Beche-de-mer research and development in Papua New Guinea

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Fishery

PNGs Beche-de-mer fishery dates from the 18th century. At one stage in 1903 beche-de-mer became the fifth largest export for British New Guinea. In recent years, beche-de-mer has slowly become an important income earner for the coastal and island communities especially at this time of depressed copra prices which is the traditional cash generating product for the island communities.

A private beche-de-mer buyer in PNG shows local fishermen to correct way to process sandfish (Photo: Paul Lokani)

Average prices paid to the fishermen bringing in dried beche-de-mer in Kavieng in early 1990 was Kina 5.00/kg. Fishermen can however get a top price of K10.00/kg for super grade sandfish (*Holothuria scabra*), while the exporter can get up to K 23.00/kg (FOB).

Beche-de-mer is known to be consumed in a very few communities in PNG but it is not important in the diet of the local communities. The Kombe people in the West New Britain province consume some *Actinopyga* species and some areas in Manus use *Holothuria atra* to fish for octopus. Beche-de-mer is important only as an export commodity.

The beche-de-mer species are being exploited by free diving, wading and with the aid of a light during the night. Night fishing targets sandfish. Fishermen report a higher catch rate for the larger species of sandfish in the night compared to daytime collecting.

The species currently exploited are: sandfish, white teatfish (*Holothuria fuscogilva*), black teatfish (*Holothuria nobilis*), blackfish (*Actinopyga miliaris*), deepwater redfish (*Actinopyga echinites)* and surf redfish (*Actinopyga mauritiana)*. About 95 per cent of the products are shifted by air within the country and at export.

In 1989, sandfish accounted for 70 per cent of the total beche-de-mer export. This is a high valued species which was targeted as in a typical beche-de-mer fishery which targets the high valued species in the initial stages. Figure 1 shows the case of the Tigak Beche-de-mer fishery. As the production of the sandfish dropped, which was directly due to decreasing stocks, the other species picked up production.

Table 1 shows the production of beche-de-mer for the last 9 years.

Most of the products have been harvested from the Milne Bay, New Ireland, Manus and North Solomons Provinces. In the beginning of 1990, production has picked up in the East New Britain and West New Britain provinces.

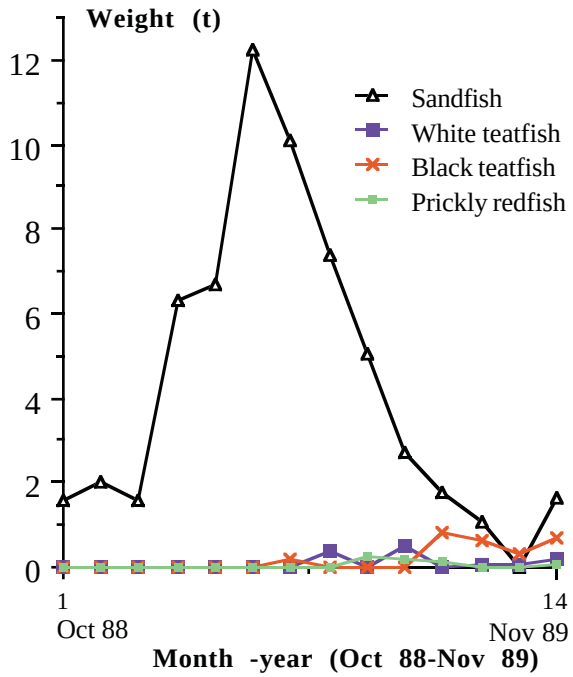


Figure 1. Beche-de-mer production by species for the Tigak area

Table 1. Beche-de-mer exports from PNG since 1982

Year	Weight (t)	Value (Kin
1982	8.415	26,201.11
1983	7.630	23,938.97
1984	4.668	13,472.49
1985	19.491	58,192.00
1986	105.942	349,158.00
1987	192.055	591,009.22
1988	202.789	801,770.13
1989	194.896	1,146.584.85
1990 (to March)	43.168	201,812.61

Research activities and results

There has been widespread concern from the provincial fisheries authorities that local overharvesting of beche-de-mer species was becoming very common and that there was a need to enforce some management regulations. This was discussed in the 1988 and 1989 Fisheries Advisory Committee meeting and also noted by the Fisheries Sector Review in 1988 which made the following recommendations:

1. Exports be subjected to tighter control, with species declared separately, as well as grades, and Province of origin specified.

2. Introduction of a minimum size restriction.

In connection with both of the above, some training of inspection staff would probably be needed.

3. Quick effective survey techniques need to be developed by RSD staff and recovery from exploitation monitored in selected areas.

4. Greater Provincial involvement in monitoring production should be encouraged.

Information on the biology and exploitation of beche-de-mer species in PNG is very limited or absent. Management will therefore be a problem as there are no facts to base any management regulations on. To compound the problem there is no known beche-de-mer fishery in the tropics that is managed. While the state of Queensland in Australia has a minimum size limit of 15 cm for beche-de-mer species the fishery in this area is not in existence.

The Department of Fisheries and Marine Resources in PNG is embarking on a research programme to study some aspects of the biology and ecology of beche-de-mer species for the rational development and management of this resource.

Gonad sampling:

Gonad sampling started in April 1989 for the following species:

1. *Holothuria scabra*
2. *Holothuria fuscogilva*
3. *Holothuria nobilis*
4. *Actinopyga miliaris*
5. *Actinopyga echinites*
6. *Thelenota ananas*

Populations of the above species are being sampled once every month for gonad to look at the seasonality in spawning. Gonad samples are running through on the second year and will continue until the full two years through to 1991.

Gonad Index (G.I.) is calculated as follows:

G.I. = gonad weight / whole weight x 100

G.I. is also being calculated as a ratio of the gutted weight. It appears that spawning occurs throughout the year under the influence of the lunar cycle.

Growth trials

Growth trials on *Holothuria fuscogilva* and *Thelenota ananas* in the field started on December 1990. The animals are kept in enclosures 2 m by 1.5 m at a depth of 12 m and 22 m. The enclosures are constructed of arch mesh wire and covered with half inch mesh chicken wire.

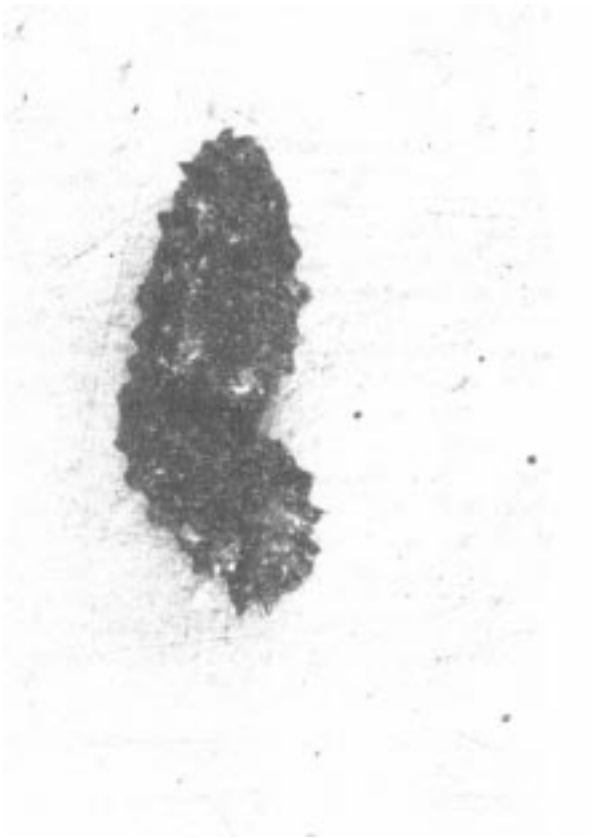
The enclosures for *Holothuria fuscogilva* were placed in a sandy substrate while the enclosures for *Thelenota ananas* were placed in a rubble and stony substrate. The substrate types were chosen according to their association with each species.

PNG sea cucumber fishermen use simple fences made from sticks and chicken wire to accumulate enough supplies for processing (Photo: Paul Lokani)

Measurements of the length and weight are taken every month. The length is taken at the seafloor while the animal is stretched on its natural stage while the weight is measured at the surface. *Thelenota ananas* had a very high escape rate. After 4 weeks, all the animals escaped. Some of the animals developed lesions sustained while trying to escape.

Only one *Holothuria fuscogilva* died while in the enclosure. The rest of the *Holothuria fuscogilva* were very healthy after five months in the enclosures.

There has not been any significant growth detected after four months in the enclosures. This is perhaps due to the fact that food has been limited. To remedy this situation, the enclosures will be moved every week a few meters from the original position, so the animal has a new feeding ground every week.



Prickly redfish (*Thelenota ananas*) with lesions (injury) sustained while trying to escape from the enclosures in the growth trials. (Photo: Paul Lokani)

Pilot survey

A pilot survey has been conducted in May 1990 and to be completed on July 1990. The aim of the pilot survey is to test the different survey methods (transect, quadrat and Manta Tow) and test the different sizes for sample optimisation in terms of cost and the precision of the abundance estimate.

Results of the distribution of the commercial species in terms of habitate and depth from the pilot survey will be an invaluable help to the above. Plans and the survey methods to be used in the provincial surveys will rely on the results of the pilot survey.

Sea cucumber research in Washington State

by Alex Bradbury
Washington State Department of Fisheries, USA

The only species of commercially exploited holothurian in Washington State, USA, is *Stichopus californicus*. Alex Bradbury, biologist in charge of managing echinoderm fisheries with the Washington State Department of Fisheries, sent us the following notes about his work.

' We have a single commercial species here, *Stichopus californicus*. The commercial dive fishery is long established, but only in the last few years has it grown to a size that warranted more than cursory management. We also have an experimental beam trawl fishery that began in 1987.

Over the last few years, the urchin and cucumber fisheries have grown seven-fold in terms of fleet size, and this winter I have been swamped in legislative battles for limited-entry, lawsuits, emergency closures, etc. I have little time to think about biology.

We still do not actively survey state waters for these animals; only during our dive surveys for sea urchins and geoduck clams do we make incidental counts of cucumbers. This began in 1986, and I have real reservations about its usefulness to management. I have requested funds for video equipment, since this seems the ideal way to make quantitative surveys. So far, we haven't got either the money or time to do these surveys. Instead, our management continues to rely on analysis of fisherman logbooks for catch-per-unit-effort data.

When we do our underwater surveys, we swim a 900 square-foot transect (83.6 square meters) and simply count animals. We use a spool containing 150 feet of polypropylene line weighted at intervals with bits of lead. The spool itself has handles that extend 3 feet on either side of the spool centerline, so that we survey a 3-foot by 150-foot area. Two divers operate the spool, one on either handle, so that each has to count a 450 square-foot area—with our poor visibility in these waters, that's about the most we can expect to cover and see all animals. During our regular geoduck clam surveys, we run continuous transects from the -18 foot level to -60 foot level, with a line of such transects made every 500 feet of shoreline; we survey about 300-500 acres of geoduck habitat each year. During our sea urchin surveys, we run about 70 transects per year. As I said, we count sea cucumbers during both the geoduck and urchin dives.

This year's season began on May 1; by the time you receive this, we'll have completed our seventh underwater survey at Pulali Point, the area we are monitoring for recovery following commercial harvest. So far we have performed six surveys prior to the area being fished; these surveys were performed every two months over a year's time. During each survey, we counted sea cucumbers within 12 transects, each measuring 83.61 square meters. Transects were placed at four different depths, ranging from -7.62 m to -25 m (corrected for datum tide level). Our seventh survey will be the first since the area was opened for fishing on 1 May 1990. We are monitoring the fishery at this site via mandatory fishing logs, so we should have some catch-per-effort data as well as total harvest data. Naturally, we will continue our dives every two months for several years to monitor recovery.

We have done some simple research projects near our lab on Hood Canal. We have completed two years of work collecting monthly samples of cucumbers from a discrete, unfished area. While we haven't fully analysed the results, the data show pretty clearly that cukes cease feeding in the fall and lose weight in the winter. Longitudinal muscle weight during the first year peaked in May and reached its lowest level in November, a drop of 37 per cent. Body wall weight peaked in October and reached its lowest level in January, declining 20 per cent. Peter Fankboner found a similar thing occuring to cukes during the winter.

We began an ambitious tagging/movement study in fall of 1988. Our objective was to determine if cucumbers moved between shallow and deep water. We used Floy tags with a double 'T' at each end (on the assumption that cukes could withdraw a single-T tag into their body cavity and expel it). We held 18 tagged cukes for 88 days and found that 28 per cent died during this time. Untagged 'control' cukes experienced no mortality during the same period, although all animals held for this study showed a decrease in size index. Only one cuke that survived this 88-day period lost its tag. We then dived an open, rocky area near our lab and tagged 720 cukes in 35 feet of water over a three-day period. Every two months since then we have dived the area, counting cukes at various depths within a series of 900