new ways of keeping fish fresh

Take a fillet of cod and expose it to a controlled quantity of nuclear radiation.
What happens?
Its appearance is unchanged, but the fish — kept in a cool store — will still be edible and practically indistinguishable from fresh fish days, sometimes weeks, after ordinarily treated fish has had to be thrown away.
Advantages seem from this addition to preservation methods are reported following experimental trials on cod, lobsters and shrimps.

This use of the irradiation technique has been studied for many years for possible application in the preservation of other foods. One example is potatoes, which are now allowed on the market in some countries. In dealing with fish, care has to be taken to ensure against the possibility of food poisoning, such as has been known to occur with conventional methods, and of changing the flavour in a way which might wreck its suitability for sale. A comparatively low dose of irradiation intended only to pasteurize the fish and reduce bacterial contamination, is therefore used; the value of the technique, the critical extension of storage life which it permits, is effectively unimpaired.

Storage life is critical, because its extension could open up wide new markets within the great land masses and make a valuable source of protein more widely available. It could be of especial importance to a country such as Iceland, which has a fairly small domestic market for fish and exports a large proportion of its catch to Europe. A longer storage life could allow people who have never eaten "fresh" fish to buy it in their shops.

As reported in the Bulletin in 1968, the governments of the United States and of Iceland, in collaboration with the joint Food and Agriculture Organization/IAEA Division of Atomic Energy in Food and Agriculture, decided that year to carry out a shore-based experiment to determine whether this method of fish preservation is practicable under the actual conditions of the industry. The US Government supplied a 35 000 curie irradiation unit for use in the study — in practice it could be carried on the mother ship of a fishing fleet — and the Government of Iceland undertook to supply installations, raw materials, manpower and so on for the experimental team. The study was undertaken not so much for its immediate relevance to the Icelandic economy but because the information obtained could be useful in future.

The experiments concentrated on three products — cod (Gadus callaris), Norway lobster (Nephros norvegicus) and deep-sea shrimp (Pandalus borealis). They obtained their raw materials mostly from commercial fish processing plants and in some cases from fishing vessels at the time of landing, so that actual conditions could be approximated. To prevent discoloration of the lobster tails and shrimp, which can develop harmless melanosis, or black spotting, both were blanched by dipping them for a minute or so in boiling water before irradiation.

A report by two of the research team, G. Hannesson and B. Dagbjartsson, of the Icelandic Fisheries Laboratories, Reykjavik, tells the story of their results. The report was prepared for and discussed at a meeting of a panel of experts in the irradiation preservation of foods of marine origin in Vienna at the end of 1969.

"Untreated lobster tails are generally unacceptable after five to six days," the two reported. "Irradiated samples had a storage life up to three weeks; samples blanched for two minutes had a storage life up to four weeks. A longer storage life was obtained when the lobster tails were blanched for two minutes and then irradiated, and this combined treatment resulted in a storage life of about five to six weeks.... The most promising results found in this study were those that were obtained when the lobster tails were blanched for two minutes and then irradiated, preferably at a dose level of 2—3x10 rads. Storage life of such a product was found to be up to six or seven weeks at a storage temperature of 0—1°C, which is recommended for such products."

For deep-sea shrimp the optimal combination of treatments was felt to be five minutes blanching, followed by irradiation at a dosage of 1×10^5 rads. This also gave a storage life of six to seven weeks at 0—1°C.

The storage life of cod was judged partly on the basis of a test for odour, which the experimenters felt was "a convenient and reliable method of evaluating the quality of unprocessed white fish..." Results obtained by this test were in good agreement with other determinations. On this basis, unirradiated line-caught cod fillets stored at 0—1°C were rejected at seven days, and fillets of net-caught and trawl-caught cod after five days. Fillets irradiated with 2×10^5 rads were rejected only after 24 days, 20 and 19 days respectively.

The Icelandic workers emphasized strongly in their report to the panel meeting the importance of clean working conditions during the preparation of fish products for irradiation. "It may be said that as very fresh raw material, line caught cod and haddock, is always available in Iceland the radiation preservation should be performed in a shore-based radiation centre," they commented. "This shore radiation centre could also process other seasonal seafoods. The filleting of cod should be done by machine, and strict sanitation measures used during handling and packing prior to irradiation... Low level irradiation of whole, eviscerated cod showed a promise for export to foreign markets" as well.

Advantages in India and USA

Studies in India on Bombay duck (Harpodon nehereus), shrimps (Metapenaeus Sp. and P. stylifera) and pomfrets (Stromateus cinereus) gave equally encouraging results. The income from fisheries in India in 1966 was estimated at $80 m, with annual foreign exchange earnings of more than $17 m. Within this market freezing and canning processes have made great advances in recent years — up from 32 per cent in 1962-63 to 70 per cent in 1968 — but the domestic market has suffered from the difficulty of transporting fish products within the country from the main fishing areas off the west coast.

U.S. Kumta and A. Sreenivasan, of the Biochemistry and Food Technology Division of the Bhabha Atomic Research Centre, Trombay, reported that radiation processing in their country "can be expected to result in considerable savings within the fishery trade by centralization of filleting operations as well as reduced waste and distribution costs. Irradiated fish fillets with their increased shelf-life would allow regular and less frequent deliveries to the retail shops and offer significant prospects, especially for transportation from coastal regions to consumer centres."

Experts from the US Bureau of Commercial Fisheries reported that studies in the United States showed that irradiation processing could bring many benefits to the industry. "Most retailers see no particular advantage in extending the shelf life for much more than 11 or 12 days over that of the nonirradiated fresh fish," said the report. But, it went on, "retailers claim that using irradiated seafoods would permit holding of the fillets after the peak demand day in the week has passed rather than having to mark down the price or discard the fillets due to spoilage. The process would enable the retailers to offer fresh fish throughout the week to a degree greater than is now possible. Producers also claim that these savings can be passed along to consumers.

"Spokesmen for eight of the largest chain supermarkets in the nation state that they could, and would, sell irradiated fresh seafoods in areas where fresh seafoods are not sold now."