



Above: Indonesian fishermen pickling fish in a canoe. The brine may be used for three batches if salt is added each time to maintain the original concentration. Right: Dry-salted flying fish being laid out on bamboo mats for sun drying.

Simple Methods Of Fish Preservation

By H. VAN PEL*

Those concerned with the preservation of fish who lack modern preserving equipment will be interested in the methods of fish curing described in this article.

IN some islands, more fish is caught at times than can be consumed. Methods are described below of keeping the surplus fish in good condition for later consumption. Again, fishermen sometimes cannot return to their villages promptly with fresh fish they have caught, and it will be of value to them to know how to preserve their catch by simple means.

All the methods described in this article have been tested, and are used even for commercial purposes.

There are four main techniques of fish curing for which simple means can be used. They are salting, drying, smoking, cooking. Combinations of these four techniques can be used. For instance, fish can be first salted and then dried, or it can be salted and smoked, or again it can be cooked and dried, etc.

Salting

There are many different kinds of

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salt, some being better than others for fish curing. However, in islands or in outlying places there is often no choice, and whatever is available in the way of salt has to be used, whether it is bought in a shop, prepared on the spot, or extracted from earth containing salt.

A distinction must be made between the two chief techniques of salting: wet salting and dry salting.

Wet Salting: This is the cheaper, since it requires lesser amounts of salt. The principle is to keep the fish for a long time in brine.

The equipment needed consists of a watertight container, which can be a tin, drum, canoe, barrel, etc. To make the brine, one takes four parts of clean

water (sea or fresh water) and one part of salt. If the salt is coarse, it has to be ground or pounded first. It is then dissolved into the water by stirring with a piece of wood. To be good, the brine must float a fish.

The next step depends on what kind of fish one wants to salt. It is best first to cut off the head, and gut and clean the fish, though small fish can also be salted whole. Large fish must be cut open, and it is preferable to take out the backbone. Fish with a heavy armour of scales must be scaled. In places where the flesh is thick, slashes must be made so that the salted brine can penetrate the flesh. Very large fish should be cut in thin fillets.

After the fish has been prepared

according to its size, it must be cleaned and put in the brine. A plank or matting is laid over it and weighted with rocks so that the fish is entirely covered with brine.

This salted fish can be kept for a long time in a dark or at least a shady place. The remaining brine can be used three times, but water and salt must be added every time until a fish can again float on the liquid. In any case, fresh brine is always best.

Dry Salting: In this method the fish is salted but the juices, slime and brine are allowed to flow away. Dry salting can be done in an old canoe, or on mats, leaves, boxes, etc. In any case, the brine formed by the fish juices and the salt must be allowed to run away. For two parts of fish, one needs one part of salt. Layers of fish must be separated by layers of salt. It is a valuable method when one has no containers. This method is used to salt down flying fish in open fishing boats while at sea, and the fish in this case are kept whole.

Some people like the salty taste of fish prepared in this way, but it is always possible to wash the salt away by soaking it in fresh water before use.

Drying

Very small and thin fish can be dried straight away in the sun if they are brought in early enough in the morning (and if, of course, the sun is shining!). If these conditions are not fulfilled the fish must be put for one night in brine, or dry salted. They can then be dried the next morning. If it happens to be raining the next day, it is necessary to wait until the weather has cleared up, which could take from a few hours to a couple of days. In this latter case it will be necessary to wash the salt away from the fish by soaking it in fresh or sea water for a couple of hours before drying it; this depends again on the tastes of the consumers and on the purpose for which the fish is cured.

Small fish are mostly sun dried on mats, or suspended. When it rains the fish must be kept dry by covering or transferring them under shelter. If fish are laid on mats or other material to dry, it is best to turn them over every two hours so that they will dry quickly and not become maggotty. In the case of large fish, hanging is better if they are merely split.

Dry salted fish can also be dried, but they should first be cleaned in water.

Normally the fish will be dried after three days. If a great quantity of fish has been dried and is to be kept for some time, the best way is to pile it up in a dark place, off the ground and preferably on wooden boards. It should then be covered with a sack or mat. After a fortnight the fish should again be laid in the sun for one or two hours and then put away as before.

These are only indications of the main principles of fish drying; variations are possible.

Smoking

Any kind of fish can be smoked. There are three main methods of smoking:

- (a) Smoking and roasting;
- (b) hot smoking;
- (c) long smoking.

Smoking and Roasting: This is a simple method of preservation, for consumption either directly after curing or within twelve hours. Re-smoking and roasting can keep the product in good condition for a further twelve hours. Fresh un-salted fish is put over a wood or coconut husk fire. This should be kept very small and the fish turned over every five minutes. In about half an hour the fish is ready for consumption or, if it is the intention to keep it for a while, it should be put in an aerated container.

Fish can be preserved in this way even in open fishing boats, but the smoking has to be done in a tin or a half-drum. Salted fish can also be smoked by this method, but this is used mostly for immediate consumption or in order to bring the produce in smoked form to a nearby market.

Hot Smoking: The hot smoking system can be used for immediate consumption or to keep the fish for a maximum of 48 hours. Small fish can be salted first for half an hour (see wet salting). After salting they are put on iron spits and dried in a windy place or in the sun for another half hour.

It is necessary to have an oil drum to make the smoking stove. The top of the drum is cut out and holes are made 8 inches below the rim to place spits. Near the bottom a rectangular opening is made to control the fire. This opening should be closed with a small door or piece of steel plate.

A fire of hardwood or coconut husks is made in the stove, and once it is well started it is regulated so as to give no flames. The fish are then placed over the spits. During the smoking operations the top of the drum must be covered with a sack or with palm fronds laid as close together as possible; the fire control opening should also be closed. The fire must be watched from time to time. The fish will be ready in about one hour. An indication that they are done will be found in the golden yellow colour of the skin.

For big fish, 1½ to 2 feet long, the best method is to split them in halves, to the right and left of the backbone. Each half fish is fixed between two flat bamboo slats or sticks. These halves are then rested head down on racks built four feet above ground. A number of split fish can be lined up next to each other.

A fire of hardwood or coconut husks, or several separate fires, are then lit under the rack. The number of fires depends on the quantity of fish one has to smoke. There should be a slow fire for about half an hour followed by a brisk one for one hour. A small fire is then kept going for six hours (just smoking).

After this treatment the fish is ready for transport and will keep in good condition for two to three days under tropical conditions. This method is used in particular in the Celebes for skipjack and other tunas.

Long Smoking: If fish must be kept in good condition for a long time, for instance, two or three months or even longer, it can be done by smoking, provided the fish is not oily.

For this purpose, a small closed shed made of palm leaves or other local material can be used. The dimensions of the shed depend, of course, on the quantities of fish to be smoked, but the height should in no case be less than six feet. In this shed, racks are built to hang the fish from or to lay them upon. Hanging the fish on spits is the best method, but they can also be laid on loosely-woven matting. One can start hanging fish three feet from the bottom up to the roof.

The preservation of fish is effected by smoke only in this method, and it is best to use coconut husks which should burn very slowly so that the fish is dry-smoked after 48 hours. After such a treatment the flesh is dried throughout.

If it is necessary to transport these fish to other islands, they should be packed in small packages wrapped in dry leaves and reinforced with bamboo or sticks.

In Eastern Indonesia, packages of smoked fish are sent over great distances; these are mainly garfish.

Cooking

Fish can be kept for two or three days in the following way:

Small drums (possibly oil drums) are cleaned and filled with water. Salt is added in the proportion of four parts water to one of salt. Small oblong or round baskets made of bamboo or leaves are filled with fish, and as many baskets as possible are put in the drum. Care should be taken that the top baskets are fully covered.

A fire is lit under the drum and the water boiled for about half an hour before the fish is well done. The baskets are then taken out and the water drained off. The fish can then be transported in the baskets. The water may be used three times for cooking, but more water and salt must be added each succeeding time. By evaporating the remaining

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A young palm with fronds badly chewed by adult rhinoceros beetles. Locality, Vunairima Methodist Mission, North Coast Road, New Britain.

the control of the beetle and most likely to succeed in the Pacific. It is not desired to make a choice of parasites or predators for shipment to the Pacific until the preliminary survey has been made in at least some of the other areas in India and South-East Asia, when the choice can be made with a better know-

ledge of what is available over a wider area. In the meantime, however, information is being accumulated on the habits of some of the more promising species and the collection areas and the methods of collecting and handling these insects if it should be decided later to ship them to the Pacific.

Coffee Processing

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to give a clearer idea as regards production and power, the hour has been taken as the work unit.

Operations	Production in lbs. per hour	Power per hour (h.p.)
Pulping	9,700	2
Peeling off the parchment	1,300	10 - 12
Hulling the berries	749	10 - 12
Sorting	661	3
Grading	881	3

As regards the water supply required for the wet method of processing, the grower will find it technically sound to multiply the weight of green coffee to be obtained by 10. For example, in order to obtain 1 ton of commercial coffee he will need to use 10 tons of water, or 13.08 cubic yards. This average may be increased fivefold without risk, but it could not be reduced by as much as two-thirds without jeopardizing final production. It must never be forgotten that the greater the quantity of water, the greater the chance of success when processing coffee by the wet method.

Coffee, it should be stressed, is a rich product whose future is largely dependent on quality. It is on this aspect

that growers in the coffee-growing areas of the South Pacific should primarily concentrate their efforts. Effective results would be encouraged by well-directed agricultural propaganda, a policy of strict grading and incentives to the producers of higher grades of coffees. It is only by granting preference to the better qualities that a higher all-over quality will be obtained.

The coffee beans of the South Pacific generally have flavour and aroma peculiar to the region which cause them to be classified as "improving varieties". If attractive appearance were added to this

rare privilege, the market prospects for coffee production in the South Pacific would be virtually assured.

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Fish Preservation

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water over a fire or in the sun, a good fish paste can then be obtained.

Fish can also be cooked in coconut water, but without salt. If there is not enough coconut water available, grated coconut can be added. The fish are put in baskets and cooked as described above. After cooking, the flesh is separated from the bones and is pounded and dried on mats in the sun (when the sun is not shining, the pounded fish can be dried over a fire). For this purpose steel plates, which can be made from flattened drums, are placed over a small fire. Mats of bamboo or other material are laid over the plates and the pounded fish is placed on the mats to dry. Fish cooked in this way should be thoroughly dried. The result is an excellent fish meal suitable for human consumption and retaining an excellent coconut flavour. This meal can be kept for six months in a dry place. It is ready for consumption, but may also be used for fried fish cakes.

The bones of fish prepared in this way can also be crushed, and provide excellent pig food; the entrails of the fish are also very good food for pigs.

Before concluding this article, I wish to stress that for almost every locality methods can be devised for keeping fish for some time. Many other preservation techniques than those described can be used. Anyone desiring further information on the subject is invited to write to the South Pacific Commission, Noumea, New Caledonia, giving details of conditions in his locality.

QUARTERLY BULLETIN and PACIFIC READING To be Amalgamated in July

The two quarterly magazines issued by the South Pacific Commission, the *Quarterly Bulletin* and *Pacific Reading*, are shortly to be combined in one publication under the title of the former.

Pacific Reading is published by the South Pacific Commission Literature Bureau, established by the Commission to stimulate provision of literature and visual aids for island peoples. Each issue records information from the Pacific area about work being done there in the preparation, distribution and use of new literature and visual aids.

It is intended that the amalgamation of the two magazines will take effect from the July issue of the *Quarterly Bulletin*. Subscribers to *Pacific Reading* whose subscriptions have not been exhausted by that date will have them applied to the *Quarterly Bulletin*, without extra charge. Alternatively, the amount involved will be refunded where readers so desire.