

of trochus within legal size limits (65 to 100 mm) on the reef edge (4.03 ± 0.630 se per 156 m², n=35) was significantly greater than on the reef flat (0.39 ± 0.107 se per 156 m², n=56). The high occurrence of small shells possibly indicates growth over-fishing of the trochus resource. The results from this study can be utilised (in conjunction with satellite images) to estimate the total area of habitat, standing stock and biomass of trochus in King Sound.

The papers from the conference have been published as an ACIAR Proceedings entitled: Trochus: Status, hatchery practice and nutrition. For copies of these proceedings please contact:

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Part 2. ACIAR Trochus Reef Reseeding Research

by Dr Chan L. Lee

Following the successes achieved in the Trochus Hatchery and Nutrition Research Project (see Part 1), the Australian Centre for International Agricultural Research (ACIAR) is funding another phase of the trochus research involving reef reseedling of juvenile trochus. The ACIAR-funded project involves three countries and six institutions; a three-year research budget of AU\$ 680,138 was provided. The commissioned organisation for the project is the Northern Territory University with Dr Chan L. Lee appointed as project co-ordinator and Dr Tasman Crowe as research associate. The Australian component also involves the Western Australian Fisheries Department and the Aboriginal communities of King Sound. The two other countries involved in the research work are Indonesia and the Republic of Vanuatu. The Indonesian institutions involved in the research project are the Indonesian Institute of Sciences, University Pattimura and University Nusa Cendana with Dr Dwiono, Miss Dangebun and Dr Rebhung respectively as country co-ordinators. Vanuatu is represented by Mr Moses Amos of the Department of Fisheries as the country co-ordinator.

There are many reasons for carrying out the trochus reseedling research over such a wide geographic region. Although there have been several preliminary studies into the potential of reseedling as a tool for the management of trochus fisheries over the last 13 years, no clear consensus has emerged. To date, the success of reef reseedling has been variable. In some cases there have been

encouraging results, but hatchery-reared juveniles released into the wild have not always been recaptured in large numbers. Mortality or loss of juveniles can act to limit the impact of hatchery-reared individuals on adult populations. The preliminary nature of the studies, however, limits the scope of the conclusions that can be drawn from them. The results have been variable, there have been some methodological problems, and some issues, such as temporal variation in success of reseedling, have not yet been investigated. The study commissioned by ACIAR under the Trochus Reseeding Research Project should help to resolve some of the issues. For further discussion on the potential of reseedling with juveniles as a tool for the management of trochus fisheries, see Crowe, Amos & Lee (**In:** Trochus: status, hatchery practice and nutrition, ACIAR Proceedings, June 1997).

According to Mr Barney Smith, ACIAR Fisheries Programme Co-ordinator 'the ACIAR-funded Trochus Reef Reseeding Research Project is at the cutting edge of research on stock enhancement. It also involves training in hatchery work and on research to standardise the spawning and mass production of trochus juveniles'. Since the commencement of the research project, numerous benefits have already been derived by the institutions and staff involved in the research. Some of these are:

1. Upgrading of the trochus hatchery in all participating institutions;

2. Improved method of spawning and rearing developed in NTU has been transferred to all participating institutions, resulting in record production of juveniles;
3. The analytical skills of project staff have been enhanced by a two-week workshop on 'Design and analysis of environmental sampling and biological experiments'. These skills have been put to practical use by the project staff involved in the design, execution and analysis of reef reseeding research;
4. Development of a new technique for tagging juvenile trochus and training of research staff to use an underwater metal detector to search for tagged animals;
5. The successful hatchery work has encouraged the Aboriginal communities in King

Sound, WA to come together to fund a multi-species hatchery; trochus and giant clam will be the first two species to be produced by the hatchery.

Since the commencement of the research project, the project teams have carried out research including pilot cage studies, site selection and growth and density studies involving the release of juvenile trochus of a range of sizes from 1 to 50 mm. This work should give a clear picture of the effectiveness of reseeding in a broad range of biogeographical regions. The project is due for completion in June 1998.

In Part 3 of this series of articles on trochus research in Australia, some practical outcomes on hatchery practice and juvenile production are discussed.

Part 3a. ACIAR Trochus Reef Reseeding Research: A simplified method of induced spawning in trochus

by Dr Chan L. Lee

Introduction

Seed supply has been identified as a bottleneck for many aquaculture species and trochus is no exception. Since the first reported spontaneous spawning of trochus in the hatchery (Heslinga, 1981), all trochus hatcheries have mainly relied on this method to produce juveniles for grow-out or for reseeding research.

However, this method of spawning is dependent on ready access to large numbers of broodstock and the results of spontaneous spawning are inconsistent.

Further, although it is workable in locations where broodstock is readily available, the method is very wasteful, as it is dependent on a few females spawning from a large number of mature animals that need to be collected for spawning induction.

Out-of-season spawning is not possible using this method of spawning. A simpler and more reliable method of spawning needed to be standardised if mass production of juveniles was to be attempted.

This short communication, based on research conducted in the Northern Territory University (NTU), Darwin, Australia as part of the ACIAR-funded reef reseeding research on trochus, gives a summary of a simplified, reliable method of inducing trochus to spawn, using basic equipment readily available in the Indo-Pacific region.

Methods used for induced spawning of trochus

Since the work of Heslinga in 1981, numerous methods of spawning trochus have been attempted to improve spawning outcomes. The methods used were based on applying physical and chemical stimuli, which have been reported to be effective in spawning other molluscs. Shokita et al., (1991) and Kikutani and Patris (1991) reported that UV irradiation was effective in spawning trochus. In contrast, Dobson (1994) believed that UV irradiation did not work but physical massaging of the gonad with a jet of water produced better success in spawning induction. Dobson (1994; 1997) and Gimin (1997) tested the effectiveness of using hypersalinity, desiccation and hydrogen peroxide for inducing spawning without significant positive results. Gimin (1997) also failed to achieve meaningful spawning of trochus with application of serotonin which was highly effective in spawning giant clam.

Improved and simplified method developed at NTU

Broodstock supply

The NTU trochus hatchery is unique and also the most difficult to operate compared to other hatcheries in the Indo-Pacific region. The hatchery has no ready supply of broodstock and all