

Potential Market for Frozen Beche-de-mer in New Zealand

By-Pro Marketing (P.O. Box 38679, Petone, New Zealand), is trying to establish itself as a beche-de-mer middleman in the Cook Islands, as well as other South Pacific nations. By-Pro's field representative and co-owner, Raymond Joe, has met with Cook Islands Marine Resources to discuss the market potential of its beche-de-mer. Besides wanting to deal in the normal smoked/sun dried product, he claims that By-Pro has located a market for frozen beche-de-mer that has simply been gutted, or gutted and then boiled, depending on the species. Another interesting claim is that besides for any of the established commercial species, he has found a market for gutted/frozen leopard fish (*Bohadschia argus*), which is traditionally not a commercial species. The species found in the Cooks that they wish to buy, and rough prices for the different processing methods of each are as follows:

Species	NZ\$/kg dried	NZ\$/kg frozen
<i>Thelenota ananas</i>	5	3-4
<i>Holothuria nobilis</i>	4-5	3-4
<i>Actinopyga mauritiana</i>	2-3	2
<i>Bohadschia argus</i>		2-3

By-Pro Marketing is seeking as much beche-de-mer as it can get, and has proposed setting up a sea freight container/freezer, for storing beche-de-mer produced in the Cook Islands, and then shipping it off when full. If By-Pro Marketing's claim pan out, beche-de-mer processing in areas with freezers may become much simpler, and for those who also have commercial quantities of *B. argus* it may provide an opportunity to tap another profitable resource.

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Research Officer

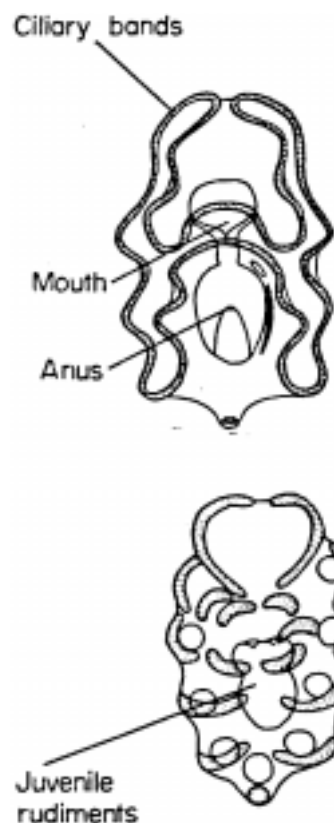
Cook Islands Ministry of Marine Resources

It is interesting to note that the price for gutted/frozen *B. argus* is in the same league as for the high commercial value species *T. ananas* and *H. nobilis*. *B. argus* may only be gutted and then frozen, because boiling water causes its body wall will disintegrate.

Beche-de-mer resource management studies in Guam

A team of researchers at the University of Guam, under the supervision of Marine Laboratory Director Bob Richmond, are undertaking a comprehensive research programme to investigate the biology and ecology of three commercially important sea cucumbers - *Actinopyga mauritiana* (surf red fish), *Holothuria nobilis* (black teatfish) and *Thelenota ananas* (prickly red fish). The programme involves experimenting with spawning induction and larval rearing, and artificial induction of fissioning (asexual reproduction), as well as abundance surveys in various parts of Micronesia. Much of the work is a preliminary to looking at the possibility of enhancing natural sea cucumber stocks by seeding with juveniles, and, ultimately, perhaps farming these animals.

Much of the work on reproductive biology is being carried out by graduate student Dave Hopper and colleagues. Sampling of local populations of the three species under study has enabled the periodicity of spawning readiness to be documented. At regular intervals samples are taken and the weights of the animals (whole and after evisceration) and their gonads recorded. This permits calculation of the gonadal index, or GI (weight of gonads divided by whole weight). Since the GI rises during the spawning period, monitoring the progress of the gonadal index allows the spawning regime of the species to be understood. For instance, the GI of *A. mauritiana* in Guam peaked in June 1988, and in April 1989, indicating that spawning in this species occurs at the end of the (northern hemisphere) spring or early in summer. This information, as well as contributing to our knowledge of the biology of the species, was valuable in allowing the UOG team to anticipate spawning and achieve success in the larval rearing work.



Auricularia (above) and doliolaria (below) larvae of a generalised holothurian.

(From Laverack, M. S. and J. Dando: Lecture Notes on Invertebrate Zoology. Blackwell Scientific Publications, London)

Results of the larval rearing experiments have been good. Adults of all three species collected from the wild have been successfully induced to spawn. Spawning is greatly enhanced by thermal shock (usually delivered by leaving the animals in a tankful of slowly heating water on the back of a flat-bed truck as they are driven from the collection site to the lab). Fertilisation and development through the first (auricularia) to the second (doliolaria) stage has been achieved in *A. mauritiana* and *H. nobilis*. The developing larvae are raised in aerated water in glass containers and are dosed with penicillin to prevent bacterial and ciliate infection. The larvae are fed on dinoflagellates and this material can be seen in the gut canal, which is transparent, until metamorphosis to the doliolaria stage, at which time it becomes replaced by unpigmented detrital matter. Development of the larvae to juvenile sea cucumbers has not yet been achieved, and this is an area on which studies are focussing at present. Lab staff have recently built a larval stirring system which has proven useful. Using the system, all the larvae from a January 1990 spawning of *H. nobilis* have been induced to settle, and the research team are now experimenting with different substrates and diatoms on which to raise the larvae.

The UOG team has also been looking at aspects of adult culture, and in particular artificial induction of fission, by keeping wild-collected adults of a range of sea cucumber species in artificial enclosures. The adults are fed daily using homogenised *Sargassum* seaweed. Fission can be induced in *H. nobilis* and *A. mauritiana* (but not *T. ananas*) by placing a tight rubber band around the animal for several days. The sea cucumber will eventually divide into two at the point

where the rubber band constricts it. Although this may ultimately prove to be a useful way of avoiding juvenile mortality and improving recruitment in sea cucumber farming, the experiments carried out so far have been of limited success. Additionally, the classic problems of negative growth rates (shrinkage) and necrosis in captive animals continue to plague the UOG experiments and there is still a lot to learn about keeping these animals in captivity.

As part of an overall effort to encourage sustainable exploitation of the sea cucumber resource in Micronesia, Bob Richmond believes it would be wise for Micronesian states to consider forming a marketing consortium so that harvesting and export could take place in a controlled, managed way. At present, beche-de-mer harvesting in Micronesia - as well as in many other localities - takes place in a sporadic, ad hoc way, with individual islands or communities producing small, irregular consignments and then trying to sell them. Small quantities and irregular production usually mean low prices, so foreign buyers are able to take advantage of this situation. A marketing consortium would enable production from the various island groups to be pooled and marketed as bigger lots on a more regular basis. As well as maximising economic returns from the resource, such a system would also enable harvests in particular locations to take place at regular, sustained levels, rather than the 'boom-and-bust' style of exploitation that has typically characterised beche-de-mer fisheries in small islands.

Garry Preston

Aspidochirote holothurians of the New Caledonian lagoon: biology, ecology and exploitation

Abstract of the recent thesis by Chantal Conand, published in 1989 by ORSTOM (see Conand, 1989, reference list this issue)

Some Aspidochirotid Holothurians (Ecinodermata) are fished and processed into bêche-de-mer (or trepang) for human consumption. At first the 48 species collected from the New Caledonian lagoon are presented and classified into commercial categories.

The main characteristics of the distribution and abundance of these species, in the different reefal and lagoonal biotops are defined by an autoecological study. Groups are also distinguished according to reefal and depth gradients, as well as by substrate preferences. Several holothurians assemblages (or taxocenoses) are described. Their richness (by number and by mass) decreases from the inner reef-flats to the inner lagoon, then the outer reef-flats up to the outer lagoon and the reef slopes. Populations appear to be stable. The study of the population biology of the nine main commercial species enables the determination of the main parameters of their biometry, reproduction, growth and mortality. Sexual reproduction exhibits

rather homogeneous characteristics: these species are gonochoric and iteroparous, have an annual sexual cycle, late sexual maturity and high fecundity. Growth and mortality, whose study is particularly difficult, are both quite low. On the whole, the means mass of the species can be related to the biological and ecological parameters as a gradient in the adaptive strategies is shown.

Exploitations in New Caledonia and other countries of the South Tropical Pacific are described. The causes of their wide fluctuations are analysed and connected with Hong Kong and Singapore markets. Maximum sustainable yields are estimated at about ten to thirty kilograms per hectare per year in the rich assemblages. Their thematic mapping, an example of which is given using high resolution images from SPOT silulation, remains necessary for the lagoon as a whole. Lastly several options for fishery management are discussed.