

Final Task Report

Task Number: T1.6a

Title: Exploring the Potential of Bath Sponge Aquaculture in Torres Strait

Start Date: 01-Jul-04

End Date: 31-Dec-06

Task Contacts

Task Associate: Maxwell, Robin

Task Leader: Duckworth, Alan

Task Associate: Mosby, Donald

Objectives

1. Through a Torres Strait wide survey of Dictyoceratid sponges and consultation with community leaders, identify a short list of candidate species and locations for development of commercial sponge aquaculture enterprise to supply the international commercial bath sponge market.
2. Develop aquaculture methods for optimal and environmentally sustainable commercial production of up to two target sponge species in at least one location selected for the project.
3. Develop the knowledge base for sustainable management of natural populations of target species for seed stock supply, and methods for monitoring and managing any environmental effects of commercial production of sponges.
4. Transfer technology developed to relevant Torres Strait communities, including effective extension exercises, hosting traineeships, providing technical advice in the development of formal educational material, encouraging Torres Strait Islander candidates for the post-graduate scholarships, and other appropriate methods.

Need (from proposal)

There is an urgent need for new ventures for regionally based industry in Queensland and Australia. The Australian aquaculture industry is also urgently in need of diversification. In particular, for remote indigenous communities, there is need for ventures that will not interfere with cultural principles. They need to be inexpensive to initiate and where the product is: easy to process; durable; can be stored without refrigeration; is cheap to transport; and offers a variety of value adding extensions. Mariculture of new species for fibres and biomaterials is a novel, reliable and readily applicable answer.

The demand for sponge skeletons, either for cosmetic, bathroom, or industrial use, has been consistently growing since early Grecian times. This demand is now intense and sustainable supply is a long way short of meeting global need. In addition, many other markets are now flourishing for these types of products - industrial, ornaments, souvenirs and biomaterials (collagen for biomedical use). These markets are based around a group of sponges known as the Dictyoceratida that produce pure collagen as fibres. There have been a number of small production areas around the globe (Mediterranean, Caribbean) but in recent times, the lack of seed stock and periodic pollution events causing sponge dieback, have severely limited the yield of commercial bath sponges. Currently, there is demand globally in many markets with vast potential for Australia to contribute to global trade in this commodity (Business Plan and Market Analysis, Coolgaree CDEP, Qld State Development, ATSI 2001).

The northern coastal regions of Australia offer significant resources in terms of high biodiversity of the types of sponges that will support an industry for their skeletons. Evidence from farming experiments established over the last three years on the Great Barrier Reef and around the Palm Islands in conjunction with the Indigenous community and Traditional owners of that region, suggests that these species will be readily amenable to scale up production. Sponge biodiversity is even more extensive in the Far Northern Regions of Australia with indications that a number of high commercial value sponge

types are present. The opportunity is large enough that there would be almost no competition between regions to supply markets, indeed due to the need to grow sponge targets close to their origin (translocation issues and because they grow better near source), different regions are likely to supply different market sectors as they will preferentially grow different species.

This potential industry therefore addresses the need for new venture in remote regional locations, establishing a framework for employment, skill acquisition, education, development of business acumen and a platform for other spin off ventures as new ideas are incorporated to add value to the product (for example marketing with essential oils, artwork associated with packaging etc).

Reasons why timing is right for this initiative:

- Global demand far outstrips supply;
- Immediate demand for sustainable production technologies;
- Queensland has many candidate-species to match most market sectors (wool sponge, rope sponge, classic sponge and commercial sponge);
- Recent research work by the Australian Institute of Marine Science (AIMS) and James Cook University (JCU) has shown that commercial sponges can be seeded without significant impact on the environment;
- AIMS/JCU has also identified a number of commercial bath sponge candidates in the Townsville region.
- After almost two years of research, preliminary aquaculture research on these species suggests the venture is economic and ready for transfer to regional communities for scale-up development and commercialisation.

Significance (from proposal)

While sponge aquaculture is not a new concept, successful and sustainable sponge aquaculture is. Absence of a balance in the nexus between target species, their commercial application, environmental sustainability of production (including management of wild seed stock populations), quality control and other market parameters has historically prevented a reliable global supply of sponges, which continues to be based on wild harvests. Nevertheless, global demand for sponge skeletons continues to rise and outstrip the current largely unsustainable supply. Recent years have seen a resurgence of interest in aquaculture sponge products, and Australia is poised to lead the world through projects such as this one in Torres Strait. AIMS has recently generated sustainable production technologies on the Great Barrier Reef. The project will build on this foundation, by transferring technology to Torres Strait. This opportunity will be developed sustainably, strictly adhering to cultural guidelines, concepts of protection and environmental ethics central to any activity in a reef environment.

The significance is clear and simple - this project is an opportunity to develop new industry based on sustainable use of reef resources, foreign income earning potential and jobs for Torres Strait. Strategic relevance exists with the immediate industry potential in established markets. This potential will be realised through application of existing AIMS and JCU capability in identifying new targets and implementing commercially viable production technology that is both responsive to market forces and environmentally sustainable. The project will be built in intimate and immediate collaboration with indigenous communities and provide every opportunity for extension activities from cadetships, training in aquaculture and linkage programs with TAFE and Universities. Opportunities will range from skills in working in and on the sea, around aquaculture structures, environmental studies, biology of target organisms, production technologies, commercialisation and marketing skills and liaison.

The Project is unique in that it permits steady, secure growth of a new ventures in pace with market realisation and skill development. Ownership by the communities is immediate. Cultural priorities are taken highest regard of and the final structure of a collective venture for Torres Strait should be built on foundations of full respect for the environment married to hard commercial reality. It will be possible to integrate activities from the outset with marine estate managers thus permitting an informed regulation process prior to full industry elaboration.

The Project addresses the Key National Research Priority Areas:

1. An Environmentally Sustainable Australia

Transforming the way we use our land, water, mineral and energy resources through a better understanding of environmental systems and using new technologies

- Transforming existing industries
- Sustainable use of Australia's biodiversity

3. Frontier Technologies for Building and Transforming Australian Industries

Stimulating the growth of world-class Australian industries using innovative technologies developed from cutting-edge research

- Breakthrough science
- Frontier technologies
- Advanced materials
- Smart information use

Finally the project contributes significantly to the strategic aims of the Torres Strait CRC. It provides synergy with: Sub Project 1.3 Sub Project 2.2 Characterising the Torres Strait Marine Ecosystem; Sub Project 3.1 Regional Marine Planning for the Torres Strait Peoples; Sub Project 3.3 Multiple Use Ecosystem Level Management Strategy Evaluations.

Research Summary

A Torres Strait wide survey determined that the bath sponge *Coscinoderma* is locally abundant around the Yorke Islands. AIMS and YICC signed a MOU to help facilitate the research done at Yorke Islands, including arranging five Yorke Islanders to dive with AIMS scientists on the project, thus promoting technology transfer of farming procedures. The first farming experiment compared several culture methods and found that mesh panels promoted highest sponge growth and survival. Using mesh panels, the following experiment examined the importance of farming depth and season. Sponge survival is slightly higher in winter, while the optimal farming depth depends on the farming location. This study also determined that the best location for a sponge pilot farm is between Kodall and Masig Islands. The optimal initial explant size to farm is 100 cubic cm. Several experiments were also done to provide the necessary knowledge base for the sustainable management of bath sponges. An ecology study determined that *Coscinoderma* grows generally in summer and autumn and recruits in summer. A survey around the Yorke Island group identified several "hotspot" where *Coscinoderma* is very common, approx. 1 sponge every square meter. Damage experiments, where different amounts of tissue are removed from individuals, have determined that *Coscinoderma* will survive and regrow after 70% of the sponge biomass is removed to supply explants.

Task Associate Comment

No comment available.

Outcomes/Achievements against each Specific Objective

1. Through a Torres Strait wide survey of Dictyoceratid sponges and consultation with community leaders, identify a short list of candidate species and locations for development of commercial sponge aquaculture enterprise to supply the international commercial bath sponge market.

This objective was achieved in July 2004, when we completed a Torres Strait wide survey for Dictyoceratid sponges. After community consultation, we concentrated our work at four communities/locations that requested their waters to be surveyed: Darnley, Yorke, Badu and Thursday. We surveyed 5-7 sites at each location, with each site involving four independent 100 m² transects. In total, 10,000 m² of substratum was quantitatively surveyed for dictyoceratids, representing one of the largest sponge surveys ever done. This study found the bath sponge, *Coscinoderma* sp., containing high quality spongin at high abundance at Yorke Islands. To facilitate future sponge farming work, a Memorandum of Understanding was signed between AIMS and the Yorke Island Community Council. Importantly the MOU allocated five divers from Yorke Island to be involved in all aspects of the sponge experiments (e.g. diving, measuring sponges), thus promoting the transfer of skills and knowledge directly from the project into the local community.

2. Develop aquaculture methods for optimal and environmentally sustainable commercial production of up to two target sponge species in at least one location selected for the project.

From a series of experiments we have achieved this objective. We first tested several farming systems (threaded line, mesh panels and nursery treatment), each varying in line type or net material. After 9 months of experimental farming, we found that plastic mesh panels promote highest sponge growth and survival, and should be used for commercial bath sponge farming in Torres Strait. The experiment also showed the *Coscinoderma* had high growth, doubling in size in 9 months. Using mesh panels we next examined the importance of farming season, and found that growth is slightly better for *Coscinoderma*

farmed during winter and spring possibly because of higher food abundance. This study also found that growth and survival of *Coscinoderma* were similar among several experimental farming sites at Yorke Islands. In consultation with YICC and Torres Strait Regional Authority, we thus based site selection for the pilot sponge farm on other variables such as closeness to the community, protection from storms and substrate depth and type. YICC and TSRA are currently obtaining funds for the pilot bath sponge farm, which will be operational in 2007

3. Develop the knowledge base for sustainable management of natural populations of target species for seed stock supply, and methods for monitoring and managing any environmental effects of commercial production of sponges.

This objective has been met through several studies. One study that involved monitoring *Coscinoderma* growth and population dynamics every 3 months for 15 months, found that the sponge recruits onto coral reefs during summer and autumn. A second study investigated the effect of harvesting different amounts of biomass from wild sponges to supply material to be farmed. Ideally you want to maximise the harvest amount without having any negative impact on the wild sponge population. In this experiment, sponges had 30, 70% or none of their biomass removed. After 15 months, all sponges had survived and were growing back at the same rate regardless of the biomass harvested. This study therefore shows that *Coscinoderma* sponges can have 70% of their biomass harvested with little environmental impact. A third study explored patterns of *Coscinoderma* abundance and size across depth among islands in and around the Yorke Islands. The main aim of this study was to find where *Coscinoderma* is largest and most abundant, and thus determine which populations should be harvested to supply sponge explants for farming.

4. Transfer technology developed to relevant Torres Strait communities, including effective extension exercises, hosting traineeships, providing technical advice in the development of formal educational material, encouraging Torres Strait Islander candidates for the post-graduate scholarships, and other appropriate methods

During a September 2006 field trip to Yorke Island in collaboration with the Yorke Island divers, we will finish all farming and ecology studies. Once all field work is complete we will write and submit the technical report by 30 December 2006.

Utilisation and Application of the Research, Commercialisation

The bath sponge farming industry, world-wide and in Torres Strait, is still being developed. This research will help develop the industry in Torres Strait.

Publications

(Final Report)

Refereed Journal Articles:

Duckworth AR, Wolff CW. Submitted. Patterns of size and abundance of Dictyoceratid sponges among neighbouring islands in central Torres Strait, Australia. submitted to Marine and Freshwater Research.

(Previous Yearly Reports)

Technical Reports:

Duckworth A, Wolff C and Evans-Illidge E. 2005. Distribution and abundance of Bath Sponges in Torres Strait. AIMS. 23pp.

Other Outputs

Sponge farming poster, explaining project, displayed at the Yorke Island Community Council.

(Final Report)

Media Activities (Television, radio exposure, newspaper or magazine):

After the July 2004 Torres Strait survey, we gave several radio, newspaper and TV interviews discussing the findings.

Number of Other Public Presentations, eg Seminars and Conference Presentations:

August 2006, giving presentation at the Australian Aquaculture Conference about the Torres Strait project

Public Meetings, Industry/Interest Group Meetings (relevant to CRC Reef) Attended:

June 2006, Meeting with Task Associates from TSRA and YICC discussing the farming results and planning future work, including setting up a sponge farm.

1st July 2004 - 30th June 2005

Public Meetings, Industry/Interest Group Meetings (relevant to CRC Reef) Attended:

Carsten Wolff and I gave a public presentation to the local community about the bath sponge project, explaining what we are doing and hope to accomplish. At the meeting were several fisherman and local elders. In collaboration with CRC Torres Strait, we also visited the local school and talked with the students about sponges and diving

Postgraduate Students

No students

Grants & Awards

None reported.