MERCURY IN FISH

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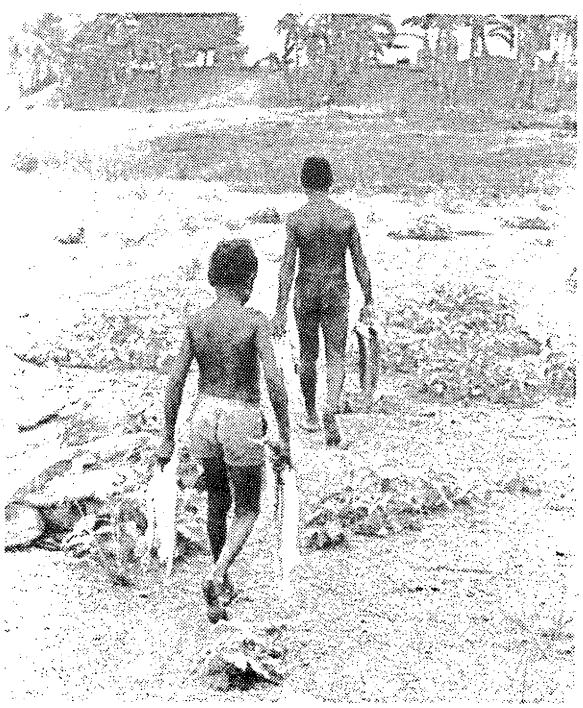
INTRODUCTION

Mercury has only relatively recently been known as a very dangerous environmental poison. It was recognised following outbreaks of poisoning in Minimata Bay (1953-1960) and Niigata (1965) in Japan.

The people in these areas were poisoned by methylmercury that was present in fish and shellfish they had eaten. It had been discharged from factories in industrial waste as either methylmercury or inorganic mercury.

Gradually the mercury built up in the sediments (mud) of Minimata Bay and the Angano River (Niigata). There, much of the inorganic mercury was converted by microbes into methylmercury. This poison began to build up in fish and shellfish. About 80-90% of the mercury in fish is methylmercury, the most poisonous form of mercury. By eating the contaminated fish, the people eventually became ill and many died.

As a result of these outbreaks, many countries have introduced regulations to prevent people eating fish that are contaminated with mercury. These regulations have had a serious effect on many fishing industries round the world. One industry in Papua New Guinea which could be affected is the barramundi fishery around Lake Murray and Daru.



Two boys returning from clearing their fishing net, Lake Murray, Western Province

THE EFFECT OF METHYLMERCURY

Methylmercury affects the central nervous system. Symptoms of poisoning include tremors (shaking), numbness in fingers and toes and a gradual worsening of sight and hearing. In bad cases, these symptoms get worse, the person becomes very ill and eventually dies.

The amount of mercury built up in people's bodies is estimated by an analysis of hair, urine and blood samples.

REGULATIONS TO CONTROL MERCURY

In order to control the amount of mercury people take in by eating fish, many countries have banned the eating of fish which contains over a certain level of mercury. Imports of fish containing over the maximum level of mercury are not allowed.

Australia, U.S.A. and Canada selected a maximum level of 0.5 parts per million (p.p.m.) based on the wet weight of the fish. Sweden, West Germany and Finland approved a limit of 1.0 p.p.m. In Japan a maximum level of only 0.4 p.p.m. was chosen, of which 0.3 p.p.m. could be methylmercury. The low limit in Japan is because a lot of fish is eaten there.

Fish often contain some mercury, even if there is no industrial pollution in the area. The introduction of the regulations has meant that fish from unpolluted areas are now sometimes banned for consumption. This has lead to the decline of some fishing industries. Those involving large sea fish such as swordfish, dogfish and shark are particularly badly hit. These fish do not pick up mercury from coastal pollution; they acquire it naturally through their food. In fact, it has been shown that museum specimens of tuna and swordfish collected about 100 years ago, contain about the same levels of mercury as those caught today.

Only one case of mercury poisoning due to eating fish not contaminated by industrial pollution has been reported. It was a woman in the U.S.A. who deliberately ate large amounts of swordfish as part of a weight reducing diet.

It has been calculated that before symptoms of poisoning show, a person weighing 70 kg would need to continue eating 4.1 kg of fish per week for 200 days (about 28 weeks). All the fish would have to contain 0.5 p.p.m. mercury.

THE SITUATION IN PAPUA NEW GUINEA

Fish caught in the sea and freshwater around Papua New Guinea usually contain very low levels of mercury. However, some barramundi caught in Lake Murray and around Daru contain levels of mercury which are close to the acceptable limit, whilst those from Baimuru, Kikori, Kaweto and Port Moresby contain very low levels. It is believed that the source of mercury in the Western Province is the Strickland River system. Mercury levels in the Fly River are relatively low, and there is, at present, no industrial pollution in the Strickland - Fly River system.

Most of Papua New Guinea's barramundi is exported to Australia and this means that it must comply with Australian regulations. At present, Papua New Guinea barramundi is acceptable in Australia but the imports are closely monitored because some fish from the Lake Murray and Daru areas have mercury concentrations close to the limit.

A lone fisherman returns to 2 waiting children. Lake Murray, Western Provin

WHAT IS BEING DONE

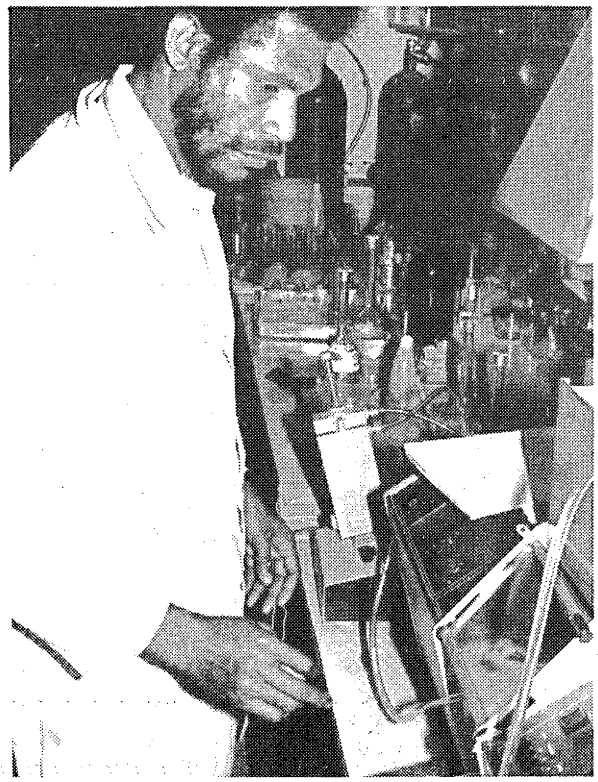
Papua New Guinea has no regulations to limit the amount of mercury in fish sold for local consumption, or imported into the country. However, the National Standards Council is now examining the problem of contaminants in food. They will eventually set limits for the amount of various contaminants, including mercury, that is allowable in food products offered for sale in Papua New Guinea.

Barramundi, like most other fish, tend to accumulate mercury as they get older. In general, it has been found that the bigger the fish, the higher the mercury content, so that if Australian regulations on mercury in fish become more strict, it may be necessary to restrict the export of larger barramundi.

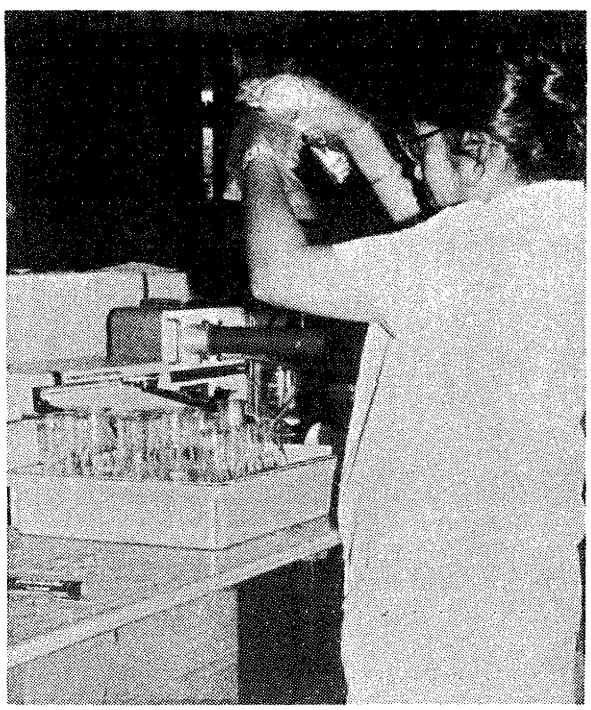
In order to estimate the effect of size on mercury content, the author, in association with D.P.I. Fisheries Research, has recently examined a large number of barramundi of different sizes from different regions of the Gulf of Papua (Kikori, Baimuru, Daru) and Lake Murray.

The mercury concentrations in the edible flesh of fish from these areas were determined at the Chemistry Laboratories, University of Papua New Guinea. The lengths and weights of the fish were recorded, and from this information, the fish sizes likely to have mercury concentrations which are close to the permitted level for export to Australia, were determined.

The results have been published as a internal report of the Fisheries Research and Surveys Branch of the Department of Primary Industry. The conclusions reached in the study were:



Analysis for total mercury in fish samples being performed by Atomic Absorption Spectroscopy in the Chemistry Laboratories, U.P.N.G.



Analysis for methylmercury and inorganic mercury in fish is performed using a mercury monitor. Chemistry Laboratories, U.P.N.G.

1. The mercury concentrations in barramundi from Daru and Lake Murray have an average concentration close to the limit of 0.5 ppm set by the Australian government. No one fish exceeded the exclusion limit of 1.5 ppm.

2. Mercury concentrations in barramundi do not correlate well with the length or the weight of the fish. In other words, small barramundi do not always have the lowest concentrations of mercury, and large barramundi do not always have the highest. Therefore, length or weight is not a good measure to use to control mercury levels in barramundi.

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