First results of an internal tag retention experiment on sea cucumber

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Introduction

Tagging is an established method of studying growth, mortality, and migration in fish. While tagging is applicable to the study of holothurians, a number of problems have been encountered (see Shelley, 1982; Conand, 1983 and Conand, 1991). External tags have been rejected and have caused extensive necrosis (see Shelley, 1982 and Conand, 1983). Tags tested to date include Super-Plastic tags, Vital stain, plastic tags, gun-inserted tag and freeze branding (Shelley, 1982), Swiftachment fasteners (Dennison tagging gun), self-adhesive numbered labels and floy tags (Conand, 1983). Conand (1983, 1991) records floy tags and fasteners retained on the body wall of sea cucumbers for more than one year. Shelley (1982) records Dennison tags retained on the body wall of sea cucumbers for more than six months.

This note outlines the interim result of a tag retention experiment which started in early January 1992 and continues. The main objective of the experiment is to test the ability of holothurians to retain a coded wire micro-tag in the body wall over a period of time. The experiment is being carried out by the Kavieng Fisheries Research Station of the Papua New Guinea Department of Fisheries and Marine Resources with financial support from the South Pacific Commission Inshore Fisheries Research Project. SPC also arranged for a number of micro-tags and a simple tag injector were supplied by North West Marine Technology (NWMT), based in the United States, for this experiment.

Methods

Three species of commercial holothurian, white teatfish (*Holothuria fuscogilva*), prickly redfish (*Thelenota ananas*) and deepwater redfish (*Actinopyga echinites*) were injected with micro tags. Once injected the tags can only be seen by X-ray or a tag detector. This type of tag has mainly been used for tagging fish.

Four body sites were selected in the white teatfish and prickly redfish and three sites in the deepwater redfish (Figure 1). One tag each was injected about 2 cm from the anus and from the mouth, on the dorsal side of the animal, and approximately on the fourth teat on the right facing the anal teat in the white teatfish and facing the anus in the prickly redfish. Deepwater redfish were tagged about 1 cm from the anal teeth and mouth and in the mid-dorsal section as in the white teatfish and prickly redfish. Five specimens each of the three species were tagged.

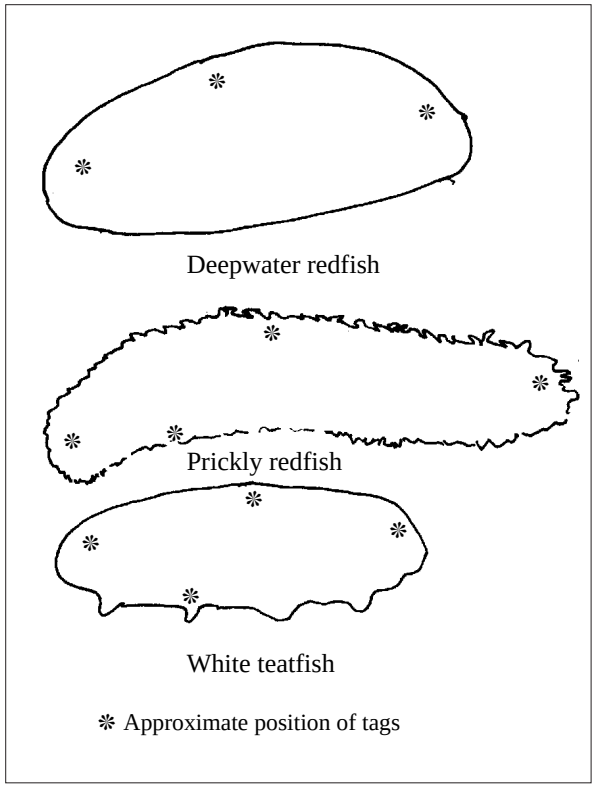

Figure 1. Body sites for the three species of sea cucumbers

The tagged animals were X-rayed after tagging (Figure 2) to confirm that the tags were indeed imbedded in the body wall. One or two animals were put in a bucket of water and transported to the X-ray theatre in a bucket of sea-water. After tagging and X-raying the animals were placed inside 2x 1 m enclosures constructed of arc-mesh wire covered with chicken wire (Figure 3). Each prickly redfish was placed in a separate enclosure while other enclosures each contained one white teatfish and one deepwater redfish. The enclosures for the white teatfish and deepwater redfish were placed at a depth of 2m on a turtle sea grass bed. Enclosures for prickly redfish were placed in a sand bed at 4 m.

After the first day of tagging the animals were X-rayedevery day for the first three days, then every week for three weeks for the white teatfish and the deepwater redfish and for two weeks for the prickly redfish. Prickly redfish were X-rayed

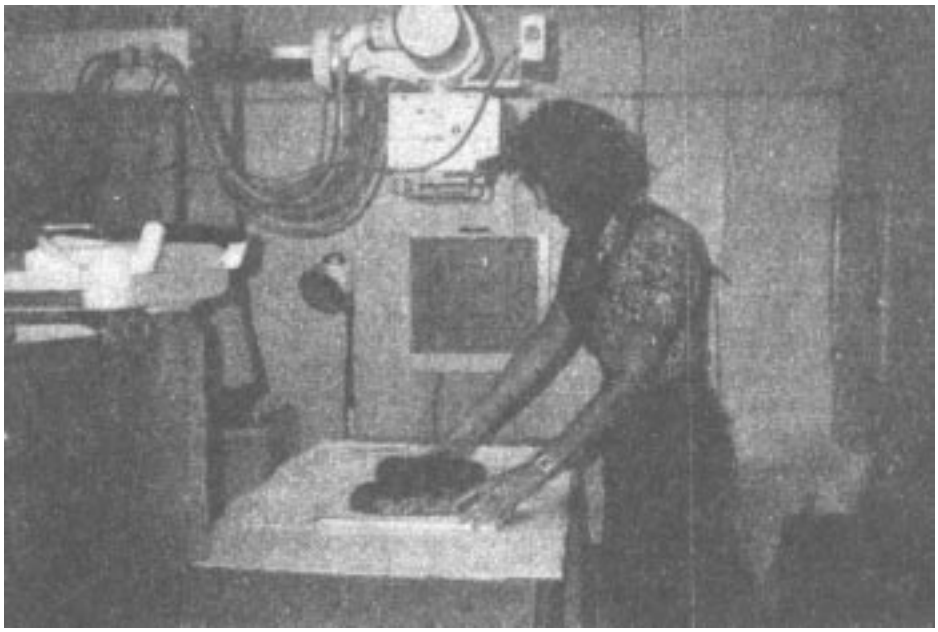

Figure 2. The tagged animals are X-rayed to confirm that the tags have been absorbed by the body.

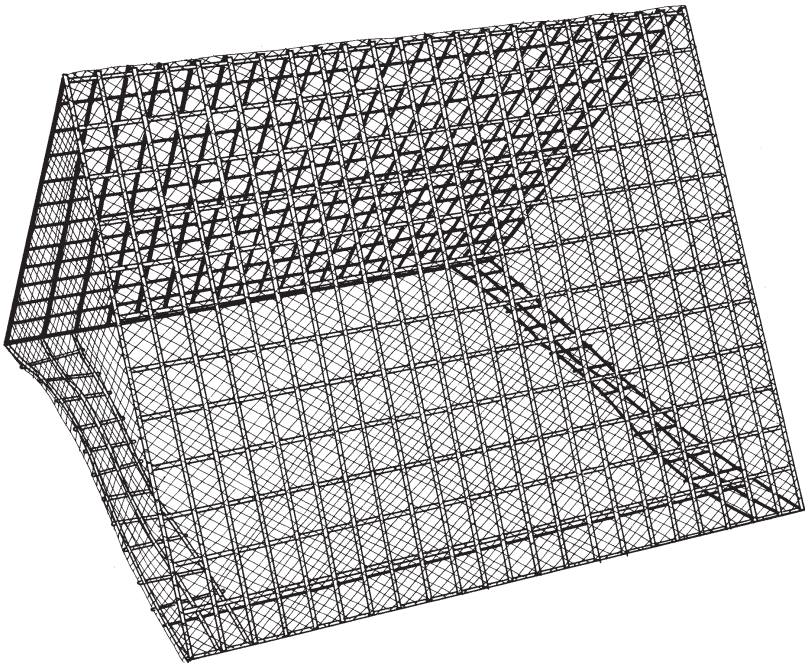

Figure 3. Enclosures constructed of arc-mesh wire covered with chicken wire

again in the sixth and ninth weeks after tagging, and the white teatfish and the deepwater redfish X-rayed in the seventh and eight weeks.

There was no control group of untagged sea cucumbers as the primary concern of the experiment was tag retention in the body wall.

Results

Tags retained in the body wall

The table (next page) shows the percentage of tags retained over time by body site for each species. Two prickly redfish and two deepwater redfish died during the course of this experiment. One deepwater redfish probably escaped.

Percentage of tags retained per tagging site, by species

	Week	1	2	3	4	5	6	7	8	9
White teatfish	Anal teeth	100	100	100	-	-	-	60	60	-
	Dorsal body	100	100	100	-	-	-	60	60	-
	Teat	100	100	100	-	-	-	40	20	-
	Mouth	100	100	100	-	-	-	60	40	-
Prickly redfish	Anal teeth	100	100	-	-	-	100	-	-	30
	Dorsal body	100	100	-	-	-	60	-	-	30
	Teat	100	100	-	-	-	100	-	-	0
	Mouth	100	100	-	-	-	100	-	-	100
Deepwater redfish	Anal teeth	100	-	-	-	-	-	50	-	50
	Dorsal body	100	100	100	100	100	100	100	100	100
	Mouth	100	-	-	-	-	-	50	-	-

The cause of death for prickly redfish was lesions sustained through contact with the meshes of the enclosures, probably due to insufficient availability of food. Deepwater redfish sustained some injuries from the meshes, but these were not as serious as those in prickly redfish. Deepwater redfish deaths were probably due to insufficient food.

The calculations for prickly redfish and deepwater redfish are based on the three and two animals respectively which are still alive.

All body sites tagged for all species retained 100 per cent of the tags for the first three weeks. In the sixth week the tag retention rate in the three live specimens of prickly redfish was still 100 per cent for all sites except the dorsal body which dropped to 60 per cent. By the eighth week tags injected on the teats were completely lost while the percentage of tags retained in the anal teeth and the dorsal body dropped to 30 percent. Only tags injected on the dorsal side of the mouth still remained intact at 100 per cent retention.

In the seventh week the percentage of tag retention for the white teatfish dropped to 60 per cent for all sites except the dorsal body which dropped to 40 per cent. By the eighth week tags retained in the anal teeth and dorsal body still remained at 60 per cent. The percentage of tags in the mouth dropped to 40 per cent, and in the teat to 20 per cent.

Effects of the tags

No obvious physical symptoms due to the injection of the tags were observed. No lesions or ulcers developed in the body sites injected. None of the animals eviscerated their guts after tag injection or during transport and X-raying. It is anticipated that a control group will be set up in other enclosures once more tags become available. The effects of frequent X-raying need also to be investigated.

Discussion

Keeping the animals in the enclosures restricts their movements and therefore limits their food supply. This, in turn, may affect the ability of the animal to retain the tags in the body wall, because of thinning of the body wall.

There also appears to be a difference in the ability of the body sites of the holothurians to retain or eject tags. By the ninth week all tags near the mouth of prickly redfish were still intact while all tags in the teat were all lost and only 30 per cent of the tags were still intact near the anal teeth and dorsal body.

Shelley (1982) conducted tagging trials in tanks with some tagging in the field, while Conand (1983, 1991) also conducted tagging trials in an aquarium and in the field. Both authors stress that the environment cannot be recreated accurately in an aquarium and that this will influence tag loss. Conand (1983) hypothesises that the high percentage of tag loss in the aquarium after 18 weeks was caused by reduced feeding.

The environment for the present experiment was not precisely the same as the natural one. The site was chosen because of proximity to the X-ray Unit. Enclosing the animals makes it easier to observe and X-ray the same animals every time. The primary suspected cause of tag loss in this experiment is the limited food supply in the enclosed area, which leads to very reduced feeding.

Prickly redfish and deepwater redfish sustained injury which resulted in ulcers and death from the mesh of the chicken wire. Meshed enclosures are not suitable for this type of experiment.

The correct exposure of the X-ray film is important. Very often a tag will be hard to see if the film is over-exposed. It was observed that some tags which did

not appear on one film appeared on later shots of the same animal. If tags are not observed in the animal during the first "take" a second or third shot of the animal should be made.

References

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Queensland's beche-de-mer fishery

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Interest in the commercial harvesting of beche-de-mer species for food and medicinal purposes was renewed several years ago. Harvesting commenced along the East Coast of Queensland as well as in the Torres Strait.

For management purposes the East Coast and Torres Strait are considered as separate entities, although jurisdiction for commercial harvesting of beche-de-mer lies within the Queensland Department of Primary Industries which administers the Queensland Fisheries Act. The following Table contrasts the management methods currently operating for the two harvesting areas.

East Coast	Torres Strait
Permit to individual	Permit to Island Community Council
Industry quota	-
Individual quota	-
Limit of 10 divers	-
Collection only from areas covered by water at low tide	-
Quarterly returns	Quarterly returns
No species restrictions	No species restrictions
No size limits	No size limits
Collection by hand only	Collection by hand only

The present annual industry quota for the East Coast is 500 t (wet weight). Individual quotas allocated are between 15 and 75 t. Additional quota may be requested during the tenure of the permit. Additional allocation is made on the basis of total reported industry collection at time of application for quota increase. All permits are tenured for 12 months and for the fiscal year (July to June). Repeat permits may be granted, subject to satisfactory performance criteria. The maximum annual industry catch reported to date is 130 t.

There are difficulties with the processing of beche-de-mer, particularly in areas away from the larger coastal centres. Export standards for beche-de-mer are set by the Australian Department of Primary Industry and Energy, Exports Section. A joint project between the industry and the Queensland Department of Primary Industries is exploring methods of processing to satisfy export standards. The Northern Territory, which has also recently re-established a beche-de-mer fishery, will participate in this project. It will assess processing techniques and determine specific composition (e.g. amino acids, etc.) and storage methods. Possible interaction with FAO is being explored. Thirteen species are to be analysed. The six of major commercial potential are *Holothuria scabra, H. atra, H. nobilis, H. fuscogilva, H. echinites* and *Thelenota ananas.*

The beche-de-mer fishery is relatively small. Little information is available on stock size or specific distribution and the conservative management reflects this low level of knowledge. The only other pressure on beche-de-mer stocks is from the marine aquarium trade which has a high demand for the more colourful species*. There has also been interest recently in the use of powdered beche-de-mer as a slow-release fertilizer for use by the plant nursery trade.

Note from the editor: most of the species have toxins and holothurians generally bring about mortality of other aquarium fauna.