

Regional Sea Cucumber Meeting

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From 3 to 5 March 1993, regional fisheries officers, biologists and an economist met at the University of Guam Marine Laboratory to discuss aspects of sea cucumber biology, ecology, fisheries, and economics to determine the possibilities for developing a regional approach to sea cucumber resource utilisation and management.

The meeting was funded by the National Marine Fisheries Service (NMFS) under the Saltonstall-Kennedy (S-K) programme, and was sponsored by the University of Guam.

Participants included representatives from NMFS, the South Pacific Commission, and the marine resources divisions of Guam, Kosrae, Palau, Pohnpei, Chuuk and the national office of the Federated States of Micronesia.

Data from a five-year study on the reproductive biology and larval ecology of commercial valuable sea cucumbers were discussed along with several different fishery models and economic analyses for the sustainable development of sea cucumbers fisheries.

SPC Senior Inshore Fisheries Scientist, Dr Tim Adams, pulls the following notes on the meeting from his trip report (Note that the term *beche-de-mer* is not common parlance in Micronesia, where *sea-cucumber* refers to the animal and *tre pang* is often used for the dried product):

☞ Paul Callahan's (University of Guam College of Business & Public Administration) presentation focused on some economic and trade issues for sea-cucumber, particularly as they affect the small-scale fisherman.

One interesting example here was an analysis of the profitability of sea-cucumber fishing to the average harvester, taking all factors into account including the opportunity cost of processing. Since the price structure of the *beche-de-mer* export trade is strongly stratified by size (bigger specimens having a much higher price per kilogramme than smaller specimens), it was shown that there can be a strong economic justification for minimum size-limits, in addition to the biological justification of trying to prevent growth-overfishing.

The economic analysis shows that fishermen will often actually lose money by collecting small sea-cucumbers, because the unit price is low whilst the cost of collection and processing is still the same.

However, since the vast majority of village fishermen measure profit by the amount of cash that goes into their pocket, they will continue to collect small ones without appreciating that they would be better off, in total, by working half as hard and processing only the big ones. There are complications of course, but this is a potent political argument for the introduction of sea-cucumber fishery management practices. It provides a short-term economic justification in addition to the long-term one of trying to flatten

out the boom-bust cycle and thus encourage more permanent investment.

☞ The University of Guam (UOG) Marine Lab has concentrated mainly on the biology of surf redfish (*Actinopyga mauritiana*), black teatfish (*Micrrothele nobilis*) and prickly redfish (*Thelenota ananas*), and these are the commoner economically important species in the fairly high-energy coastal environment of Guam. Sea cucumber larvae are planktotrophic.

The larvae hatch with minimal food reserves, and spend a long time floating around in the plankton, metamorphosing through numerous stages before settlement. Sea cucumber larvae may drift for considerable distances before settlement, and the finding that a temperature increase can trigger settlement is probably a signal to the maturing larvae that they have drifted into a lagoonal or coastal area. Considerable progress has been made in elucidating the breeding biology of these species.

The discovery of a germinal vesicle around the eggs of the prickly redfish means that artificially propagating this species is presently a high-technology option, but surf redfish and black teatfish are more straightforward and often spawn in response to the simple stress of collection. Work remains to be done on developing a reliable feeding regime for sea-cucumber larvae, right through the planktonic part of the life-cycle to settlement, but UOG reckons that this is only a matter of time.

☞ Sea cucumbers, like many other marine invertebrates, coral polyps and giant clams included, appear to spawn in synchrony in response to pheromones released into the water column. Success in fertilisation would thus appear to be dependent on the density of the population (and the quality of the water?), but sea cucumbers do at least have the option of 'getting together' denied to the more sedentary invertebrates.

Although the reliable artificial production of settled seed of these species has not yet been accomplished, bucket-culture of tropical sea-cucumber larvae is already feasible. Whilst there is no present way of knowing whether the release of sea-cucumber larvae artificially into the ocean would have any noticeable effect on recruitment, the possibility of mitigating the constraints of density-dependent fertilisation on a depleted species is interesting.

☞ Sea cucumbers are an item of local diet across all of Micronesia. The meeting didn't get down to the level of the individual species used, and these apparently vary. In Palau, several *Stichopus* and *Actinopyga* species are consumed fresh, and the intestines of some of these are a delicacy.

☞ Nobody has apparently investigated the broader (or ecological) effects of sea-cucumber over-harvesting. Several studies have shown that sea-cucumbers have an important *bioturbation* role: in turning over the lagoon floor, returning nutrients (and pollutants) to the surface, and oxygenating the upper layers of sediment, but the significance of this to the total productivity of the lagoon is not well understood. It is not known whether the diet of sea-cucumbers would include *Gambierdiscus toxicus*.

☞ The search for a satisfactory method of identifying individual sea-cucumbers still continues. Paul Lokani's experiments with internal tags have been described in a previous issue of this bulletin, and Brian Stewart's photographic logs of the unique wrinkle patterns of certain species provide another possibility (although perhaps without the *cachet* of photo-identification of the larger cetaceans).

At UOG they have had some success with 'scar-tagging', particularly of surf redfish (although such marks were found to disappear from teatfish and sandfish within a couple of weeks in Fiji). Observation of marked animals in Guam suggests that sea cucumbers tend to stay around

the same area, although they will tend to aggregate and become very visible at spawning time, and may seem to disappear completely around the occasion of a cyclone. If the animals are local in their wanderings, it may provide some encouragement to continued experimentation on ranching.

☞ Several small holothurians are now apparently targeted for the aquarium trade. Since many holothurians are toxic to some extent (the red, saponin-containing fluid that is released by *Holothuria atra* being the best-known example, but similar toxins are contained in the skin of several species, and in the Cuvierian tubules of the genus *Bohadschia*), this may lead to some interesting domestic species interactions.

The huge species diversity of holothurians, particularly towards the western side of the Pacific, is also likely to be attractive to bio-prospectors looking for pharmacologically useful molecules. The fissioning ability of certain species is of interest to researchers studying the processes regulating cell-division and ageing, and the non-reactive nature of certain holothurian proteins to the human immune system has already provided a role for certain sea-urchin spines in human bone-grafts. Pacific island sea-cucumber fishery management may need to take much more into account than simply *trepang*.

These observations are drawn pretty much at random from my incidental notes on the discussion, and do not reflect the full content of this interesting and broad-ranging meeting, whose main focus was to consider the practical possibilities of both developing and sub-regionally managing a sea-cucumber fishery in Micronesia.

Further information can be obtained from Dr Bob Richmond, at the address given below, and I believe that a full report of the meeting is being prepared, outlining the consensus perception of a co-ordinated Micronesian sub-regional sea-cucumber fishery.

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