Tun Sakaran Marine Park

Alternative Livelihoods Programme

Preliminary Business Plan:

Farming of giant clams for the aquarium trade

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Summary

This business plan provides a case for developing a programme for culture and farming of giant clams for sale as aquarium specimens and also to re-stock over-exploited populations on the reef. This dual output would meet both conservation and livelihood targets for the Tun Sakaran Marine Park.

It is recommended that this is a joint enterprise between Sabah Parks, Semporna Islands Project and local communities, in partnership with the '*Tropical Marine Centre*', a long-established and reputable company in the UK which supports sustainability and accountability within the marine aquarium trade.

Giant clams can be sold for the aquarium trade at around 18 months – 2 years of age when they are between 5-10cm long. Depending on species and colour, the export price is between US$ 6 – 12 per clam (RM 18-36).

The following actions are recommended in order to get this enterprise off the ground:

a) MICC continue with the giant clam spawning programme, concentrating both on species of particular value for the aquarium trade, such as *Tridacna squamosa*, *T. maxima* and *T. crocea* as well as the over-exploited species.

b) A trial export of a batch of the existing stock of *Tridacna derasa* juveniles is organised as soon as possible (June/July), to test out all the procedures, including obtaining the necessary CITES certificates.

c) Discussions are with local communities in TSMP, offering the opportunity to take up take up giant clam farming as a small business enterprise.

d) Organise and run workshops for the community participants to learn how to make, clean and maintain the cages and clams and monitor their survival and growth.

e) Provide the community participants with some of the existing stock of around 1500 juvenile *Tridacna derasa* as a 'start-up'.

f) The farmers maintain the clams for a period of 2-3 months, until they are ready to be marketed.

g) Sabah Parks / SIP act as the selling agent and provide the farmers 50% of the exprt price plus (free-of-charge) a batch of new juveniles for grow-out (the 50% retained by Sabah Parks/SIDP will be invested in expanding the scheme to other communities and maintaining the breeding programme).

h) The farmers maintain the new batch of clams until they are large enough to be sold. SP/SIDP pay the farmers 75% of the export price and keep 25% to maintain the breeding and conservation programme. The farmers buy new seed clams out of their profits at a fixed price (to be decided).

1. Potential for giant clam farming as an alternative livelihood

One of the management objectives for the Tun Sakaran Marine Park is to encourage diversification away from fishing towards livelihoods that are more sustainable and compatible with conservation. A number of options have been explored, and activities such as seaweed farming are already well established. Other opportunities exist in the field of aquaculture, including culture and sea-ranching of a number of invertebrates.

Giant clam farming has been recognised for some time as a potential alternative livelihood for communities living in the Tun Sakaran Marine Park. The original concept was for giant clams to be grown out for their meat and shell because there is a local market for both products in Semporna. At the same time, some of the farmed stock would be used to replenish over-exploited stocks.

One of the problems associated with growing clams for food is that it takes at least 5 or 6 years for the clams to reach a marketable size. In addition, the price is quite low considering the amount of time that has to be invested in producing the product.

Other invertebrate species were considered and it was decided that abalone in particular would be more appropriate to grow for food because they have a high value and can be marketed at around 9 months to 1 year of age.

The other outlet for giant clams is as aquarium specimens, which entails the use of young clams and offers a relatively high price. This has not, until recently, been considered as a feasible option because of the logistical challenge of exporting the stock in the absence of any dealers in the Semporna area. However, as will be discussed in this plan, opportunities do now exist.

2. The product: giant clams as aquarium specimens

The marine aquarium trade is a large, global enterprise with the consumer market focussed mainly on Europe and the US but also supplying Japan, China and many other countries. A large proportion of the fish and invertebrates that are used for the trade come from Indonesia, with other important supplying centres in the Pacific, Australia and South-East Asia.

Giant clams are an increasingly popular addition to reef tanks because of their beautiful colours. They need to be placed into well-established tanks with good quality water, strong water movement and appropriate lighting but otherwise are relatively easy to maintain.

Farm-raised giant clams are particularly popular because they are usually hardier, comply with CITES regulations (see section 7), and also fulfil sustainable-sourcing criteria demanded by many importers. A hatchery exists in the Tun Sakaran Marine Park, together with staff trained in culture of giant clams, and there are local communities interested in 'growing-out' the young clams.

Seven species of giant clam have been recorded from the Tun Sakaran Marine Park – *Tridacna gigas, T. derasa, T. squamosa, T. maxima, T. crocea, Hippopus porcellanus* and *H. hippopus*. All these species are of potential interest to aquarists although the

most popular are the species with the most brightly-coloured mantles, such as *T. squamosa, T. maxima* and *T. crocea*.

Tridacna clams for aquariums are traded as soon as they are strong enough to be handled and shipped but not too large to be established in captivity. For example, around 6cm is a good size for *T. crocea* and *T. maxima* (Thompson: Tropical Marine Centre UK, pers. comm.) which would be attained at about 2 years of age. *T derasa* is faster-growing and may be ready for market slightly sooner.

3. Impact assessment of giant clam culture and farming in TSMP

a) Impact on wild populations

Giant clams are endangered species and a business enterprise involving any of the seven local species would need to demonstrate an absence of negative impacts on wild populations.

Production of juvenile giant clams for the aquarium trade and for re-stocking the reefs will be based entirely on *in-situ* breeding of adult broodstock and will not involve removal of specimens from the wild. Individuals used as broodstock consist of adults originating from the Boheydulang lagoon or other reefs in the Park, together with a number of farmed specimens of *Tridacna gigas* and *T. derasa* purchased from the Philippines in 2008. The reason why these particular species were obtained from elsewhere is that they have been over-exploited in Sabah to the point where insufficient numbers were available for the breeding programme.

Giant clams are induced to spawn by injection into the gonad with the neuro-transmitter serotonin. This is a standard procedure that can be repeated at intervals of a few months without causing ill effects to the broodstock. Animals are only selected for inclusion in the spawning programme if they are healthy and show no signs of stress, and the risk of death is negligible.

Giant clams produce millions of eggs at each spawning, of which thousands can be expected to survive to the stage where they are large enough either to be planted out on the reef or exported as aquarium specimens.

Sale of a proportion of the output will not jeopardise the stock enhancement programme – on the contrary it will help to finance it, thereby promoting conservation and recovery of giant clam populations.

b) Impact on the environment

There are various stages in the culture and farming of giant clams and it is important to assess all of the procedures that will be undertaken and ensure there are no environmental impacts.

Spawning of giant clams is carried out in-situ, using adult stock that is kept close to the Marine Invertebrate Conservation Centre (MICC) on Boheydulang. The clams have been placed on natural sand patches to avoid disturbance to the reef, and care is taken during the spawning procedures not to touch or damage nearby corals.

Fertilisation and larval culture takes place in the MICC (hatchery) and there are minimal environmental risks associated with this phase. Chlorine (chlorox) is used to clean the larval tanks and very small doses of antibiotic (streptomycin) are used for the larval rearing, but both of these substances should be denatured and highly diluted by the time any waste water is flushed into the lagoon. The water circulating in the juvenile rearing tanks is not treated with any chemicals.

The final stage of giant clam farming involves transferring juveniles to cages that are deployed in the ocean. Previous experiments carried out by SIP/SP in the Tun Sakaran Marine Park showed that benthic cages set out on legs on the seabed are easier to maintain than floating cages.

Training will be an integral part of the programme, and this will include guidance and instructions on how to set up the cages in such a way as to avoid damage or disturbance to corals or other marine life.

4. Market analysis

Farming of giant clams for sale as aquarium specimens has not, until recently, been considered as a feasible option because of the logistical challenge of exporting the stock in the absence of any dealers in the Semporna area. However, it is clear that there is a demand for this product – for example Aquatics International, based in Singapore, expressed interest in buying stock. They would then sell the clams to importing companies around the world.

Tropical Marine Centre (TMC), based in the UK, and the largest importer in Europe has also formally offered to purchase the farmed giant clams. This arrangement would be beneficial because it would cut out one link in the export chain and so lead to greater profitability for the community enterprise based in Tun Sakaran Marine Park. TMC is a long-established and reputable company which supports sustainability and accountability within the marine aquarium trade and would provide detailed advice on procedures for packing and export.

Depending on species and colour, the FOB (free-on-board) export price is between US$ 6 – 12 per clam (RM 18-36).

5. Production procedures

Total production time for batches of juvenile clams is approximately 18 months to 2 years and consists of the following steps:

a) Spawning of broodstock

Spawning of giant clams will be carried out *in-situ* on the Boheydulang reef using the broodstock that are maintained there.

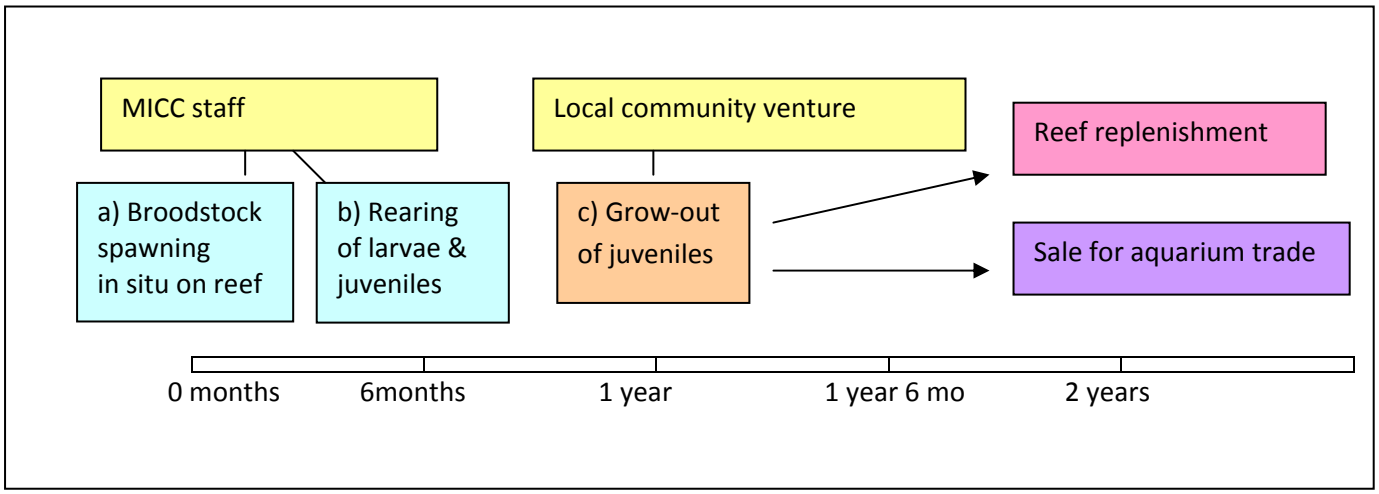
b) Rearing of larvae and juveniles

Eggs and sperm collected from the broodstock will be transferred immediately to the hatchery (Marine Invertebrate Conservation Centre - MICC) for fertilisation. The larvae will be maintained in rearing tanks for about a week before being transferred to large tanks for settlement and onward growth. These procedures will be carried out by Sabah Parks staff from the MICC.

Once the larval clams have settled they will then be reared at the MICC until they are big enough to be transferred to ocean nurseries for further development.

c) Grow-out of juveniles(farming)

Grow-out in ocean nurseries will begin when the clams are about 6 months old (shell length 3-5cm). Local communities will be involved at this stage and will take care of the clams until they are large enough either to be transplanted on the reef or sold for the aquarium trade. This phase will last about 1 year.



6. Management and financial aspects

The programme to culture giant clams and re-introduce them to reefs in the Tun Sakaran Marine Park has been funded primarily by Sabah Parks through the building of the Boheydulang Giant Clam Hatchery in 2004 (now re-named the Marine Invertebrate Conservation Centre), purchase of necessary equipment and employment of staff. Technical and financial support has also come from the Marine Conservation Society and Darwin Initiative through the Semporna Islands Project.

These investments by the partner organisations were considered as an essential part of the biodiversity conservation initiative designed to tackle the problem of severe over-exploitation of giant clams in the Semporna area.

The existing giant clam breeding programme provides the opportunity to meet one of the other management objectives for the Park which is to encourage local communities to move away from fishing towards more sustainable livelihoods. Giant clam farming is a low-impact activity that will not only provide jobs for local people but will also bring in revenue from sales that can be re-invested in the giant clam culture programme, so ensuring that conservation efforts are maintained.

Farming of giant clams by local communities for sale as aquarium specimens is a financially-viable proposition because costs of research and development have already been covered, so the local community project will not have to take on this burden. In addition, day-to-day running costs of the MICC are supported through Sabah Parks as part of the initiative to promote biodiversity conservation and the alternative livelihoods programme.

Currently the local community does not have the financial resources to buy seed clams from the Sabah Parks hatchery. However, the enterprise could be developed by subsidising the start-up phase until enough income is generated for the participants to buy their own seed clams.

7. Key activities and implementation timetable

JUNE/JULY 2011: TRIAL EXPORT OF EXISTING STOCK

- Export entails a series of steps including preparation of the animals, obtaining the necessary CITES documentation and organising packaging (styrofoam boxes) and air freight.

- A trial run using existing stock is recommended in order to make sure that operations run smoothly. This would involve exporting a consignment of several hundred animals.

JUNE 2011 onwards: CONTINUOUS ROLLING SPAWNING PROGRAMME

- MICC continue, as a matter of urgency, spawning of giant clam broodstock and concentrate on species of particular value for the aquarium trade, such as *Tridacna squamosa*, *T. maxima* and *T. crocea* as well as the over-exploited species (*T. gigas* in particular).

- Larval and juvenile clams are reared at MICC until they reach a size of 3-5cm when they can be moved to ocean nurseries.

JUNE 2011 onwards: TRAIN PARTICIPANTS & LAUNCH ENTERPRISE

- Hold discussions with local communities in TSMP, offering the opportunity to take up giant clam farming as a small business enterprise. This would be subsidised for the first year and then become self-sustaining (i.e. the farmers buy seed clams in the same way as the seaweed farmers buy seedling plants).

- Organise and run workshops for the community participants to learn how to make, clean and maintain the cages and clams and monitor their survival and growth. These workshops would be organised collaboratively by SIP and Sabah Parks, with funding from CIMB.

- Provide the community participants with some of the existing stock of around 1500 juvenile *Tridacna derasa*, ranging in size from 5-10 cm*. For this start-up, it would be possible to provide 200 clams to each of 4 communities and keep 200 to enhance wild stocks on reefs in the Park.

- The farmers maintain the clams for a period of 2-3 months, until they are ready to be marketed.

- Sabah Parks / SIP act as the selling agent and provide the farmers 50% of the export price ** plus (free-of-charge) a batch of new juveniles for grow-out (the 50% retained by Sabah Parks/SIDP will be invested in expanding the scheme to other communities and maintaining the breeding programme).

  ** export price is approx US$ 6-8 per clam according to TMC.

- The farmers maintain the new batch of clams until they are large enough to be sold. SP/SIDP pay the farmers 75% of the export price and keep 25% to maintain the breeding and conservation programme. The farmers buy new seed clams out of their profits at a fixed price (to be decided).

- The cycle continues…

8. Export trade and permit requirements

All species of giant clams are listed in Appendix II of the Convention on International Trade in Endangered Species (CITES), which means that international trade is monitored and permits are required for export and import. Malaysia is a signatory to CITES and permits for giant clams are issued in Sabah by the Wildlife Department.

Export of wild-caught giant clams from Malaysia is prohibited, but since the farmed giant clams will be 100% hatchery bred then it should be possible to obtain CITES-export licences without any difficulty.

It would be beneficial to devise a system where the baby clams are attached to a small piece of artificial substrate at an early age. This has two advantages – firstly they suffer less disturbance and secondly it is a then very easy to identify them as hatchery-bred individuals, which makes the CITES inspection process much easier.