Practical Fish-smoking in Fiji

By M. B. McGeever*

This article attempts to outline briefly the possibilities of fish-smoking as an aspect of fisheries development; it is based on an exercise carried out as much for its effect on islanders' morale in the aftermath of a hurricane as for its immediate economic benefits. The writer is an administrative officer, not a fisheries officer, and relied almost entirely for practical guidance on the article 'Curing Fish By Smoking' (South Pacific Bulletin, *April 1961) which described a technique developed by the Papua and New Guinea Department of Agriculture, Stock and Fisheries, and to whose anonymous authors he is greatly indebted.*

FISH, DRIED and smoked, has long been an important item of diet in the Pacific islands. In Fiji, the time-honoured method of processing it, however, does not lend itself easily to commercial exploitation, and in the past has been largely used as a means of preserving the odd fish left over from a subsistence catch, or for accumulating sufficient quantities of fish over a short period to deal with the demands made on village food supplies by an influx of visitors to a wedding or other ceremonial occasion.

In Fiji, the method in its basic form consists of suspending the cleaned and gutted fish, spitted on sticks, over a small smoky fire for several hours, until such time as they are considered to be 'done.' A rather more sophisticated method makes use of an old oil drum over the mouth of which a piece of wire netting is placed, a fire is lit in the drum and the gutted fish are then dried and smoked on the wire netting. It is often the practice to extend the processing over a period of several days, subjecting the fish to a daily 'booster' of heat and smoke to keep deterioration at bay.

Lack of Quality Control

In the hands of an expert, this traditional method can produce smoked fish which keeps well, and is appetizing and nutritious, but it is obvious that any kind of quality control is difficult, and the result is often a burnt, blackened, case-hardened product which would tax the ingenuity of the most patient and persevering of cooks.

Other disadvantages of this method are that the amount of fish which can be processed at any one time is limited to what can be suspended over a small fire or placed over the mouth of an oil drum, and that the fish needs constant supervision during smoking; for instance, it requires to be turned over at frequent intervals.

An excellent smoking and drying technique developed by the Department of Agriculture, Stock and Fisheries, in the Territory of Papua and New Guinea was illustrated in the article *Curing Fish By Smoking* (SOUTH PACIFIC BULLETIN, April 1961) whereby, with a minimum of equipment (which can be as expensive or as cheap as you wish to make it), considerable quantities of fish of all varieties and sizes can be processed to a high standard of quality and uniformity, with a minimum of labour and supervision, in a period of 24 hours or less.

The equipment as described in the article consists of drums or containers in which the fresh fish is steeped in brine, and a simple drier, which, as adapted in Fiji, is in essence a box, some 11 feet in height by 5 or 6 feet square; the roof is a hinged lid which can be propped open during the drying process.

Cash Income

Immediately after the hurricane in February 1965, the method was introduced into the Yasawa Islands in Western Fiji, as a means of providing cash income to the islanders whose food crops, coconut groves, and houses had been severely damaged. These islands are situated between 30 and 60 miles from the urban centres of Western Viti Levu which provide ready markets for fish and island produce.

Encouraging results were obtained from the first drier built, which was composed entirely of bush materials and a few pieces of old corrugated iron salvaged from a kitchen destroyed in the hurricane. Subsequently, a kit was made up consisting of—

- 4 x 13', 4" x 4" posts. (This allows 2 feet or so to be sunk in the ground).
- 10 sheets 7' x 3' corrugated iron (8 sheets for lower fireproof walls and door, 2 sheets for roof 'lid').
- 12 x 6', 3" x 2" bush poles for bracing walls and roof.
- 1 pair large 'T'-hinges and screws (for hinging roof 'lid').
- 1 pair small hinges and screws (for inspection door).
- 2 lb. assorted nails 3", 4", and 6".
- 1 lb. roofing nails and washers.

The cost of this kit would vary from place to place, of course, and much depends on the availability of transport to carry the materials to the eventual site. The basic cost, ex-store, in Fiji, is about £11. Almost any locally available materials can be used to furnish the 'walls' at the top of the drier, provided a reasonably air-tight structure is achieved. Planks from old crates and packing cases are ideal, but plaited coconut fronds are quite satisfactory, although they need replacement every two or three months.

Cleaning, Curing, and Smoking Process

The process followed was basically as described in the earlier article in the SOUTH PACIFIC BULLETIN, but with one or two variations to suit local conditions.

Cleaning

The fresh fish were carefully opened along the back by the use of a sharp machete, and the head was split along the same line. (This latter stroke was most effectively achieved with a sharp

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blow on the back of the knife from a billet of wood.) The backbone was left intact for the following reasons—

(i) It holds the flesh together during processing.

(ii) The local consumer appears to prefer the fish unfilleted, the presence of the bones is said to improve the flavour during cooking, and the flesh is easily removed during serving.

(iii) From the fisherman's point of view, the loss of weight between the cleaned fresh fish and the dried product, already in the region of 45 per cent, is kept to a minimum.

After being opened, the fish were carefully cleaned, the gills removed, and the dark coloured pancreas which adheres to the backbone, together with all blood, was washed away in clean water.

Curing

A brine solution consisting of 8 gallons of water, 12 pounds of good quality salt, and 1 ounce of saltpetre per 100 pounds of fish having been prepared, the fish were steeped for a period of 1 to 1½ hours. They were then taken out, rinsed quickly in clean sea water, strung on the sticks from which they were later to hang in the drier, and placed in the shade to drain.

Depending on the prevailing climate, the draining process took about 2 hours, and the fish assumed the tight 'tackiness' desirable for good smoking.

Note

Although it is best to use a fresh brine mixture for each processing, the brine can be re-used if it is first carefully strained through a cloth, boiled, and topped up with a little water.

Drying

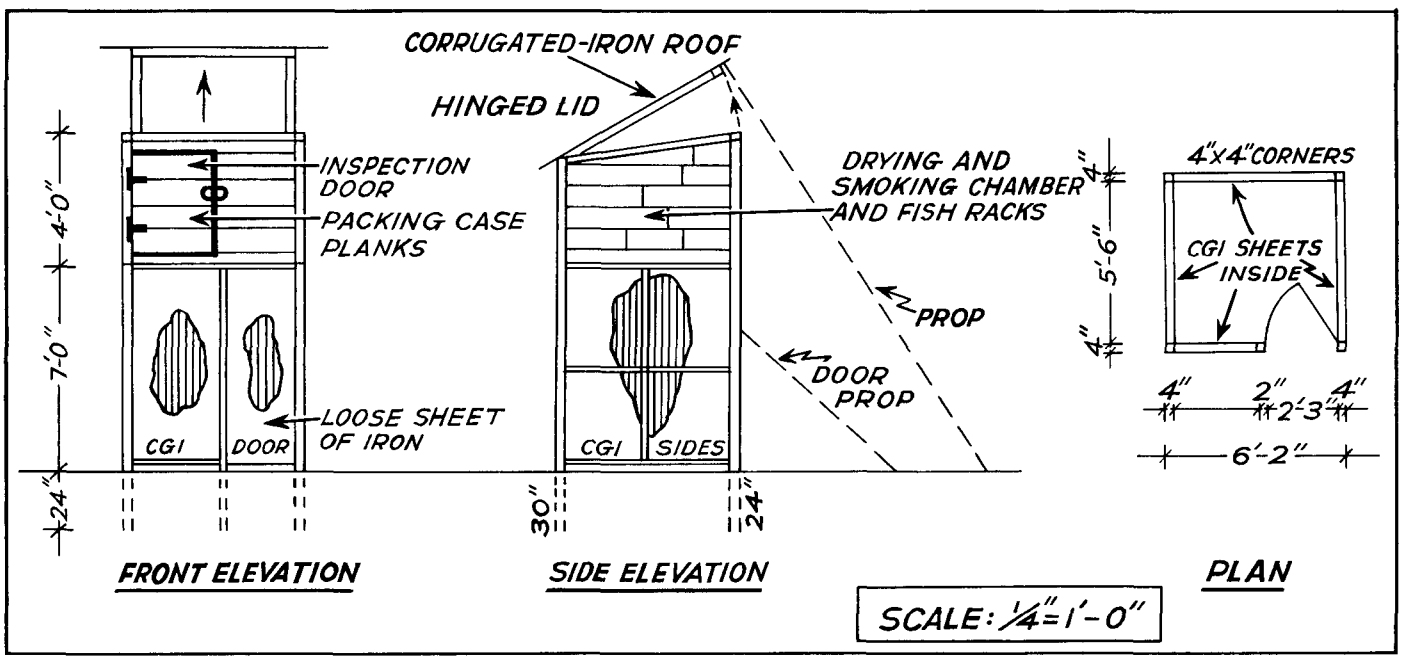
The fish were next transferred to the top of the drier and hung on the racks. The larger fish were placed in the lower part of the 'box,' and the smaller varieties nearer the top. The fish on the lower racks are thus suspended some 7 feet above the fire. Care should be taken to see that, as far as possible, the fish do not touch each other so that each one may receive a good draught of hot air.

To begin the drying process, the lid of the drier was opened wide and a very slow fire was started. After about 30 minutes the fire was gradually built up until a moderate heat was obtained, and this was maintained for about 2 hours. During this period a close watch was kept on the fish to ensure that the heat did not become excessive, a good indication of this being the tell-tale quivering of the fish in the rising heat.

Smoking

After 2 hours the fire was allowed to die down, the 'lid' was closed completely (interstices in the joints, planking, or thatch appear to provide sufficient ventilation for the fire and for the escape of any further moisture), the embers were then piled with coconut husks, the door was closed and, with only an occasional inspection, the fish were allowed to smoke gently for some 10 hours. A point to watch at this stage is that all fuel should be perfectly dry. Sawdust is better than coconut husks for smoking, but was unobtainable locally in the Yasawa Islands and could not be shipped over because of rhinoceros beetle control restrictions.

The drier was then opened (this was usually on the morning of the following day), the fish were allowed to cool down thoroughly and 'set,' and were then stored away from flies or other animal pests pending marketing.



Specifications and materials: 10 sheets 7 ft. x 3 ft. corrugated iron; 3 in. x 2 in. or 2 in. x 2 in. bush poles to frame or brace iron walls and roof. Packing case timber for walls of drying and smoking chamber. One pair of large 'T' hinges and one pair of small hinges. Screws, nails, and roofing washers.

Additional 'Wrinkles'

So much for the basic processing, which is almost exactly as described in the 1961 article. From experience, however, certain additional 'wrinkles' were learned which may be of use in other territories where conditions are similar to those in Fiji.

To begin with, whilst it would be splendid to have homogeneous catches of fish of the ideal size for smoking (about 2 lb. in weight), it is more often the case in island fishing to be confronted with a very mixed bag indeed. There may be anything up to six or seven species, varying in size from the barracuda of about $1\frac{1}{2}$ lb., to the large cod or grouper of 60 lb. or more (not to mention the ubiquitous shark, which, where food *tabus* permit, provides excellent smoked fish).

These large fish can be dealt with quite effectively in the standard drier, once they have been cut into pieces of about 2 to 3 lb. in weight. With the thicker-fleshed varieties such as cod or grouper, the piece may be simply tied, after curing, with pieces of string. This prevents the heavy flesh from falling away from the skin during drying, and the string can be removed once the fish has 'set' after processing.

Certain species, notably the horse mackerels, tend to form bubbles or blobs of moisture just under the surface of the skin during the drying process. Unless allowed to escape, this moisture may be resorbed into the flesh and thereby to some extent nullify the drying process. These blobs are easily observed in the light of the fire and are dealt with neatly by lancing them with a wire needle attached to a stick or cane of suitable length.

Keeping Qualities

The keeping qualities of fish subjected to this 'once only' processing will vary according to storage facilities and climatic conditions. Although flies pay absolutely no attention to the fish in the period when it is hanging up to drain, immediately after the curing process it is important to give it a degree of protection after the smoking process is complete, in case accidental breaking of the surface occurs in handling. Ideally, the fish should be hung in a specially constructed shelter, which need not be large, but which should have a weatherproof overhanging roof and walls of mosquito gauze or netting—a kind of glorified meat safe, which keeps out insects but allows free passage of air. Fish processed in this way should keep for about 10 to 14 days, however, if it is just loosely packed in closed cardboard cartons inside a house. The less handling the fish receives after processing the better.

Over and above this minimum processing, the longer the drying and smoking, the longer the fish will keep; conversely, it also has a less appetizing appearance and texture.

Where fish of the larger-scaled varieties, for example the snappers, are being processed for long keeping, it is also perhaps an advantage to remove the scales as, when dry, these tend to slough off in long storage, thereby depriving the fish of its protective smoke coating. The writer, however, never had the opportunity to put this theory fully to the test, and it was certainly not found necessary when keeping qualities of only 10 to 14 days were required.

Preparation for the Table

The fish can be prepared for the table in a variety of ways, one of the most popular being to boil it gently for about 5 minutes in water, discard the water (thus reducing the salt), remove the bones, and cook the resulting flesh slowly in coconut cream flavoured with onion and chili.

The economic aspects of fish smoking are very attractive if markets are available within a reasonable distance. The keeping qualities of the smoked fish allow the fisherman to fish throughout the week and market once only—at the weekend. This breaks the vicious circle which often prevails, in the absence of sophisticated freezing equipment, whereby the fisherman spends more time getting to and from his market, and selling his catch, than he does at his fishing grounds.

Smoked fish also has many advantages for the consumer. The urban worker usually likes to have fish on his table at least on Sundays, but he is often only able to purchase it at the Friday and Saturday markets. Unless he has a refrigerator, he must cook it there and then, or risk its spoiling overnight. In addition, many people come to the weekend markets from inland villages to sell their produce, and, faced with a long trek home, are reluctant to risk buying fresh fish. The result of all these factors is an over-consumption of imported tinned fish, which the availability of local smoked fish can help to counterbalance.

Financial Returns

Given reasonable marketing facilities, with improved fishing techniques such as long lining and deep lining, which allow the fisherman regular catches without denuding the lagoon fisheries (necessary for village subsistence), the financial return to the fisherman may be found sufficient to justify the necessary loan assistance to establish him as a full-time professional rather than the under-equipped, spasmodic provider of fish, at the mercy of wind and weather, which he often is today.

Yasawas fishermen in 1965 were able to command a price of between F2s 0d and F2s 6d per pound for their smoked fish of all varieties, and with one fisherman or small syndicate marketing between 100 and 200 lb. of smoked fish per week, an income was achieved which amply covered overheads such as benzine and boat maintenance, and left the fishermen a reasonable return for their labours. By fishing on their way to market, they were also able to sell both fresh and smoked fish on arrival, with little extra expense in either fuel or time.

Even if only 30 weeks' fishing is calculated per year—the rest of the time being accounted for by bad weather, attention to food crops, etc.—the fisherman may, by smoke-drying fish, substantially augment the income which he receives from his agricultural activities. This is particularly the case with offshore islands where land is limited and the population is inexorably rising.

In the Yasawas, the technique was introduced on a communal basis, at a time of communal crisis, in the wake of the 1965 hurricane. It worked satisfactorily in this way until the crisis had passed, houses had been rebuilt, and food gardens re-established. By late 1966, the driers had largely been taken over by individuals and small groups, some of whom continue to provide small but welcome consignments of smoked fish to the markets.

The technique could doubtless be very well worked on a co-operative system, but, with the small capital outlay involved, it is equally suited to the needs of the man who wishes to make fishing his principal occupation and his living.