TUNA TAGGING IN PAPUA NEW GUINEA

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Village fishermen, particularly in the Manus, Morobe, North Solomons and Central Provinces, have traditionally relied on coastal tunas as a source of food and have developed special techniques to catch them. As canoes are used, fishermen rarely ventured more than a few miles offshore, and the abundant schools of tuna spread throughout the seas of Papua New Guinea remained unfished. To investigate the potential of this untapped resource, a tuna-fishing company, a Japan-Australia joint venture, was formed in 1970 and experienced good catches almost immediately. Soon after, three other companies began operations, and it was obvious that Papua New Guinea would soon have an important industry based on a type of fish about which very little was known in the Western Pacific—the skipjack tuna.

As the fishery quickly grew in size, it became increasingly important for the government to be in a position to answer such questions as—

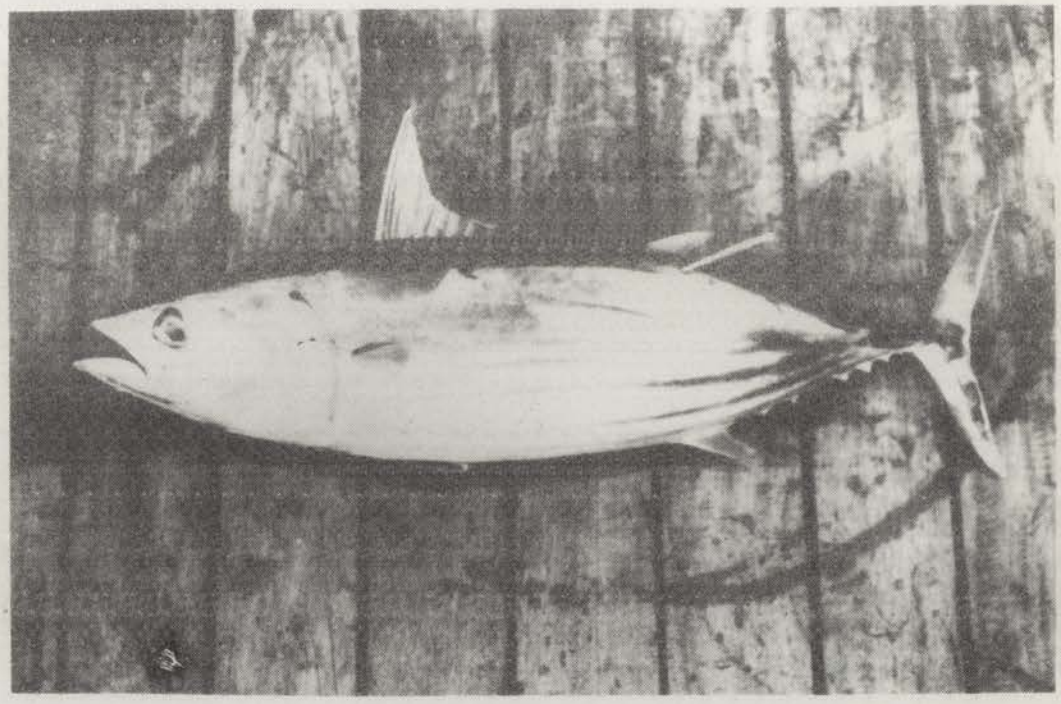
- Do these migratory fish spend all their life in PNG waters and if not, where do the skipjack which are caught here come from?
- Are other countries catching some of the same fish which are caught in PNG?
- Can an understanding of the skipjack's movements be used to help fishermen?

Some of these questions are not applicable to most of the fish we are familiar with, those of the coral reefs, beaches, mangroves and rivers, because they tend to spend their lives in one fairly small area. Tunas, on the other hand, are wide-ranging inhabitants of the open sea and some species are known to cross oceans several times during their lifetime, so these questions become quite important.

A common approach to this problem is to catch the fish being studied, mark them and

Fishing for tuna from traditional canoes in sheltered waters.

Inserting the tag into a fish held in the tagging cradle.



A tag inserted into the back muscle of a tuna.

release them. With the co-operation of fishermen, marked fish which are recaptured are returned with information on how, when and where they were caught. Over a period of time, answers to some or all of the questions asked can gradually be obtained.

Tagging tunas, however, presents problems. With their streamlined shape and special red muscle for endurance, they are built for constant rapid motion and depend on drawing a continous supply of oxygen from the sea-water passing over their gills. To remove them from the water for even a short time, particularly if they have been roughly handled during capture, means permanent internal damage and usually death. As it is important that as many as possible of the marked tunas survive, it is necessary that—

- Each fish is marked and returned to the water within 15 seconds of being hooked.
- The marker, or tag, should not damage the fish. It should remain securely attached and not be pulled off by the continuous fast flow of water, yet not interfere with the fish's normal movements.
- Each fish should be handled carefully and any which appear even slightly damaged should be rejected for tagging.

The tagging method

Tunas are caught using a variety of techniques—trolling from a moving boat, gill netting, purse seine netting (a very large net surrounds the whole school), long-lining and pole-fishing. The last technique, which is the basis of the commercial fishery in PNG, provides skipjack in the best condition for tagging. Small baitfish, kept alive on the fishing vessels, are thrown into schools of tuna. This excites them to the point that they will strike at feather jigs (coloured feathers bound on to a metal hook so as to resemble a small fish) on lines attached to poles (usually 2.5 to 3.5 metres long). They are then lifted into the boat and because the hook has no barb, are easily, shaken free. One man can pole four or more fish a minute when fishing is good.

When tagging however, the fish are not flipped over the fisherman's shoulder and on to the deck, but are directed towards a special cradle lined with wet slippery plastic. Here, the hook is gently shaken loose, and the fish slides down the sloping cradle towards the tagger's hands. He quickly measures it, inserts the tag and drops the skipjack over the side where it falls a few feet into the water. As

Poling tuna.

many as 800 skipjack have been tagged in one day, and as the usual size of skipjack in PNG is around 3 to 4 kilograms, this means that the tagger could throw 2½ to 3 tonnes of live tuna over the side on an exceptional day's tagging.

The tag

The tag resembles a small arrow, consisting of a flexible yellow tube with a nylon barb attached. The bright yellow colour helps to make it easier to see the tags, which is important when there are several thousand fish on deck.

The tags are about 11 cm (4½ inches) long and each one has its own individual number plus the words "DASF PORT MORESBY"*.

The tags fit neatly into pieces of stainless steel tubing which are sharpened at one end and can cut easily through the skin. The tubing, loaded with the tag, is pushed into the tuna's back, just under its second fin, i.e. the one which does not fold down. The tag barb

* The newest batch has the words "FISH RESEARCH PORT MORESBY"

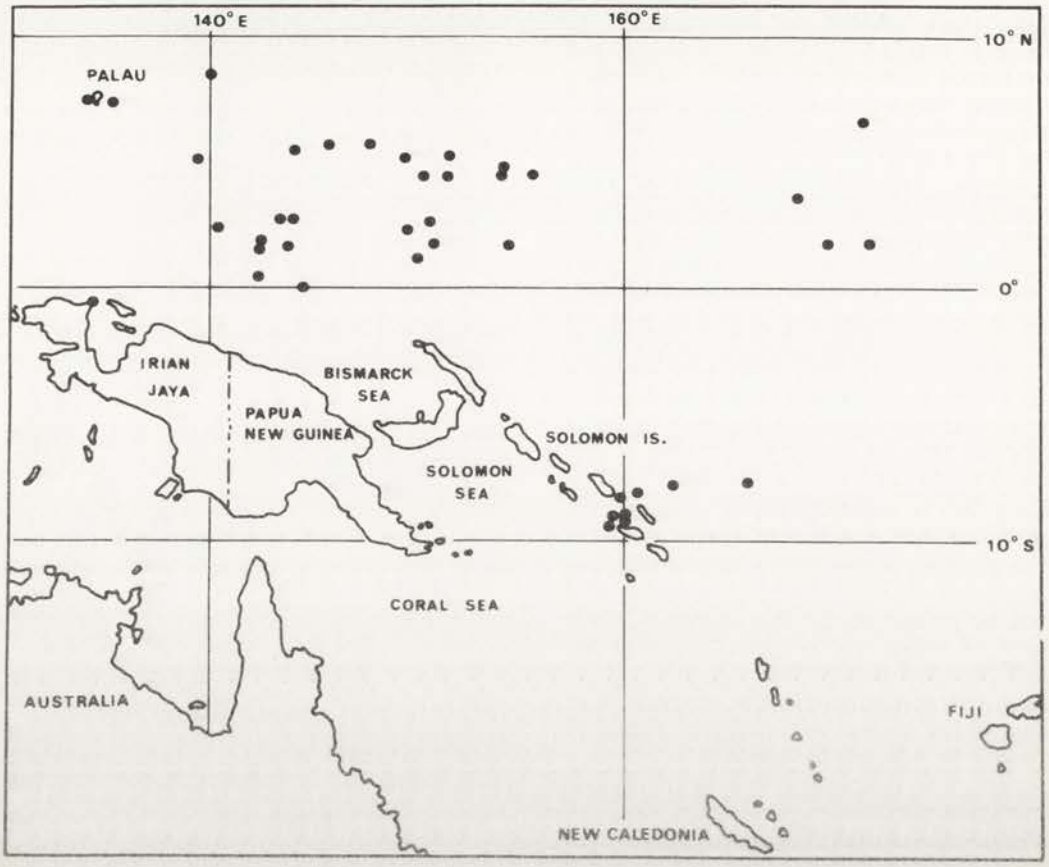


Figure 1.—Tag recoveries outside waters adjacent to Papua New Guinea.

hooks behind one of several small bones which support this fin and lock into place, while the tubing is pulled out. Care is taken not to push the tag in too far, to avoid striking blood vessels and damaging the fish unnecessarily.

If the procedure described is followed, fish are back in the water within ten seconds of striking at the jig.

They are generally in good condition and swim away rapidly; some are occasionally caught again immediately, and most fish probably do not suffer serious damage during tagging.

Numbers tagged and released

Since late 1971, when the work started, nearly 13 000 tunas have been tagged and released. Skipjack made up most of these (11 600), with yellowfin (nearly 1 000) and longtail tunas (about 400) tagged in smaller numbers. Yellowfin tuna grow much bigger than skipjack (up to 135 kg or more, as against about 14 kg for skipjack in PNG). Young fish (less than 10 kg) make up a small percentage of the commercial catch. Longtail tuna are a coastal species found only in the Gulf of Papua.

The majority of these tunas were caught and released from the Department of Primary Industry research vessels "Tagula" and "Rossel". Others have been released from commercial fishing vessels and on joint research cruises with Japanese scientists. Most work has been done in the Bismarck Sea where the Papua New Guinea fleets operate.

Recoveries of tagged fish

Over 750 tagged tunas have been recovered with information provided on their recapture. There is a reward of K2.00 for each tag returned with all the required information

Most of the recaptures have come from fishermen of the PNG-based companies, and boats based in Japan but fishing long distances from their home port. Papua New Guinea fishermen don't catch large numbers of skipjack very often, since the fish usually stay in the clear blue water outside the reef, but nevertheless, two recoveries have been made by local fishermen in canoes near Madang.

We also know of village fishermen catching tagged fish, seeing the tag and letting the fish go because, unfortunately, they though it was government property. Other tags are lost simply because they are not noticed on deck, but some of these are noticed later in canneries when the fish are being cut up. From checking boat catches and company catches, we know also that some boats and some companies are more careless than others and not all tagged fish are reported. Despite the loss of some tags, a very large amount of valuable information has been collected from the recoveries.

Skipjack have been recaptured two years after release; others have been recaptured, released and recaptured a second time. Many had moved only a short distance from where they were released; others were recaptured as far west as Manokwari in Irian Jaya (by a canoe fisherman), as far north as Palau, as far east as the Marshall Islands, nearly 3 000 kilometres away, and as far south as the Solomon Islands *(Figure* 1).

The results show that the skipjack are basically passing through Papua New Guinea waters—some may stay two years, others two weeks, but the paths they follow *(Figure* 2) are generally the same from year to year. We do not really know what factor or factors they are responding to as they make these migrations—currents, temperature, availability of food or other more subtle cues in their ocean world. What we do know is that skipjack tuna comprise a truly international resource not contained within national boundaries and as fishing pressure on them continues to increase, only a co-ordinated international approach will make it possible to reap this rich harvest year after year to the benefit of all nations in the Pacific.

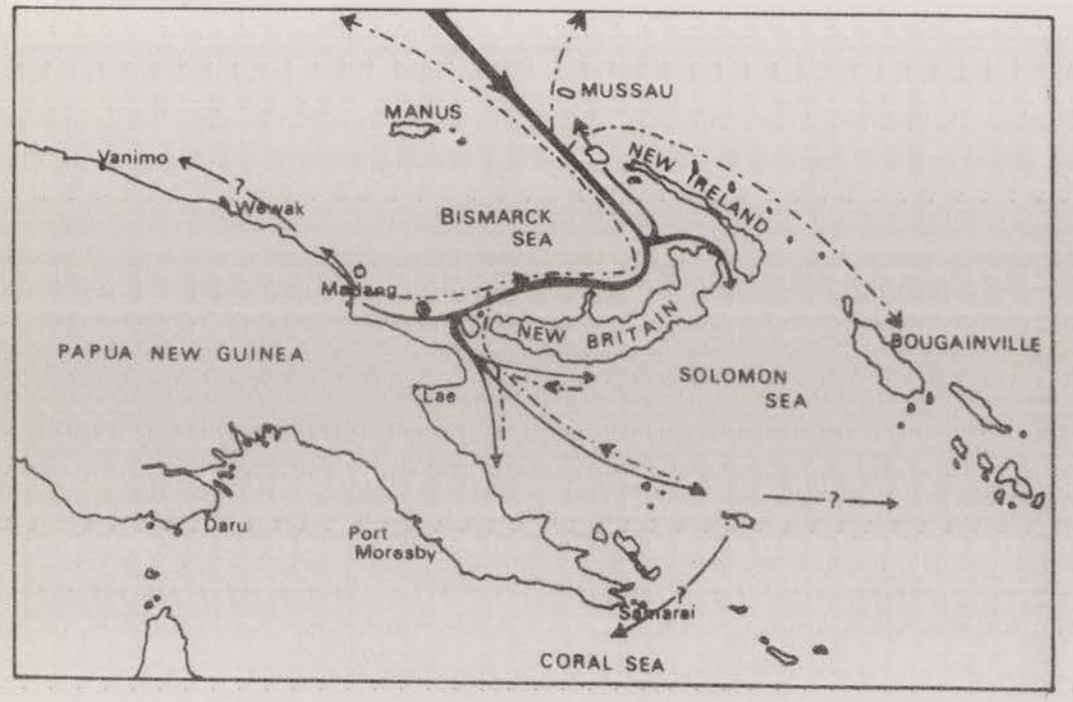


Figure 2.—**Skipjack movements within the Bismarck Sea.**