

TA-6619 REG: Marine Aquaculture, Reefs, Renewable Energy, and Ecotourism for Ecosystem Services

Context

Palau is a small nation that is an ideal demonstration hub for *all* the concepts of interest in this MARES project. By working with local communities and establishing the baseline for integrating renewable/ new tech industries into regional pacific communities this project would be ground-breaking as a prime example to bring new technology to the *blue* regions that would benefit most.

The Vision

A renewable-energy operated project, focussed on development of new food fish species for the betterment of all involved. The project would produce electricity to sell back to grid, food fish for grow out, food fish export, species rewilding (food and coral reef security) and marine science education/tourism, all benefiting from this **proven** concept. This facility will have a state-of-the-art visitor centre highlighting the cultural history, marine diversity and significance of Palau's role in the Pacific.

Bowling has lived in Palau for more than 10 years. His personal research has allowed him to culture more than 60 new species of fish. He founded Biota Aquariums based on his methods of fish culture (www.thebiotagroup.com) which is known as the only aquarium fish supplier that is 100% cultured fish. One of the reasons Palau is so significant is due to the unique combination of medium/high biodiversity with a small geographic area. This means Tom was able to conduct 10 years of research on spawning fish aggregations and from this, develop methods to collect gametes (fish eggs) from these spawning populations and then raise more than 12 new species of food fish species plus many more aquarium species. This story includes the rearing of the significant and highly valuable Bumphead Parrotfish (*B.muricatum*), red snapper (*L. bohar*) and many other species of high value. This business model also focusses on the large-scale production of corals *both* for reef health and sustainable food source for the Bumphead Parrotfish.

Solution

By establishing the natural spawning cycles of certain 'species of significance', we harvest their eggs and then produce many juveniles for multiple uses- food grow out, restocking for conservation and restocking for food security all while using 80-100% renewable energy. Through production of the right species the value is created either through exporting high-value fingerlings for grow out elsewhere, grow out locally, or restocking to the local reefs for food security (rewilding). This facility will provide resources for the large-scale coral propagation for reef resilience and to combat the effects of human induced impacts. Meaning staff, coral farms and resources to survey, re-plant and monitor damaged reefs.

This project will develop the largest coral farm on the planet.

PROJECT NAME:

Pacific Oceanic Explorers

CAPITAL COST:

\$ 3-5 million

DEVELOPER:

Alan Marbou

Chris Kitalong

Tom Bowling

PROJECT HOST:

Peleliu State,

Melekeok,

Palau

GEOGRAPHICAL LOCATION:

Republic of Palau

TYPE OF PROJECT:

Energy, Reefs, Aquaculture,
Ecotourism

PROJECT TIMELINE:

3-5 years

Technology

Energy

The sites that are secured are located in Peleliu and in Melekeok both lending themselves to multiple technologies that all relate to the MARES principles including, OTEC (within 1 kilometre of suitably Deep Ocean) Wind is reliable and Solar Power (a high return potential).

Peleliu: The Peleliu Government has already confirmed full support of land and access to establish an OTEC facility and/or solar array of suitable size to run facility and perhaps the entire island. Peleliu is already equipped with a generator facility that burns excess diesel fuel which is wasteful and not necessary for the rate of the demand on island, however it is currently the only option.

Melekeok: This state is on the 'big island' of Palau and this perhaps makes the site more useful for OTEC hence the addition of this location as an option. It could easily plug into the main grid and a small to medium system would easily supply the demands for the whole main island.

Aquaculture

The principles used are generally 'standardized' however it is the combination of these methods with the local knowledge of fish reproduction that has resulted in success with so many new species under Tom Bowling's research. Tom has spent the majority of his career defining the requirements of many different species of fish that all have major significance to the ecosystems, food securities and ultimately an export product.

Business Model

Fingerling Export- the fundamental 'cash cow' on this concept is to grow the right species for local farming and export to the 'grow out' (production) aquaculture in operations around the world. There are several species we can produce in high volume that would be of major interest to operations throughout Australasia / Pacific and Globally for grow out for food fish production. Many of these species are well suited to this as a result of being raised in high densities and weaned onto pelletized feeds that are lower in protein than the regular 'grouper and snapper' that require unsustainable high protein input.

Food Fish (local grow out)-This project would cover the most complex and expensive aspect of fish production which is the larval stage development and all associated costs in getting the fish to 'fingerling' size. This would then support multiple local companies with supply of larval fish making their time to market shorter, more reliable and more consistent as they can then focus on growth of fish and not the highly expensive and technologically demanding aspect of a larval fish hatchery.

Rewilding (conservation and food security)

By growing excess larval fish of various species, the populations of local food fish can be supported during higher-than-normal pressure of commercial fishing practices. Much like the Salmon fishery that is supported by releasing larval fish annually, this would operate similarly but with NATIVE species which would then self-regulate and not compromise reef health with disease or genetic risks (parents are wild fish).

Coral Farming

The proposed model would result in the development of the worlds largest Coral Farm. This farm would be used to feed the Bumphead Parrotfish (most sustainable for non-herbivorous species), aquarium trade AND to restock reefs damaged by storms, bleaching events and other impacts.

Financing

Initial funding will be in the range of 3.5-5 million dollars (concept is scalable and price dependant on location) to build the facility that would support this production for the future layout of this project.

This is including *Solar power* onsite that would supplement 60-70% of requirements.

In discussion with potential OTEC partner, of which the installation and financial modelling would remove OPEX such as power and water supply.

Security

Several locations suitable for hatchery, OTEC and most importantly, ocean leases for fish grow-out are **secured**.

This ensures fast start up time and confidence in investment.

Product and Results

Training and Careers

This facility, run as a training centre, will have a huge social-economic impact by seeding new careers while training locals for those jobs onsite with modern facilities. Nationally, the population of Palau will benefit by having a state-of-the-art training facility with the most advanced scientifically proven methods of fish culture and 'science-based facilities' to operate and train from.

Food security - Rewilding

Part of the projects vision is to release a fixed percentage of the species produced back to the wild.

This in turn will help supplement over-fished species such as the Lined Rabbitfish, (*S.lineatus*), which has been released in high numbers already from the Biota Palau facility over the last 6 years as part of Bowling's work.

Export Product

New technology providing renewable power to populations in the remote pacific and our state of the art facility that can produce some of the highest value food fish found in the tropical reefs around the world. For example, the Napoleon Wrasse (has been cultured in the past) can fetch the highest value in reef fish trade.

Energy Research

The Governors of both states (Peleliu and Melekeok) have expressed interest and offered help in the development of a 'technology park' where multiple facilities could be established in order to work on new technologies such as OTEC which the site is particularly well suited with deep, clean water access.

Relevant History

Bowling's work in the Pacific has expanded over 15 years in various regions, with over a decade in Palau which has allowed him to understand and integrate with the politics, processes and culture. This means that the development of a large-scale production facility would certainly benefit from the personal relationships, associations and history that already exists.

Tom Bowling is a Marine Biologist and Aquaculture Systems Designer.

He has been designing and building aquaculture operations for his entire career (25 years).

His work includes the design and construction of 4 Aquaculture Facilities and 2 Public Aquariums.

He has led teams that have cultured in excess of 60 new species of fish (many ornamental) but also the Bumphead Parrotfish - species of significance.

Tom is currently in Australia helping the completion of a high tech multi species aquaculture park that will be the first of its kind in Australia. (www.australiabaylobsterproducers.com)

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References

Provide references and weblinks to support the above.

1. www.thebiotagroup.com
2. Video explaining the reasons for focussing on species such as the Bumphead Parrotfish (*B. Muricatum*) for Aquaculture and Conservation. [BHP Video](#)

