

# THE FISHERIES BIOLOGY OF BECHE-DE-MER

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The fishery for bêche-de-mer or sea cucumber provides a useful source of income for many small fishing communities in the tropical Indo-Pacific. In Fiji the fishery produces around 30 tonnes of dried product per year, with a total value of around F\$70,000. Other areas where bêche-de-mer is produced include Solomon Islands, Papua New Guinea, Palau, Tuvalu, Sri Lanka and the Philippines. Collecting and drying bêche-de-mer is an industry particularly suitable for small outer island communities because only very simple technology is required and there is no need for refrigeration. Bêche-de-mer are easy to collect since they are very slow moving animals (top speed about one metre per hour).

The Chinese regard bêche-de-mer as a great delicacy and the product finds a ready market in Hong Kong and Singapore. Made into soups or combined with other foods in tasty stir-fried dishes, beche-de-mer is said to have a delicate flavour, reminiscent of abalone. No Chinese banquet is complete without it. Bêche-de-mer is also credited with medicinal powers. It is said to be especially beneficial for high blood pressure, and its reputation as a "love medicine" is legendary. Chinese scientists also claim success in the treatment of muscular disorders in old age patients using a preparation from sea cucumber.

## Fishing for Bêche-de-mer

Bêche-de-mer are collected either by

wading in shallow water or by free diving (scuba equipment is not usually available). Where bêche-de-mer are found in deep, clear water, the fishermen sometimes use a weighted and barbed spear which they lower on a length of line and use to impale the bêche-de-mer. It is said that under very calm conditions bêche-de-mer can be retrieved from water as deep as 30 metres using this method.

## Processing

Processing bêche-de-mer involves cleaning and drying them. The bêche-de-mer are first boiled and gutted, then dried for about 36 hours in a smoke drier and finally dried in the sun. They are then packed in sacks ready for shipment. The technique is not difficult, but care is required at all stages so that the final product is neither soft nor misshapen,



*The boiling stage during the processing of bêche-de-mer.*

(Photo: Les Nouvelles Calédoniennes)

*Bêche-de-mer being placed in a smoke drier.*

(Photo: Les Nouvelles Calédoniennes)



since these factors affect its value.

The South Pacific Commission has sponsored courses in bêche-de-mer processing since 1977. Trainees from these courses are now helping to establish bêche-de-mer fisheries in New Caledonia, French Polynesia and Tonga.

#### Species of Bêche-de-mer

Many species of sea cucumber can be found on the reefs of the Pacific Islands but only a few are of value as bêche-de-mer. Generally speaking, the valuable species are large and have a thick body wall. An exception to this rule is the elephant's trunk fish (*Microthele axiologa*)

#### Commercially Valuable Species of Bêche-de-mer

Scientific name	English name	Chinese name	Value <sup>1</sup>
<i>Microthele nobilis</i>	teatfish (black and white varieties)	white stone and black stone	F\$5.50
<i>Thelenota ananas</i>	prickly red fish	plum blossom fish	F\$4.85
<i>Actinopyga</i> sp.	blackfish	blackfish	F\$2.20
<i>Actinopyga echinites</i>	deepwater redfish	—	F\$2.20
<i>Metriatyla scabra</i>	sandfish	chalkyfish	F\$1.65
<i>Thelenota anax</i>	amberfish	—	*
<i>Actinopyga mauritiana</i>	surf redfish	—	*

1. Per dry kilogram, first grade product.

\* Value unknown, market research needed.

which, although of large size and having a thick body wall, is worthless because it is said to have poor flavour. The commonest species of sea cucumber, the small black lollyfish (*Halodeima atra*) is unfortunately also virtually worthless.

A handbook produced by SPC, *Bêche-de-mer of the tropical Pacific* (in press), contains more detailed information about species identification, processing techniques, and marketing.

#### Research Programme

Because of increasing exploitation of beche-de-mer, concern has been expressed that overfishing might occur. Some rich beds in Fiji and the Solomons are already

said to be showing signs of depletion. It was therefore decided that a basic biological research programme should be carried out on the commercial species of bêche-de-mer. This programme began in August 1978 in Fiji under the supervision of the Fisheries Division and on funding provided by SPC. Aims of the programme are to study growth, natural mortality, habitat requirements, abundance, reproduction and juvenile ecology. This will enable estimates to be made of how much bêche-de-mer should be harvested. Previously, almost nothing was known about any of these factors.

Here is a summary of what has been learnt during the first year of the study.

#### Habitats and Abundance

Much has been learnt and this knowledge has already proved of value in predicting where rich bêche-de-mer beds are likely to occur.

The teatfish, the most valuable species of bêche-de-mer, occurs in two colour varieties, a black variety and a white variety. The two forms occur in different habitats. The black teatfish is commonest in water 2-3 metres deep on the reef top and particularly on flat areas of dead coral which have a fine surface layer of silt. The white teatfish occurs on the landward side of barrier reefs in water between 2-30 metres deep. Where turtlegrass beds occur, as on the south-east coast of Viti Levu, large teatfish can be found in water less than 10 metres deep. However, where turtlegrass is absent, as in the lagoon of Tahiti and in the Lau Islands of Fiji, they occur at depths of 20-30 metres, often in association with seagrass or particular kinds of seaweeds. It seems that the abundance of the white teatfish is related more to the availability of a suitable habitat than to water depth.

It is thought that the beds of marine plants act as traps for organic detritus<sup>2</sup> which is the food of bêche-de-mer. The plant beds also provide a suitable habitat

2. The broken down remains of dead animals and plants.



A Fijian diver dives for *bêche-de-mer* in the Lau Islands.

(Photo: N. Penn)

for the young (as discussed below). The depth at which these plants occur is dependent on the clarity of the water.

#### Growth and Mortality

It is essential to know something about these factors if a realistic estimate of sustainable yield is to be obtained. A common method of measuring growth and mortality is by a tagging study. Unfortunately, there is no known method which can be used to tag or mark *bêche-de-mer*. This is because these animals have a prodigious ability to regenerate tissue damage and reject tags, which are lost in a matter of days. Dyeing and branding have also proved unsuitable. Nevertheless it is possible to obtain at least a rough idea of growth and mortality rates by measuring the growth of size-classes, and by keeping individuals in enclosures in the sea.

#### Reproduction

By monthly study of samples of reproductive organs it is possible to determine whether there is a distinct breeding season. Evidence so far shows there are individuals in breeding condition throughout the year. Madame C. Conand, a scientist at the ORSTOM Centre in Noumea, is also studying this topic. Study of the reproductive cycle

females raise their front ends in a cobra-like fashion and release the eggs and sperm from a pore just behind the feeding tentacles. It is planned to try rearing the planktonic<sup>3</sup> larvae in captivity in order to learn more about this stage of the life cycle.

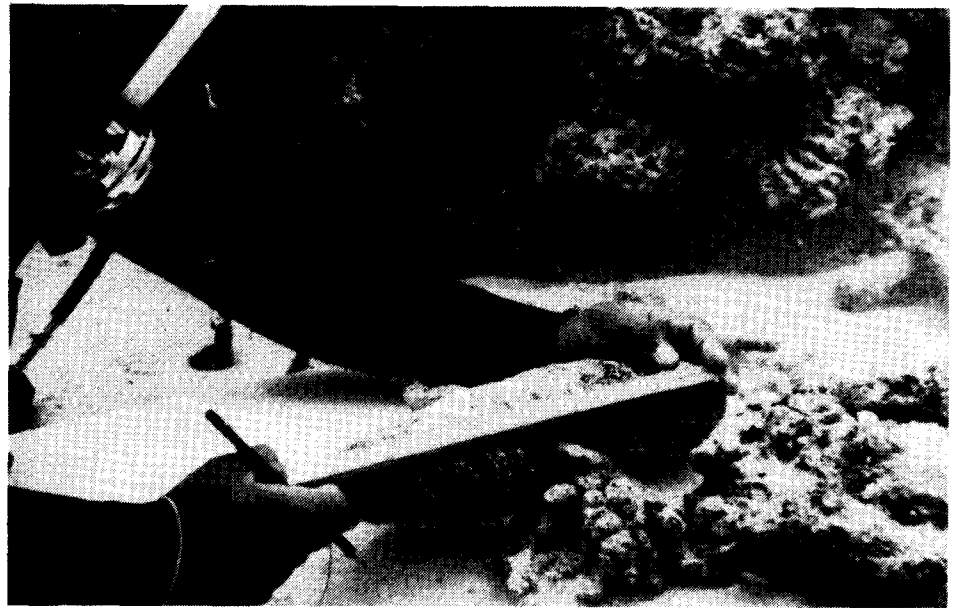
#### Juvenile Ecology

Many interesting facts have been learnt about the ecology of juvenile white teatfish. Before this study, the appearance and habits of young *bêche-de-mer* were a complete mystery. The reason for this is that the young, at least in the case of the white teatfish, are camouflaged. Perhaps this is because predators, possibly stingrays and turtles, would otherwise eat them. White teatfish less than about 20 centimetres long live hidden among turf-like seaweeds. The camouflage is made still more effective by patches of brown on the body, the same colour as the seaweed. These patches are absent in the adults. Very small, brown sea cucumbers between 1-10 millimetres long can also be found in the same habitat. These are believed to be young white teatfish which have recently changed from the planktonic form.

#### A Sea Cucumber Farm?

In conclusion, it is interesting to note

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Measuring *bêche-de-mer* as part of a stock assessment programme in the Astrolabe Lagoon.

(Photo: N. Penn)

3. Floating freely in the sea.