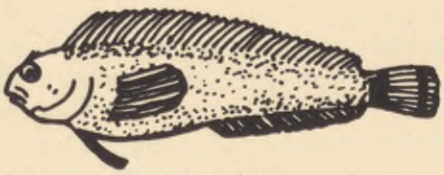
In summer, *SALMON* are extremely abundant along Alaskan and Kamchatkan streams, and virtually all Arctic rivers have "fish runs" at spawning time. The fish may be hard to catch with bait or lure at this season so you may be obliged to narrow the channel with sticks or stones, and hit, spear, or net the fish as they swim through. Your head-net will be useful here.

Fine *TROUT* will be found wintering under the ice in the larger Arctic lakes which do not freeze solid to the bottom. To catch them, a hole must be chopped and a weighted hook dropped into the water. So hungry (or curious) are the fish that they seem to need no bait. While they may not swallow the hook, they will nibble at it and are snagged by the lips or gills.

As for *COD*, you will jig for these in deeper water, perhaps along the base of a cliff. If they are numerous they may take anything as bait--even strips of cloth. In jigging, you let the weighted hook down to a good depth then jerk it upward an arm's length; let it sink down, jerk it again, and so on. This causes the bait (or cloth) to look like a living fish and the cod are attracted.

Fish that go about in schools--*HERRING*, *SMELT*, *ANCHOVIES*, *CAPELIN*, and the like--may best be caught in improvised nets. (If you have your head-net, use it.) You can net fine trout at a river mouth, too, or in a channel that you have narrowed with sticks or stones.

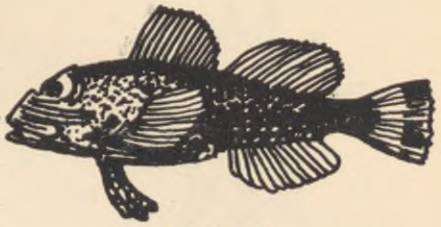
Along reefs in the North Pacific (as well as elsewhere in Arctic waters) there are numerous deep pools. At first glance these appear to be uninhabited, but by moving the luxuriant growth of kelp or seaweed you will see hundreds of small fish darting about with a few larger ones, and perhaps an octopus or devil-fish among them. The larger fish may be speared with sharpened poles. And don't pass up the *DEVIL-FISH*. Evil looking though he is, he'll keep the wolf from your door!



BLENNY

If you dig down into the beds of black mussels growing on the reefs, you may find long, oddly-shaped fish called *BLENNIES*, that you can knock silly with a club or rock. These are edible even when raw--if you're that hungry.

Many species of *FISH-TROUT, SALMON, SMELT, ETC.*, are excellent dried or smoked. The Eskimos living north of Hudson Bay, camp at river mouths until they have caught and dried the season's fish supply. During this period they live largely on part of each day's catch.



SCULPIN

One of the odd-looking Arctic species is the *SCULPIN*--a lazy fish found in shallow salt-water, that lies on the bottom waiting for food to drift within its reach. It is slender, with an over-large, flattened, spiny head. Commercial fishermen hoot at the idea of catching a sculpin, but it is edible all the same, and the fact that it takes anything as bait makes it easy to catch with any sort of hook, sharpened wire, or bent pin. A set-line with several hooks will work for you by day or night. But handle sculpins with care--their spines are sharp.

SCULPIN EGGS ARE POISONOUS so to be on the safe side, don't eat clusters of eggs you may find on pilings, logs, or rocks in sculpin-inhabited waters. The eggs of herring, smelt, salmon, and trout are perfectly edible, but you will not be likely to find them where there are sculpins.

Shellfish

The blackish-brown *SHELLFISH or MUSSEL* that is common on Arctic reefs at low tide, is known to be poisonous at times in north Pacific waters, so it should not be eaten in that region except in cases of extreme emergency. It is narrow, about two inches long, and attached by tough stems to the rocks in big clusters. *Cooking does not make it less poisonous.* So far as is known at present, *it is never poisonous in eastern Arctic waters.*

POISONOUS SHELLFISH OR MUSSEL

Most *CLAMS* are edible, but some of the larger ones are tough and hard to crack open, and at least one species of the northern Pacific area is bitter.

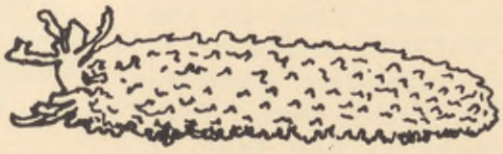
Other Seafoods

All of the *CRABS, SHRIMPS, SAND FLEAS, etc.*, of Arctic salt waters are edible. With their outer parts removed they are very tasty in a stew or chowder. Even *"SEA WORMS"* that you will find in the sand are usable in this way.

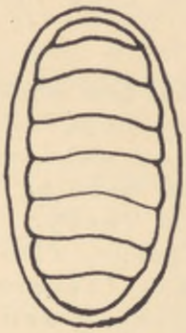
The flat, snail-like *CHITON* *(see page 50)*, which you will find attached like an adhesive pad to a rock in deeper water, is edible but tough. It

has eight plates imbedded in its back. *LIMPETS (see below)*, with their tent-shaped shells, are edible-and so are *BARNACLES*. But some of these creatures are so small that you have to work hard if you hope to make a meal of them.

LIMPET



SEA CUCUMBER



CHITON

The *"SEA CUCUMBER"* of the Alaska coast is edible. It is no vegetable, you'll find, but it's good to eat. It grows up to 7 or 8 inches long and you'll discover it in pools at low tide. Don't be discouraged by its gray color and odd appearance. It's better cooked than raw and is best when split open and dried a while, before cooking.

STARFISH don't look very wholesome-and indeed their tough outer armor is discouraging - but their soft inner parts are good to eat either raw or cooked. *SEA URCHINS* (which are abundant along the Alaskan coast) are edible too. They are spine-covered balls, greenish or purplish in color, about three inches in diameter. Eat them raw or cooked. Simply crack off the spines and outer shell and go to it.

Some salt-water *SNAILS* are small but exceedingly abundant and widely distributed, so you may eat them when you fail to obtain larger fry. Remember that they can be pulled out of their shells much more readily after they've been boiled in water a minute or so.

4. BIRDS AND ANIMALS AS FOOD

About Guns Before we discuss the problem of securing game, it might be well to consider the care of guns and ammunition in extreme cold. Don't put any sort of oil on a gun in really cold weather unless you wipe it off thoroughly. To clean a gun of oil a bath with scalding hot fresh water may be necessary.

Your rifle barrel ought to be cleaned fairly regularly, even if all you can do is to pull a string (with a bit of cloth attached) through it. Cleaning a shot-gun's barrel is not so important.

If the thermometer's way down, remember that your hand can freeze to part of a gun as easily as it can to other metal. *Furthermore both hands can get stuck to the same gun!* Watch it.

Keep the ammunition clean and dry. Clean it off carefully at "camp" or better still, before it's put into your emergency kit.

Birds and Their Eggs

If it's summer you should have no trouble finding bird eggs. Don't be too fastidious about them, for most eggs are sure to have little birds inside them sooner or later.

Look for *GULLS* and *TERNS* which are apt to nest in colonies on little off-shore islands. Nests contain two or three eggs each and there may be a hundred nests on one island.

DUCK nests may be found by looking around lake-edges, but *GEESE*, *CRANES* and *SWANS* may nest far in the interior, sometimes at considerable distances from water. Shorebirds nest anywhere on the tundra.

All ducks, geese, and swans lose their flight feathers during a 2-3 week period in mid-summer. This ought to make them easy to catch, but the fact is that some pass this awkward period at sea and others keep far inland, so they're not easily obtainable after all, as a rule.

PTARMIGAN

GULLS are so hungry most of the time that you may be able to catch them with a fish hook and a bit of fish liver or other bait. If gulls are numerous along the tidal flats you may be able to catch one by "setting" a flat rock with bait under it, and pulling the prop from under the rock when the gull goes after the bait. This will require a long cord or wire, of course.

PTARMIGAN, grouse-like birds about the size of small chickens, are common in most parts of the far north. They are speckled gray and brown in summer, but snow-white in winter. They may be caught in simple snares if they are feeding among bushes, and are sometimes so tame they may be killed with rocks.

Animals

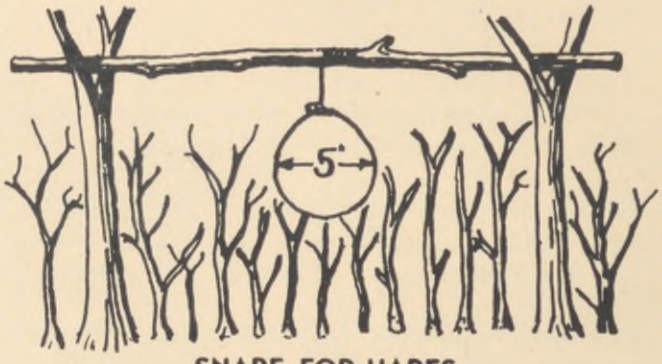
LEMMINGS, small, stub-tailed, mouse-like animals, are sometimes extremely abundant and you will have no difficulty getting them in summer by the simple process of hitting the them with your hands as they scuttle along their runways through the moss. But in winter you'll have to dig for them, and perhaps snare them. One species lives in the grass under the snow. Another burrows all through the deepest drifts. Lemming snares should be made from extremely light wire--a single strand

LEMMING

from a piece of picture wire or some fine copper wire.

If you're in "bush country" the chances are you'll see plenty of *VARYING HARE* tracks and droppings everywhere, so you should not have much trouble in snaring yourself a meal. Attach a wire to a sapling along a runway with a five inch noose set about 6-8 inches up so the hopping hare will stick its head into the noose instead of ducking under it.

ROCK DEAD-FALL



SNARE FOR HARES

To lead the hare into trouble, build a "fence" of twigs at either side and under the noose proper.

In the real Barren Grounds, the *ARCTIC HARE* is sometimes common. Here, where there is little if any shrubbery, you may have to make a fence from willow twigs as best you can and attach the snare to a stick stuck in the snow. In remote parts of the Arctic these big hares are sometimes so unused to human beings that they can be knocked over with rocks.

Where hares are numerous you may have no trouble getting them, but *don't expect to live on them exclusively* for a long time. They are lean and a man needs some fat meat especially in winter. A diet, made up exclusively of hare, will prove inadequate. You must have fat to eat along with it. Where hares are numerous there should be *FOXES*, and foxes are likely to be fat--so get a fox if you can.

This may sound ridiculous--but more than one Arctic fox has been caught by human hands. Watch a hunting fox. When it starts to burrow into a drift after lemmings wait till it disappears in the burrow, then run up and catch it. You'll get bitten if you're not quick. Haul the fox out by the tail or hind feet, swing it round and whack it hard on the snow.

In wooded country, the *PORCUPINE* has saved many a lonely trapper from starvation - for the 'Porky', armed as he is with spines, is afraid of nothing, is slow and clumsy, and is therefore easily clubbed to death. His skin is tough and you'll have to beware of the sharp quills - but Porky meat is good when you're hungry.

From Hudson Bay westward there's a fair-sized *GROUND SQUIRREL* that you may be able to catch in summer with a snare or by pulling the prop from under a flat rock. But don't expect to get it in winter, for it hibernates.

Another winter-sleeper is the *MARMOT* or 'whistler' of Alaska, a relative of the woodchuck or "ground hog" of the eastern United States. This animal will be hard to get without a gun, *but* if you can stand between it and its burrow it will almost invariably make straight for its burrow, *even right past or between your feet.* So be ready to whack it as it goes by.

To your surprise you may find yourself in a land of *POLAR BEARS.* If you have a good rifle, you'll be able to shoot these carnivores, but if you're unarmed you may have to be content with following their trails and finding an occasional half-eaten seal. Better not argue with a bear while it's eating. You know how some people are at breakfast. Remember that polar bear liver is poisonous. Also remember that if you're in really wild country a polar bear (or grizzly, brown, or black bear for that matter) can work havoc with your camp, supplies, etc. All bears are born raiders - don't trust them.

SEALS that come out of their breathing holes to sleep on the ice are sometimes trapped by the ebb tide. Another thing to remember is that baby seals can't swim. So in March or April, if you find a seal "nest" out in the salt water ice, you should be able to club the baby seal without much trouble and perhaps the mother as well, who is fearless in defense of her young. If you have a gun, remember these things about seal hunting: (1) A seal shot in the lungs is likely to sink immediately. (2) Seals shot in fresh (or largely fresh) water are likely to sink more rapidly than those shot in salt water. (3) A good place for getting seals is an open "lead" or hole in the ice. Here you will get close shots at the heads of rising animals and can retrieve the carcasses with a rope and hooks if you haven't a boat.

The *CARIBOU* is the north country's most important big game animal, not only because its meat is so good and its skin so valuable for clothing, sleeping bags, etc., but also because it is the only large land mammal found virtually everywhere both along the coast and in the interior. You'll need a big rifle for caribou. In shooting remember these points: (1) A shoulder or neck shot is likely to kill most promptly, though they have been killed with a 22 cal. rifle by hitting the eye and brain (2) Caribou tend to bunch up and slow down at nightfall. (3) Where there are many caribou there are likely to be *WOLVES.*

A dead *WHALE* or *WALRUS* along the ocean shore is not uncommon in the Arctic. If such a carcass is not too far gone it will furnish you with food even if it looks unappetizing. No matter how old it is, remember too that it will attract foxes, bears, even wolves - any one of which may furnish you with some good fresh meat.

ABOUT CLEANING GAME. In winter large game should be skinned and drawn promptly after it is shot before it freezes solid. Draining the blood by opening the jugular vein (in the neck) may make skinning a bit less messy. If you haven't the time to skin the animal, remove the entrails

at least. When skinning, keep the fat with the carcass rather than with the skin. This will save scraping the skin and perhaps give you more fat to eat. Save the skin if possible. Most meat may be kept in perfect condition frozen and *under snow*. If kept frozen and uncovered it will dry. Seal and walrus meat will not freeze solid and will turn rancid in a few days unless the fat is carefully removed. To obtain the greatest food value from birds they should be plucked rather than skinned. Pluck geese and ducks while they are still warm if you can. Feathers can be loosened by dipping the bird in scalding water, of course.

5. FOOD FROM PLANTS

General The small size of the individual plants that make up the Arctic tundra is probably the most generally-known distinctive feature of this land beyond the trees. It follows, naturally, that living off wild plants is difficult and requires a lot of time and energy. A single caribou supplies more food than the most fertile of natural Arctic gardens yields in many years. Therefore, start your search for food by concentrating on animals. In the meantime keep your eyes open for edible plants. If the animals are very scarce, then begin plant-hunting in earnest.

The Arctic landscape will look discouragingly barren at first, but when you examine your surroundings carefully, the variety of plants present will surprise you. Don't be fooled by the unproductive appearance of those flat mats of blueberry or crowberry "bushes". Look more carefully, raise the outer branches off the ground and unless a ptarmigan has beat you to it, you will find a handful of berries on even a very small bush.

Don't wander aimlessly around and expect edible plants to grow just any place. Study the following sketches, so you will know *what* to look for, and read the text so you will know *where* to look for it. The edible plants will be more conspicuous if you have obtained some idea of their general appearance before starting to search for them. It may require some practice before you can recognize a useful food plant growing in a cluster of useless ones. Unless you have been interested in wild plants previously, they may all look alike to you at first.

If you are forced to lay over at some Arctic landing field, make a plant-hunting excursion. The knowledge you gain will be as valuable as knowing how to use a parachute. The day may come when your life will depend on your ability to find food plants. Even experienced explorers have found themselves in that situation.

You will realize immediately that the variety of plants is, like their size, comparatively small. The number of edible species is likewise very small compared with temperate and tropical regions. It will not take you long to learn to recognize the 20 or 30 edible plants described here. Your task is simplified by the general distribution of Arctic

plants. The Arctic life zone is a belt of irregular width that completely encircles the top of the earth at a variable distance from the pole. Consequently, most Arctic plants occur all around the polar sea. The same plant may be found in Northern Alaska, Siberia, Lapland, Iceland, Greenland, and Labrador. Therefore, you will not need to learn a a separate group of plants for each flying route.

Once you have learned to recognize a productive plant, observe its surroundings carefully. Make mental notes on the type of locality it grows in. Then look for similar situations, and in all probability you will find another cluster of the same kind of plants. Furthermore, the number and size of the berries on one plant or the size of the edible root vary with the suitability of the plant's environment for its existence. Find the areas it "likes" best and there you will find the largest berries or roots.

If there are any animals or birds in your area, watch them feeding. Whatever they eat will be equally edible for you. Often they may lead you to food you might otherwise overlook.

The shortness of the growing season in the north permits only a single crop each year; and, particularly in dry situations, growth is very slow. These facts, coupled with the inherent small size and widely-scattered occurrence of many plants, may force you to move your camp often, if you are depending on plants for food. If you decide to travel, use your accumulated knowledge of the sources of food and follow routes through localities where you can expect to find edible plants.

Poisonous Plants None of the truly Arctic flowering plants is poisonous. Some explorers have found that lichens cause diarrhea but this may be because they have not been properly cooked. At least one Arctic and two sub-Arctic fungi are poisonous, but these, too, are easily recognized. Both of these groups are illustrated at the close of this book.

Cooking Eskimos usually eat plants, roots, berries, or greens immersed in seal oil. Berries are often made into "Eskimo ice cream": a mixture of berries, seal oil, and fresh reindeer fat beaten together until they form a frothy mass.

Although you may not have the required oils or meat, you can at least cook the plants as suggested in the following sections. Anyway, most of the plants will taste better when cooked. If your emergency kits lack cooking utensils, make a pan or two from parts of your plane. Water is abunuant in the solid if not the liquid state. If you have to depend on the former state, use ice in place of snow, for it will yield more water for an equal unit of volume.

Although the fresh water in bogs, lakes and even streams often has a brown color, it is entirely safe for either drinking or cooking purposes. After the vegetable is cooked, drink the liquid from the cooking vessel. It contains valuable vitalizing vitamins.

EDIBLE ROOTS

You are familiar with the necessity for carbohydrates in your diet. They are the energy-giving starches and sugars. You also know, consciously or unconsciously, that one of the most common sources of starch is found in potatoes and other underground plant parts. There are several Arctic plants that possess roots in which starches have been stored. The plant stores them for its own use, but in the time of your own "national emergency", you are justified in robbing the plant. Make a digging tool out of some part of your plane to get at these underground roots.

WOOLLY LOUSEWORT

Approximately
½ natural size

Flowers are rose-colored, somewhat resembling those of liquorice-root. *(see next page)*, but are arranged in denser clusters. The flower stalks are thick and strong and will be visible long after the flowers drop off. The upper part of the leaf is very finely divided.

Grows in rather dry tundra. The flower stalks may be visible above the snow during the winter.

The root is large and has a sulphur-yellow color. It is sweet and edible, either raw or when cooked.

LIQUORICE ROOT OR NORTHERN SWEETVETCH

Approximately ½ natural size

Has pink flowers similar to pea or clover flowers. The leaves resemble those of locust trees or of the famous "loco weed" of our western states. Liquorice-root will not make your "loco", however.

Grows in clumps on sandy soil. Most abundant on lake shores or along streams where it may form pure stands.

The root is perennial. Learn to recognize the leaves so you can find the roots when there are no flowers. Meadow mice gather the roots in the autumn and store them in subterranean runways near the surface. Eskimos locate the mice caches with the aid of dogs and thus obtain their own supply of "Masu". Even though you have no dogs, try to find these caches and save yourself a lot of digging.

The cooked root tastes like young carrots but is even more nourishing than its cultivated counterpart.

BISTORT OR KNOTWEED

Approximately
natural size

The small white or pink flowers occur close together in slender clusters. The elongate smooth-edged leaves come out from the stem near the level of the soil. Common in dry tundra.

The root is about the size of a pecan. It is rich in starch. The slightly astringent taste of the raw root disappears when it is cooked.

Soak in water several hours and then roast in a pan hanging over the fire, or simply bury it in live coals.

KAMCHATKA LILY OR "SARANNA"

Size extremely variable

Flowers are very dark purple. The shape of the flower is like other lilies you have seen. The stem rests in a large bulb which is surrounded by a big cluster of small bulblets, each of which is about the size of a grain of rice.

Occurs in meadows and among low shrubs. In Alaska, it sometimes covers a meadow completely.

As with the other roots, you may find a storage depot of this bulb in the burrows of field mice.

The bulbs of the Kamchatka lily contain a large amount of carbohydrates. Their food value is so great that people have been known to live solely on this root for long periods. They serve as "potatoes" for the natives of Kamchatka.

The bulbs ("roots") are very edible when roasted in coals or boiled over the fire. Dried bulbs may be powdered and used as flour or made into soup or porridge.

You may find various greens to be more abundant, and therefore easier to collect in quantity, than any other plant food. Besides their availability, they will supply you with necessary roughage and minerals, as well as make a tasty addition to any meal.

WILD RHUBARB

Approximately ½ natural size but extremely variable.

Flowers are small and insignificant but arranged in scraggly clusters which are conspicuous. Stems are reddish and, like cultivated rhubarb, bear numerous pointed leaves with wrinkled edges.

Occurs in moist soil on open river banks and on the slopes of recent landslides.

The young stems are bright red and juicy. When cooked, they resemble rhubarb in flavor.

SOURGRASS OR MOUNTAIN SORREL

Usually larger than illustration

Flowers are inconspicuous, red or green, and grow in plume-like branching clusters. The somewhat fleshy kidney-shaped leaves are borne on long, slender stalks.

Occurs on moist, shady slopes and in ravines.

The leaves and stems taste somewhat acid when raw, but are very refreshing. When cooked, they resemble spinach in both flavor and appearance. New leaves are produced all summer, thus supplying fresh greens in any summer month.

FIREWEED OR WILLOWEED

Approximately
½ natural size

Flowers are purple and very large. Leaves are willow-like and slightly fleshy. You have probably seen pictures of this plant or its close relatives, growing in northern states or in the mountains. The fireweed gets its name from the habit of appearing very soon after a fire and forming a solid carpet of vegetation over the fire scar.

Occurs on sandy or gravelly soil along river beds and raised beaches along the sea shore.

The fleshy leaves resemble spinach when cooked.

WILLOW

Approximately
natural size

Willows are the "trees" of the Arctic. They are "woody" and have tree-like branching systems, although this habit may be obscured by a cushion or prostrate growth habit. The leaves of a few of the many species present in the Arctic are illustrated. The cottony seeds serve to identify willows during the season when they are ripening and blowing around.

The young tender willow shoots may be eaten as greens. They have a decidedly sour flavor, similar to the acid taste of sour dock. Willow buds contain a large amount of Vitamin C.

DANDELION

Approximately
natural size

This plant, which is such a terrible pest as a weed in the States, is a potential life-saver to anyone stranded in the Arctic. You have probably spent long hours pulling it out of your lawn so no description is needed to help you identify it.

The young leaves make fine greens. They should be cooked only a short time but if the bitter taste offends your tongue, change the water several times while cooking. Both leaves and roots can be eaten raw.

MARSH MARIGOLD OR AMERICAN COWSLIP

Approximately
½ natural size

Flowers are bright, glossy yellow. One of the earliest plants to come out in the spring.

Occurs in wet places along streams. Most abundant in swamps, marshes, and wet meadows.

The leaves and stems are delicious, particularly in young plants, when boiled and eaten as a green.

ANTI-SCURVY PLANTS

Many chapters in the annals of early Arctic exploration are punctuated with the stories of men who died of scurvy. A prolonged diet of canned meat or no vegetables brings on this dreaded disease, which is caused by a deficiency of Vitamin C.

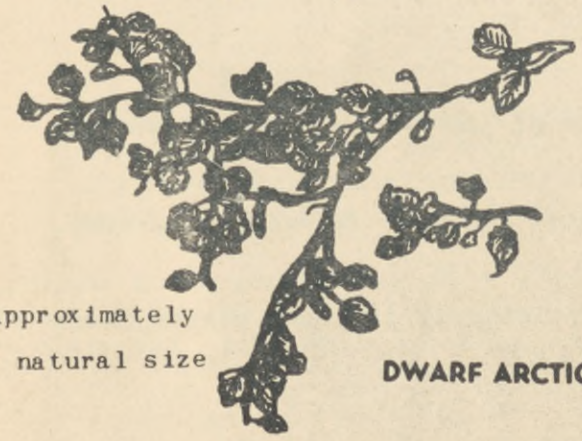
Most plants yield some Vitamin C, but several are notably rich in this anti-scurvy vitamin. Chief among them are the following:

BLACK SPRUCE

WHITE SPRUCE

Black and white spruce are the last of the evergreen trees to give up in the northward struggle of the forest against the Arctic climate, (although scrubby junipers and pines reach farther north in some areas). They have short, stiff needles that are borne individually, not in clusters as in the pines. The cones are only an inch or two long and have thin scales. Black spruce cones are globular while those of the white spruce are slightly elongated.

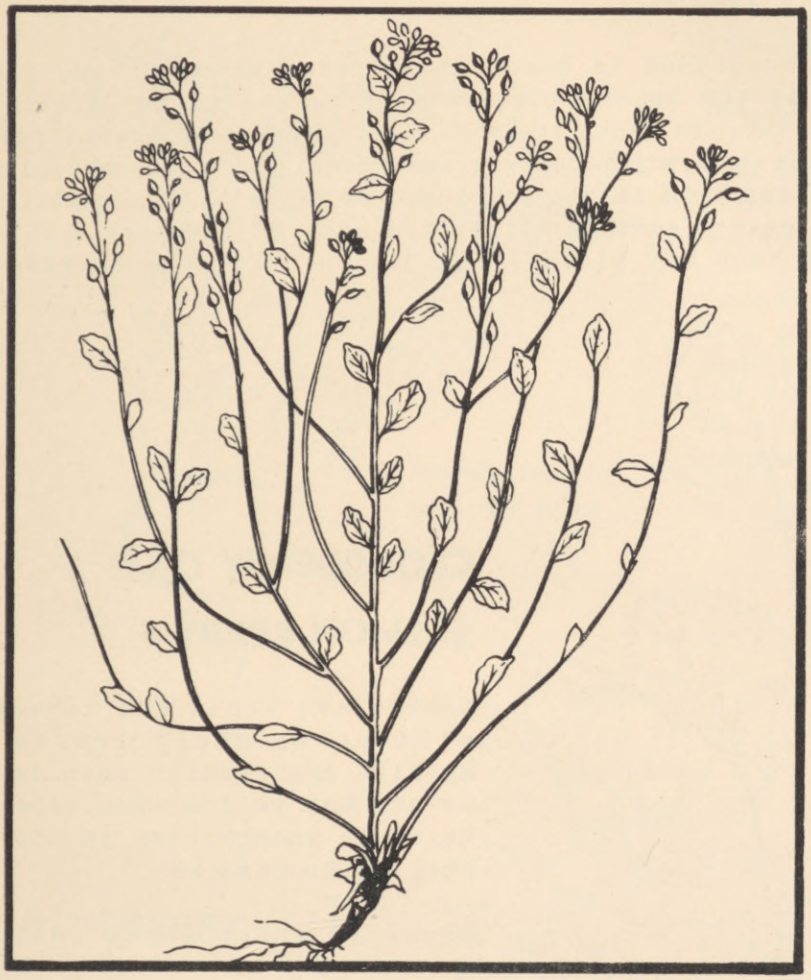
An infusion made by boiling the young twigs and leaves of the spruce is helpful in the prevention and cure of scurvy. Although the buds, needles, and stems have a strong resin taste, you will obtain the essential Vitamin C by chewing them raw.



Approximately
½ natural size

DWARF ARCTIC BIRCH

The Arctic birch can be distinguished from its companion shrub, the willow, by its thinner leaves and the bark which peels off in sheets. The fresh green leaves of the birch are high in Vitamin C content. In Kamchatka, the inner bark of the birch is eaten.



SCURVY GRASS

Approximately
natural size

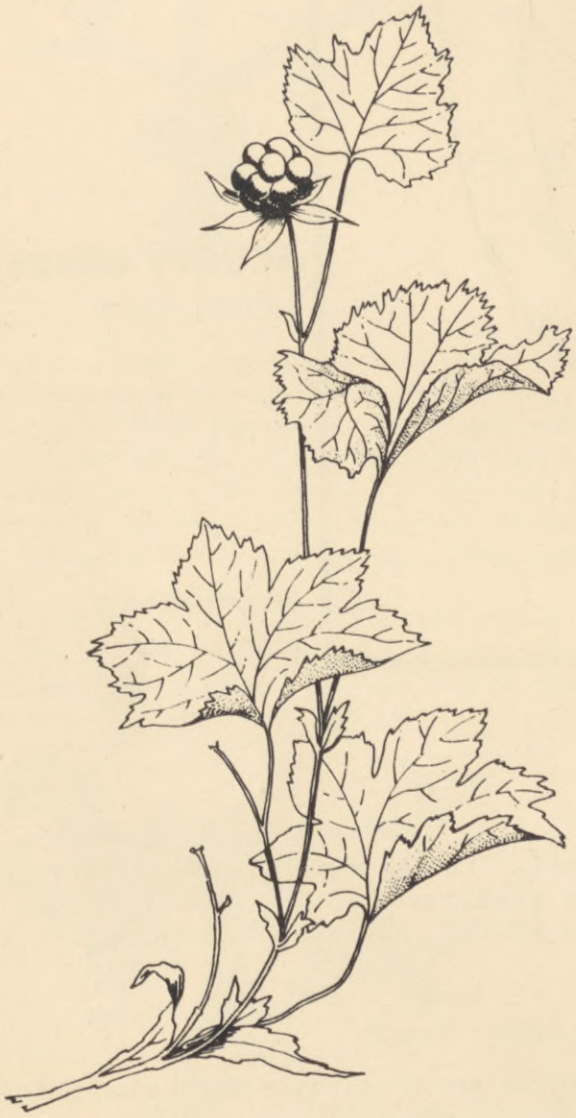
"Scurvy grass" is not a grass at all. It has small, white flowers but is more easily recognized by its globular fruits. The roundish or kidney-shaped leaves have a short stalk. All parts of the plant are somewhat fleshy.

Occurs along sea shores on the upper beach.

Eaten raw, the leaves, stems and fruits are a valuable anti-scurvy food.

All berries in the Arctic are edible, so you don't need to know them individually. The following descriptions will, however, help you locate berry-growing plants. Frequently, the berries remain on the bush over winter, and in the following year are even sweeter and tastier than those of the current season.

Because you may be accustomed to associate berries with bushes, you will be discouraged by the apparent absence of bushes in the Arctic. Bushes there are, however; in fact, there is an abundance of them. True, they are low, and often entirely prostrate and creeping. Look carefully for them. Sometimes they form attractive rosettes or mats. Fortunately, the habit of growth doesn't seem to affect the size of the berries. A very small blueberry bush may yield a big handful of large berries.



CLOUDBERRY OR SALMON-BERRY

Leaves are broad and lobed, similar to maple leaves. Berries are reddish when immature but yellow when ripe. Resemble raspberries in size and appearance.

Occur in soft, peaty soil.

If you need a laxative, eat a large quantity of these berries raw. The flavor, however, is much improved by cooking.

Approximately natural size

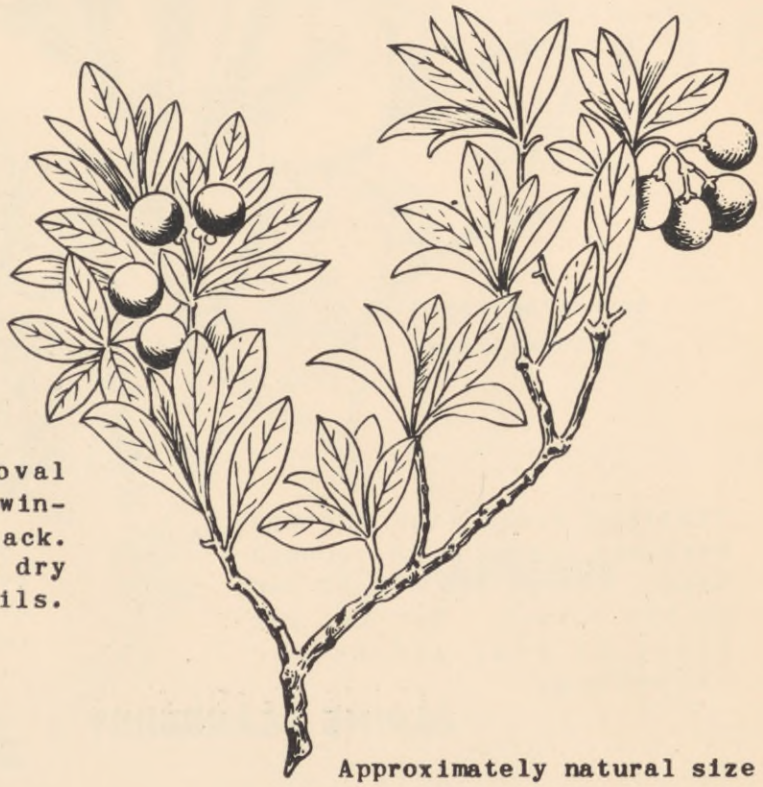
Approximately natural size

LINGENBERRY OR MOUNTAIN CRANBERRY

Low, creeping shrub with dark-green, leathery, ever-green leaves. Red berries.

Occurs in acid soil, either wet or dry. Grows best in open birch or willow thickets.

Berries are high in vitamin content.



Approximately natural size

BLUEBERRY OR BILBERRY

Low shrub with small, oval leaves that drop off in winter. Berries are blue-black. Grows in open places, in dry as well as moist acid soils.

CROWBERRY

Prostrate shrub. One of the most abundant and widespread Arctic plants. Slender leaves resembling fir needles. Berries black and shiny and rather well-camouflaged against the leaves.

Occurs in sandy and rocky soil. Grows on little shelves on rocky ridges and hills where snow is not very deep. May be found, therefore, even in winter.

Approximately
½ natural size

Approximately
½ natural size

Trailing shrub with shreddy bark and leaves with rounded tips. Leaves are bright red in the autumn. Berries are black or red, and rather tasteless.

ALPINE BEARBERRY

RED BEARBERRY

Similar to the Alpine Bearberry. Berries are coral-red.

Occurs largely on limestone or non-acid rocks.

Berries are somewhat mealy and tasteless when raw, but very nourishing and palatable when cooked.

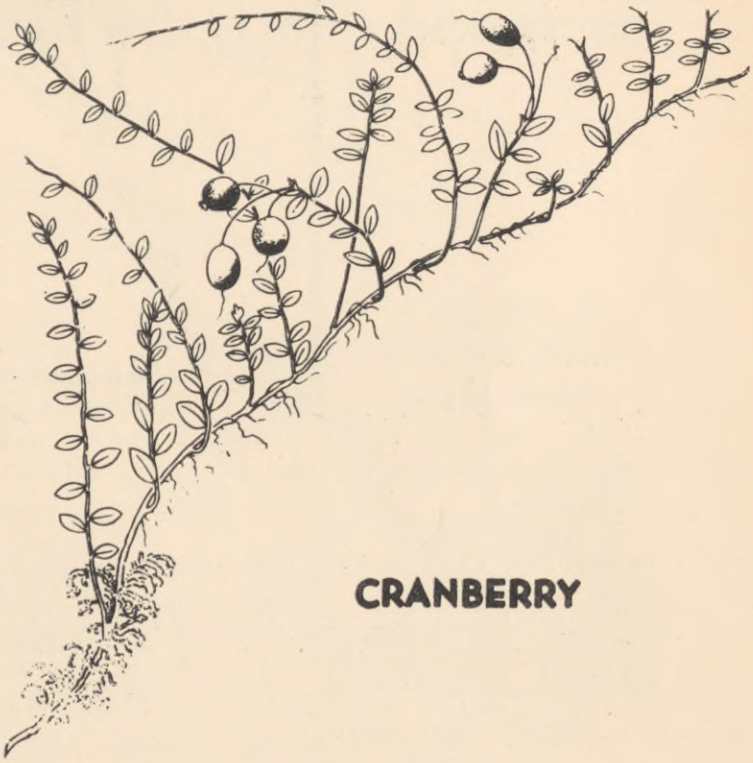
The leaves when dried and shredded make a fairly good substitute for tobacco.

Approximately ⅝ natural size

Red berries. The cranberry which grows only in bogs in the northern part of the U.S. climbs out onto the upland in Arctic regions. It will be found on shaded rock ledges particularly where peat moss *(SPHAGNUM)* occurs, as well as in marshy areas.

The berries may be rather sour. They sometimes stay on the plant over winter, however, and are much sweeter the second year.

Approximately ½ natural size



CRANBERRY

COW PARSNIP OR "POOCHA"

Grows from one to several feet tall

Cow parsnip is very conspicuous because of its characteristic flower cluster and the large sizes of the entire plant. It is abundant in the sub-Arctic areas of the Southern Coast of Alaska and on the Aleutian Islands.

The young shoots and the leaf stalks of the cow parsnip are edible. Cook them as greens or eat them raw. Leaf stalks which have rusty or reddish spots or streaks on them are better than solid green ones. The former taste less bitter. Cow parsnip also contains considerable water in its tissues. If you fail to find fresh water, eating the leaf stalks may quench your thirst.

(Compare cow parsnip with the poisonous water hemlock illustrated on page 78. The plants belong to the same family and have very similar flower clusters. *The leaves, however, are entirely different,* as you can easily see in the illustrations.)

FUNGI

Fungi are very abundant in the Arctic in the late summer and fall, especially after a rain. They are very good to eat and taste best when boiled or fried.

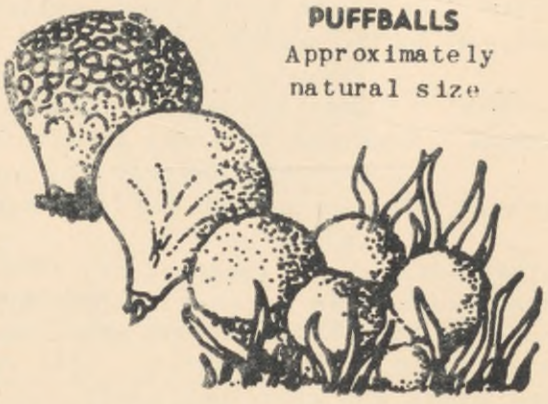
All mushrooms you will find in the Arctic are edible unless they have a yellowish or reddish cap. Only one species, the "Emetic Russula" is poisonous and it is very easy to recognize.

EDIBLE MUSHROOMS
Approximately natural size

EMETIC RUSSULA
Approximately natural size

This fragile mushroom is easily recognized because of its color. The top of the "umbrella" is pink or rosy in color when young, and red when older. It may fade to a reddish-yellow or yellow tone in old age.

Since this plant usually causes vomiting when eaten, you really don't need to worry so much about its poisonous effect.



PUFFBALLS
Approximately natural size

All the puffballs you find will be edible. You might, however, mistake a young mushroom for a puffball. Since the former might be an "Emetic Russula" and poisonous, take care. Puffballs always taper downward to a narrow base whereas in a young mushroom the base will be as large as the top. Also if you cut the plant longitudinally, you can be even more certain of your identification. A young mushroom will have gills while a puffball lacks gills and is the same throughout in structure and texture.

You may never before have seen lichens, and even if you have seen them, you probably thought they were mosses. Just a few days in the Arctic, however, will make you aware that these plants that lack flowers, leaves, stems, and roots, are very abundant. Fortunately, their great abundance is accompanied by a high nutritive value. Probably the *lichens possess the greatest food value of all the edible plants of the Arctic.* Therefore, don't be fooled by the sterile appearance of the lichen-covered landscape. Early travelers, as well as natives of the north, have lived for weeks on a diet made up entirely of lichens.

In temperate and tropical regions, lichens are so inconspicuous compared with other plants that very few people know much about them. You are probably wondering how these unappetizing-looking plants can possibly contain valuable food for you.

The following facts will help you appreciate the edible qualities of these strange plants.

An individual lichen plant is, paradoxically, two separate plants. It consists of a fungus and an alga growing in very intimate contact with each other. (The fungus and alga will sometimes grow independently if they are separated and placed in the right environments.) A lichen is is an excellent example of successful team-work. The fungus component catches and holds large quantities of water while the algous partner manufactures food. The fungus, which is unable to manufacture any food whatsoever, obtains its rations from the alga. At the same time, the alga obtains water and mechanical support from the fungus.

You know, of course, that fungi are edible. Since you now know that a lichen is part fungus, it will be easier for you to realize their food value. Reindeer live almost entirely on lichens for months at a time. And you don't require as much food as a reindeer.

Cooking Lichens Some lichens contain a bitter acid that causes nausea and severe internal irritation, if eaten raw. The acid is easily removed, however, by boiling or soaking in water. A small amount of soda added to the water helps reduce the acid.

After soaking the lichens, dry them until they are brittle. If desired, roast *slowly* in a pan till dry and crisp. Powder the dried plants by rubbing them between the palms of your hands. Pounding with a stone will yield a finer powder. Boil for one hour or soak the powder for a few hours and then boil until it forms a jelly. The product is best when used with other foods. Use it as a thickening for soups, stewed vegetables, etc. Try cooking it with meat, particularly if meat is scarce, for the lichen will make it go farther. Very nutritious biscuits can be made by mixing the prepared lichen with a small amount of flour, (if you have it), and baking the dough thus formed.

Rock Tripe Thin, leathery, irregularly shaped discs one to several inches wide, and black, brown or greenish in color. The discs grow on rocks to which they are attached by a very short stalk at their center. They are soft and gristly when wet, but hard and brittle when dry.

ROCK TRIPE

Approximately natural size

Iceland Lichen Dark brown, bushy, coral-like plants. The edges of the individual strap-like "branches" are hairy. Grows in dense colonies on sandy soil.

When properly cooked, the lichen is palatable and nourishing. It probably contains about 70% of a form of starch. It has been stated that it contains more starch than potatoes and more flesh-building food than oatmeal.

REINDEER LICHEN

Approximately ½ natural size but may be much taller

Reindeer Lichen A greyish, much branched, coral-like plant that prefers hollows or slopes where snow cover is assured during the winter. It is as nutritious as the Iceland lichen. Northern hunters often make a stimulating tea with this lichen.

Seaweeds If you are stranded near salt water you will find a variety of seaweeds (marine algae). Brown ribbons several inches wide and of amazingly great length float lazily in the surf while anchored by a slender stalk. A profusion of small, brown, much-branched forms make a jumbled mass on the rocks exposed at low tide. Green, wrinkled sheets, thin as a page from this book grow on rocks, driftwood, other algae or on mudflats in quiet bays. The latter is called "sea lettuce" because a single plant resembles a lettuce leaf. The high tide mark may be indicated by an irregular line of algal debris formed from derelict algae which have been dislodged from their anchorage and cast up on the beach by the incoming tide.

Seaweeds should be on your menu whenever possible, especially if you are eating a lot of fish. Although they have no significant direct food value to human beings, seaweeds contain valuable vitamins and give bulk to your diet. Don't shy away from them because of their unusual and unpalatable appearance; they play the same role in your emergency rations that lettuce, cabbage, and many other foods which have no direct food value play in your normal diet. The bulk they give is essential for good health since it helps prevent constipation. If you find plenty of fish you may be inclined to ignore seaweeds. That is a dangerous practice because a diet of fish alone is not healthy. The gelatinous consistency of the cooked alga may offend your sense of sight and taste but it is the very material which is needed to round out your diet. You aren't running a risk in eating seaweed, nor are you pioneering in foods. Alaskan Indians, Filipinos, Hawaiians, Chinese, and many other people have eaten seaweeds for centuries.

Be careful in selecting seaweeds for your stew pot. Healthy, fresh specimens have no marked odor or flavor, are firm, and are slippery or very smooth to the touch. If the plant smells fishy, is wilted, or is slimy it is decaying and should not be eaten (we don't ordinarily eat rotten spinach!). Possibly the first seaweeds you find will be those washed up on the beach, only part of which are fresh and edible. Use the above characteristics to select the ones you eat.

The large, brown, ribbon-like seaweeds can be minced up and eaten raw, or dried, then shredded and scattered over other food like "corn-flakes". Discard the stalk and tough parts, eating only the more tender portions. The coarser red seaweeds are better cooked up; they will be glutinous and go best if used with fish in a sort of stew. The broad-leaved bright green algae are good chopped up and eaten raw or stewed. Do not eat the filamentous or slender branched forms. They are not poisonous but may contain irritating free acid. These disagreeable acids can be detected by crushing a batch with your hands. The released acid causes decay to start immediately and within five minutes offensive odors will be emanating from the crushed mass.

THREE SUB-ARCTIC POISONOUS PLANTS

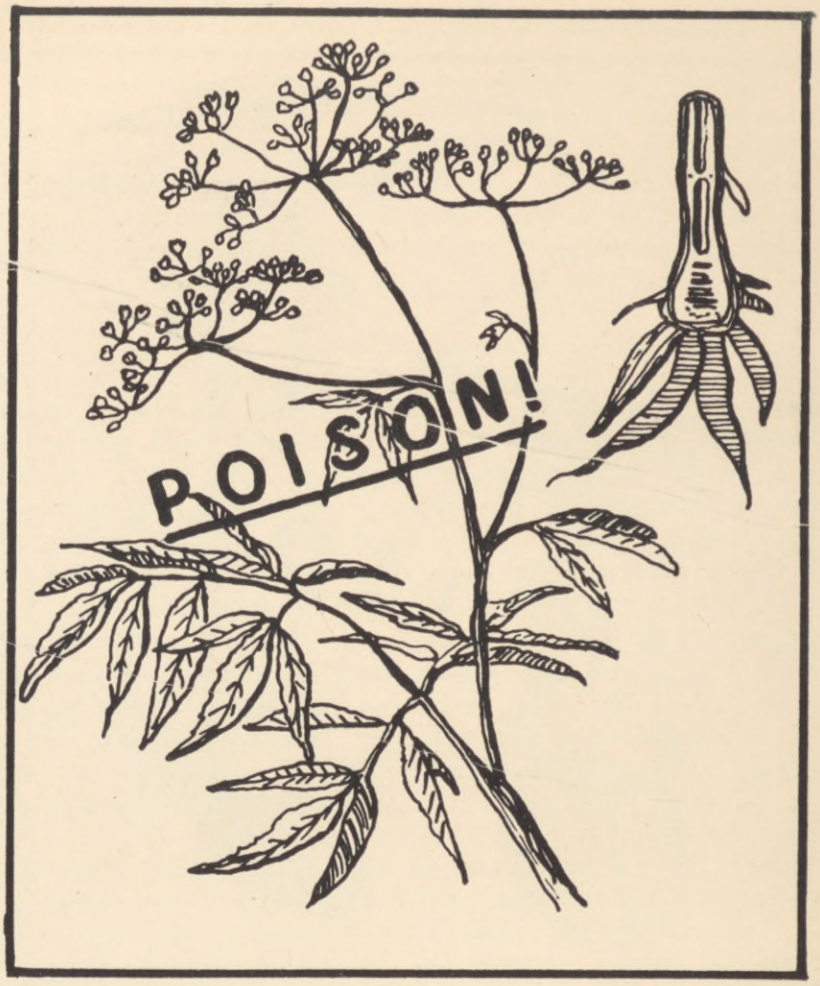
These three plants grow in the sub-Arctic forests, but not out in the Arctic tundra. They are described here only as a precautionary measure. You probably will not encounter them at all.

DEATHCUP AGARIC

Approximately natural size

This deadly fungus occurs in the sub-Arctic forests. It is usually white all over, although the cap may be olive or green in color. The cap is several inches wide and is convex when young, and later slopes downward from the center like an inverted saucer; in old specimens, the margin is raised up slightly above the rest of the cap. The surface of the cap is sticky when moist. The gills are white and are *not attached to the stem.* The flesh of the cap is white, firm and brittle when fresh, and soft and limp in old plants. The stalk is several inches tall and is white and brittle. The spherical base is buried beneath the ground so that the soft white cup in which it rests is not visible unless one digs up the entire plant. A ring occurs around the stalk at one stage of development but later disappears.

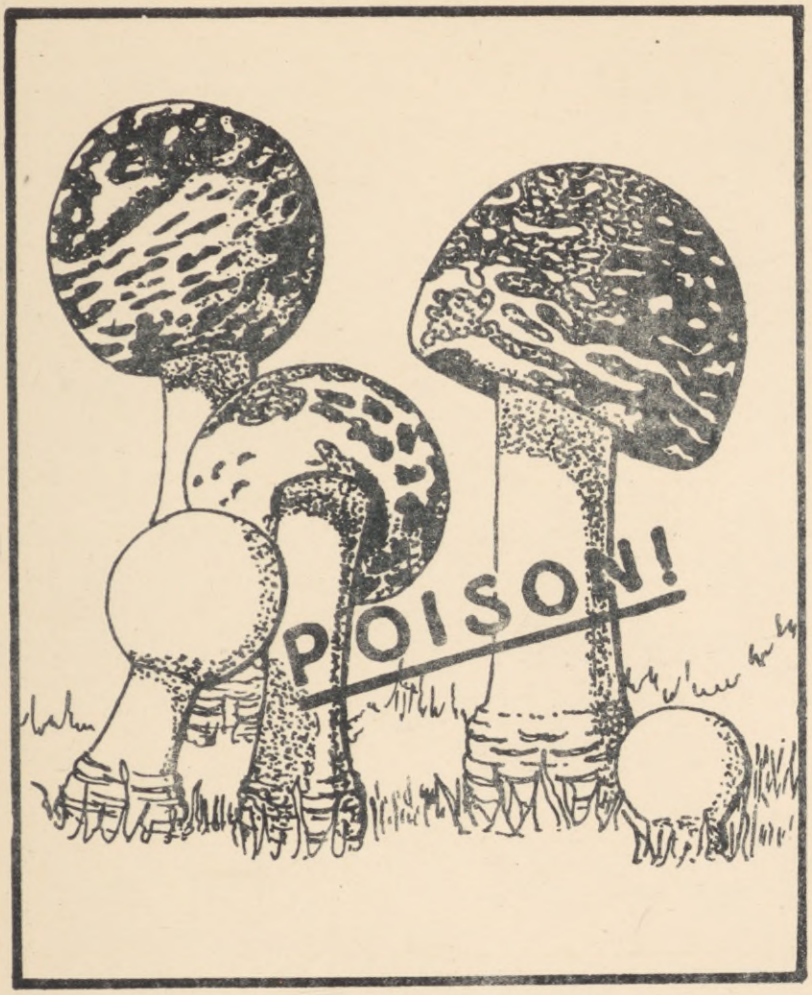
WATER HEMLOCK



Grows 3 to 6 feet tall

This poisonous flowering plant, like the really deadly fungi, does not grow in the Arctic. It or some of its relatives, however, do occur in sub-Arctic river valleys. You might see it there.

The arrangement of the flowers or fruits is a conspicuous characteristic which enables anyone to recognize immediately the members of this family (the parsley or carrot family). *Do not eat any part of this plant* or plants similar to it.



FLY AMANITA

Approximately
natural size

This fungus gets its name from the fact that infusions of it are used as fly poison. It is a handsome plant because of the usually brilliant yellow to orange or even red color of the cap. Yellow is the most common color. The surface of the cap bears a scattering of white or yellow scales which drop off quite easily, leaving the old plants with a smooth cap. The gills are white.