Differentiating between juvenile *Trochus niloticus* and *Trochus histrio* in the field

Graeme Dobson[1]

Searching for small juvenile *Trochus niloticus* in complex coral structures is a difficult task at the best of times, but it is made even more difficult by the presence of other similar juvenile gastropods. Differentiating between small juvenile *Trochus* spp. in the field is often hard and can lead to the unnecessary collection of specimens for later examination.

During surveys on reefs of northwestern Australia, the principal confusion lay between *Trochus niloticus* and *Trochus histrio*. A reliable character to differentiate between the two in the field was found to be the number of parallel ridges on the base of the shell (Fig. 1). *T. histrio* has six or seven distinct and strongly nodulous ridges, whereas *T. niloticus* has 13–16 weak ridges becoming less distinct toward the outer edge of the shell. The ridges were easily checked by running a thumb nail across the shell base.

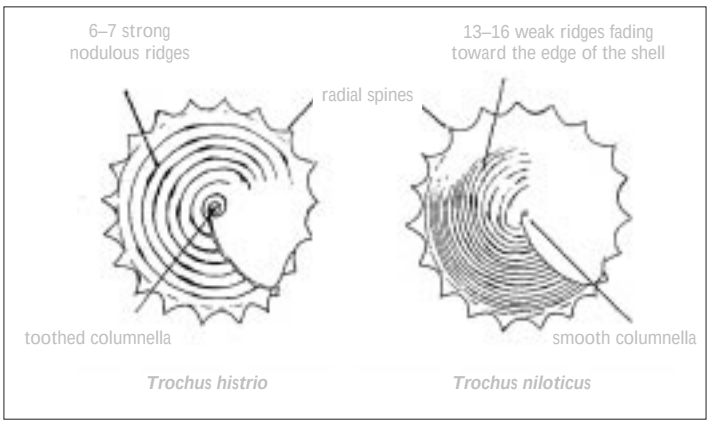

Figure 1. **The number and strength of ridges differentiate *Trochus niloticus* from *T. histrio*.**

When juvenile *T. niloticus* grow to about 20 mm shell width, the ridging is lost; however, at this size they can be readily and reliably identified by colouration and patterning.

Using underwater metal detectors for research into trochus reseeding

Tasman Crowe[1]

Researchers involved in stock enhancement, fisheries and ecology must use a range of techniques to recapture tagged animals effectively. One of the more challenging situations is when a comparatively small and cryptic animal must be recaptured in a complex habitat, particularly when the animal is mobile and may range over a wide area. As part of the Australian Centre for International Agricultural Research (ACIAR) Trochus Reseeding Research Project, it was necessary to mark juvenile trochus in the size range of 16–25 mm and recapture them over wide areas of complex coral reef in Australia, Indonesia and Vanuatu (Crowe et al. in review). After release, the animals often moved into and under the substratum (e.g. live coral or coral rubble) and could not be reliably found using visual searches (see also Castell et al. 1996).

To solve this problem, we used underwater metal detectors to locate metal tags fixed to the animals. The metal detector used was a *Pulse 8X* with a 7.5 inch detecting coil, supplied by JW Fishers Mfg (1953 County St., E. Taunton, MA 02718, USA). This

1. School of Biological, Environmental and Chemical Sciences, Northern Territory University, Darwin, NT 0909, Australia

2. Northern Territory University, Darwin, NT 0909, Australia. Current address: Biodiversity and Ecology Division, School of Biological Sciences, University of Southampton, Bassett Crescent East, Southampton, SO16 7PX, UK. Email: tpc@soton.ac.uk

detector is of the pulse induction type. It works in fresh or saltwater and is not sensitive to either the salt in the water or minerals in the substratum. The unit is contained in a housing, waterproof to 30 m depth and can be charged from a 12 V battery, making it suitable for research in remote areas.

We found the smallest tag that could fit on a juvenile trochus and still be reliably detected was a piece of 0.3 g aluminium. Tags were detectable within a range of 8 cm of the coil, regardless of the intervening medium (e.g. air, water, rock, sand or coral) and could be pin-pointed to within 1–2 cm. Each tag was made from a 30 x 300 mm sheet of domestic aluminium foil folded into a 15 x 15 mm square. Tags were stuck to the shells of juvenile trochus using cyanoacrylate glue. Folded foil tags were used because they were flexible enough to be conformed to the surfaces of the shells of the trochus, which greatly improved the strength of the bond.

The effectiveness of the system was investigated in a series of pilot trials that tested: (i) the percentage of tagged trochus recaptured in a typical habitat using a standard search pattern; (ii) the effects of the tags on the short-term survival of the trochus; and (iii) the effective life of the tags (rate of loss, long-term detectability). The trials used juveniles reared at the hatchery at the Northern Territory University, Australia. The field sites were on the coral reef at Cunningham Point on the east coast of the Dampier Peninsula, northeast of Broome, Western Australia.

Results indicated that the tagging system was an effective method for finding trochus in the complex habitat provided by coral reefs. Over 85% of a known number of juveniles were consistently recaptured (Crowe et al. in press). This information has since been used to adjust estimates of survival made using the technique in a large experiment to test stock enhancement of trochus (Crowe et al. in review; Castell et al. 1996). A variety of other visual tags have been used in research into stock enhancement with trochus, but tests of their effectiveness have rarely been reported (Crowe et al. 1997).

Contrary to expectation, the folded foil tags had no measurable effect on the short-term survival of juvenile trochus (Crowe et al. in press). The tags we used, however, have a limited operational life. After 1.5 months in the hatchery, all tags tested remained attached to the snails, but after four months many had become loose and would probably have been dislodged on the reef. Although in our laboratory study there was little loss of detectability of tags over a six-month period, many of the tags deployed on reefs as part of a larger study could not be detected after three months. On reefs, the tags were exposed to alternating combinations of salt water, air and sun that may have corroded the foil, making it hard to detect. Similar problems may not necessarily arise in subtidal research. The tags can be used reliably on intertidal reefs for at least one month. Recapture is less certain after two to three months and should not be attempted at all after three months.

Performance could potentially be improved by using solid pieces of metal that would not corrode as easily. These could not be attached with cyanoacrylate glue because cyanoacrylates will only bond surfaces that are in direct contact (i.e. they cannot fill gaps). Epoxy putty (Milliput® or Sea Goin' Poxy Putty®) may be suited to this task and may result in a more durable bond. If numbers were stamped into solid metal tags, individuals could be identified. Aluminium is one of the most easily detected metals. Metal detectors do not easily detect stainless steel.

The trials were done in a coral rubble habitat, where trochus were able to live up to 3 or 4 cm below the 'surface'. The complexity of this habitat was about average for the reseeding research that we undertook. The 7.5 inch coil could not detect trochus that lived deep within more complex habitats (e.g. live branching corals, such as *Acropora* spp.).

It would be possible, but time-consuming, to use a smaller (1 inch) probe to search for tagged animals in such habitat. Larger targets can be detected at greater ranges (to a maximum of 2 m with a 7.5 inch coil). Larger coils (up to 18 inches) are also available for use with the detector. These can detect larger targets over greater distances, but are no more sensitive to the small targets we were using than 7.5 inch coils. The value of the technique would be limited in areas with large amounts of metal debris because there would be many spurious signals.

In summary, we found the use of a metal detector to recapture animals tagged with appropriate metal tags to be effective. It is relatively inexpensive (the detector costs less than USD 1500, tag costs are negligible), convenient, uses small harmless tags, and has potential to be adapted for many applications in stock enhancement, fisheries and ecological research. Further details are available in a forthcoming article in *Aquaculture* (Crowe et al. in press).

Acknowledgements

I am grateful to the Australian Centre for International Agricultural Research (ACIAR) for funding the research project, and particularly to

Barney Smith, Research Program Coordinator (Fisheries) and Dr Chan Lee, Trochus Project Coordinator for their support.

References

Castell, L., W. Naviti and F. Nguyen. 1996. Detectability of cryptic juvenile *Trochus niloticus* Linnaeus in stock enhancement experiments. Aquaculture 144:91–101.

Crowe, T.P., M.J. Amos and C.L. Lee. 1997. The potential of reseeding with juveniles as a tool for the management of trochus fisheries. In: C.L. Lee and P.W. Lynch (eds), Trochus: status, hatchery practice and nutrition. ACIAR Proceedings No. 79. Canberra: Australian Centre for International Agricultural Research. 170–177.

Crowe, T.P., C.L. Lee, K.A. McGuinness, M.J. Amos, J. Dangeubun, S.A.P. Dwiono, P.C. Makatipu, F. N'guyen, K. Pakoa and J. Tetelepta, J. (in review). Experimental evaluation of the use of hatchery-reared juveniles to enhance stocks of the topshell *Trochus niloticus* in Australia, Indonesia and Vanuatu. Aquaculture.

Crowe, T.P., G. Dobson and C.L. Lee. (in press). A novel method for tagging and recapturing animals in complex habitats and its use in research into stock enhancement of *Trochus niloticus*. Aquaculture.

Harvesting the ra'ui[1]

Lisa Williams

Source: *Cook Island News*, 22 January 22 2000

Considering it's not legislated by law and there is no real way of enforcing it, the ra'ui which has existed in selected parts of the Rarotonga lagoon for the last two years has borne some magical fruit. Sure, it's Mother Nature's way of rewarding those who let her rest, but some would say te mana o te ra'ui (the power of the ra'ui) has indeed given hope for more than replenishing the food cupboard.

Imagine it happening in Nikao. Steaming mountains of fresh trochus meat, piled up by workers who gently work the delicacies out of boiled shells – this is one of the memories I have of trochus harvesting in Aitutaki. There is so much meat, you don't even think of eating it – you are simply overwhelmed by the sheer size of the thing. For hours, people boil water on open fires, in drums and cabin bread tins ready to blanche the sacks of trochus filled by others who have been collecting from the lagoon.

When it comes to trochus harvesting in Aitutaki, it's a united community effort – and the same work effort is being called on to help with the Nikao community's first ever harvest of trochus with the lifting of the ra'ui in two weeks time.

Aitutaki has been harvesting trochus as a major source of income for the island for years. Rarotonga has never really done a trochus harvest on a commercial scale, and there are hopes that assistance in the form of advice from Aitutaki to run the first harvest in the Nikao ra'ui zone will come through.

Already the signs of inter-island cooperation are promising. Aitutaki will weigh in the Nikao consignment - expected to be around two tonnes or fifty flour sacks, when it exports its shells to New Zealand. The return to Nikao – expected to be around NZ$ 30,000 – will go into the villages community fund. The trochus shells end up a Cook Islands export on the designer wear of fashion labels, or as components in jewellery.

There's also a demand for polished trochus, which can be dyed or sold as is. Sometimes you catch

1. Ra'ui: Rarotongan word for a seasonal closure or ban. In this case, it is effectively a marine protected area or reserve.