

BEST PRACTICES FOR THE ORNAMENTAL TRADE IN TONGA

prepared by
Secretariat of the Pacific Community (SPC)



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Executive Summary

The marine ornamental industry has been established on Tongatapu since 1988, with the trade centering on live rock, until its collection and export was banned in 2008. Live rock is a commodity highly valued in the aquarium trade. However, its collection often can have significant long-term detrimental impacts on reefs. With a ban on live rock still currently in place, operators' businesses have shifted their focus on exporting live coral and fish only. Although Tonga has a long history of exporting both fish and corals, in the past, overhead for these exports were often subsidized by live rock profits. In general, best practices for fish and coral collection, handling, shipping and export were either never developed or lost in the transition to exports of fish and coral exclusively. Thus divers and operators are relatively inexperienced in the collection, handling, holding and packing of marine aquarium fish.

Over a 3 week period, a number of activities were undertaken with two of the main exporting companies in Tonga to:

1. Train operators and collectors in best practices in the handling, packing and general husbandry of marine aquarium fish and corals for export from Tonga;
2. Raise awareness of possible improvements to local facilities to optimize fish and coral health and the safe transport of fish and corals for export; and
3. Develop, where applicable, a cost-benefit analysis for aquarium fish and coral exports.

While on location it became apparent that though it should be possible to establish sustainable and financially viable aquarium fish and coral exports from Tonga, there are currently a number of hurdles in place preventing the development of such opportunities. Firstly, in the case of fish, there are no full-time trained Tongan collectors. Locally available foreign collectors are associated with high immigration fees and associated travel expenses as well as housing costs. Therefore, to develop a sustainable and financially viable business, the lack of trained Tongan fish collectors would need to be addressed. Secondly, air cargo space is currently limited, variable, and there are no direct flights to the USA or EU, and no solution to any of these issues in the foreseeable future. Constraints on the availability of air cargo space will limit logistics and the size of the aquarium trade from Tonga. Thirdly, cost of packing materials is very high as are most business operating expenses. Fourthly, there is a lack of knowledge and understanding amongst exporters of the price competition in the region that Tonga faces to sell its fish and corals. There is also a lack of understanding that certain species, including endemics (i.e., *Siganus niger*), have a low demand and cannot be utilized to gain sales except on a very limited scale. The current market for Tongan corals is relatively strong and building fish exports onto this market strength would enhance viability of both exports.

This project implemented and/or improved Best Practices in handling, holding, and packing for the marine aquarium trade at two operating facilities in Nuku'alofa. In addition, activities undertaken allowed for one operator who was not actively exporting fish at the time to resume exporting fish weekly. Sadly this initiative failed four months later as the company's foreign collectors moved to a new enterprise that began operations after our departure. This highlights the need for trained Tongan aquarium fish collectors, just as there are trained aquarium coral collectors. The resources for the sustainable collection and viable export of aquarium fish and corals exist in Tonga and these exports would provide jobs and foreign revenue.

Introduction

The marine ornamental industry has been established on Tongatapu, the main island of the Tonga archipelago, since 1988 (see Matoto et al. 1996 for further details). Until its ban in 2008, the trade centred on the exports of live rock (Figure 1), a commodity highly valued in the aquarium trade primarily because of its function as a biological filter. However, the collection of live rock often can have significant long-term detrimental impacts on reefs (Wabnitz et al.



Figure 1 - Tongan live rock

2003). Large-scale removal of live rock, the result of hundreds of years of accretion, can destroy reef habitat, undermining the structure of coral reefs and leading to increased erosion as well as reduced biodiversity. A recent study undertaken by SPC on Tongatapu concluded that live rock collection around the island was conducted using chiefly destructive means, leaving visible scars in the reef framework, reducing reef complexity and probably significantly contributing to the decline in fishermen's reported catches of fish and other marine species typically collected from areas used for collection of live rock.

With a ban on live rock still currently in place¹, operators' businesses are dependent on exporting only live coral and fish. Although Tonga has a long history of exporting both fish and corals, overhead for these exports were often subsidized by live rock profits. In general, best practices for fish and coral collection, handling, shipping and export were either never developed or lost in the transition to exports of fish and coral exclusively (i.e., not including live rock). Thus, divers and operators are relatively inexperienced in the collection, handling, holding and packing of marine aquarium fish

Aims and objectives

This study sought to work closely with local operators to (1) introduce and build capacity in best practices for the trade at all levels, and (2) to restore financial viability in the industry. Specific objectives included:

- a. Raising awareness about safe diving protocols;
- b. Training operators and collectors in best practices in the collection, handling, packing and general husbandry of marine aquarium fish and corals for export from Tonga;
- c. Raising awareness of possible improvements to local facilities to optimize fish and coral health and the safe transport of fish and corals for export; and
- d. Working through cost-benefit analysis for aquarium fish and coral exports with traders.

¹ However, note that one exporter was granted a special 6-months "trial license" to export a set quantity of live rock destined for the aquarium trade market in 2012/2013. Furthermore, rumours and recent stock lists of a number of online retailers indicate that live rock exports were (and may still be) taking place to the US and therefore that further live rock collection exemptions must have been issued.

Implementing Best Practices

At the time of our visit there were 3 exporters operating from Tongatapu² – Ecological Reef Farms International, Quality Reelife Marine Tonga, and South Pacific Paradise Exports. To best be able to determine the types of activities needed and that would benefit the industry locally, a meeting was arranged with each exporter. Subsequent to this initial discussion, one of the operators indicated they were not interested in taking part in the activities we had outlined, thus limiting our work scope to the remaining two operators. At the time of our visit, Quality Reelife Tonga was exporting corals and a very small number of fish (approximately one box weekly); while Ecological Reef Farms focused on coral exports, expanding into the sale of fish in March 2013, unfortunately ceasing exports in July/August 2013.

Diving and collection

It was hoped we would be able to dive with certified collectors from each operator and do some hands-on training of "best practices" with regards to collection of corals and fish, on-boat handling of specimens, general environmental impacts, and safety practices. However, this work could not be implemented as divers do not currently hold a valid SCUBA certificate – therefore, for liability reasons no diving work with any of the collectors was undertaken. As an aside, divers were not motivated to go out and collect fish as the sea cucumber fishery was open at the time of our visit, providing a much more lucrative income opportunity than aquarium fish collection (i.e., TOP60 per sea cucumber compared to approximately TOP80-100 per day for aquarium collection). Although SCUBA diving is not allowed in the sea cucumber fishery, enforcement of this regulation seemed non-existent. Thus, we were limited to having a general conversation about dive profiles and safety protocols with one of the operators only.

Holding and general husbandry of marine ornamentals

Several visits were paid to the two local holding facilities. Detailed inspections allowed for the provision of hands-on advice on how to improve design and structural aspects to maximise survival and quality of fish and coral at shipping time. Details at the level of each individual company are provided below.

ECOLOGICAL REEF FARMS INTERNATIONAL

A review of procedures in place and of the fish showed that there was not a good grasp by owners and staff of how to maintain the fish section of the facility, or the fish themselves. Best practice was not understood or the financial benefit it can provide when implemented. Fish were not being maintained to maximize health. Basic understanding of fish feeding, water flow, protein skimmer adjustment, etc... was absent. A variety of improvements were initiated to improve the situation, within the scope of limited financial resources and equipment available locally.

Plumbing and Protein Skimmer

Plumbing suggestions were made to maximize flow through all portions of the fish holding tanks and thus improve water quality to the fish. Subsequent work with the designated plumber allowed for those suggestions to be implemented and adjusted where necessary. Instructions

² Plans are currently underway for two more operators to establish themselves on the island and one of them has started operations as of 2014

were also provided on how to fine-tune the skimmer based on load and flow rates to optimize its efficiency and ensure good water quality.

Screening of fish for quality, cosmetic imperfections, and health

Upon arrival, fish were either kept in plastic sealable cups (i.e., take-away or soda drink plastic containers) or in larger home-made plastic mesh vats. The cup set-up did not allow for regular adequate screening of fish. Hence, one of the first tasks undertaken was to develop a basket system in the large aquaculture vats that would minimize stress on animals and allow for fish to be inspected properly with a flashlight (see “holding section” below for further details). We discussed fish screening procedures and the importance of the process in detail with the exporter, and undertook the training of two staff over several days. It was our recommendation that screening of fish be undertaken on arrival from collection and daily, at the same time every day. Specific fish screening training steps included the following:

- On arrival at the facility, screen fish for quality, sizes, cosmetic imperfections, and species on order. All fish that show significant imperfections, are not on order, of unmarketable size, and/or poor health should be cupped to be returned to the ocean the next day.
- On arrival at the facility, screen fish to determine if they are sufficiently decompressed. If this is not the case fish should be separated from others and cared for appropriately.
- Screen fish daily for quality, cosmetic imperfections, and disease. It is recommended to use markers (e.g., marble) to label cubicles/baskets of fish that should be monitored more closely.

The training focused on how to undertake rigorous fish screening and the decision making process associated with fish that should be kept and monitored closely and individuals that should be returned to the reef.

Fish maintenance

Holding of Fish

The small enclosed cup method in place prior to our arrival did not allow for adequate screening of fish, or for the fish to be fed (when and if needed). It also significantly restricted the movement of larger sized fish. All resources available at local shops in Nuku'alofa were screened in an effort to find the best low cost option for providing fish with their own “cubicles”. This proved to be a fairly time consuming endeavour given sizes of existing goods that could serve as “cubicles”, prices, and quantities available. After considerable effort we opted for a type of basket sold in one local shop that provided sufficient room for the fish, facilitated feeding (when and if required), improved water circulation through it, and provided a good view for screening of the fish (figure 2).



Figure 2 - New cubicle system adapted to locally available resources and conditions

We made a realistic determination of number of fish to be maintained at the facility at any given time based on economic and typical order size considerations and purchased the required quantities of baskets to accommodate these fish. While the new set-up was a large improvement over the small cups there were still constraints to this solution (e.g., what species of fish could be mixed in baskets). Using past experience, trial and error, and knowledge of fish aggressive behaviour a set of recommendations were drafted listing which species could cohabitate and which species would need to be kept individually (see Annex I).

Feeding of Fish

The fish that were in the facility on our arrival had been kept cupped in the vats longer than is the norm or recommended, and were, for the most part, undernourished. All fish in the facility were screened upon arrival and individuals not of saleable size or species, as well as individuals we deemed would take too long to feed until they could be shipped, were returned to the ocean. For the remaining fish we purchased locally available frozen shrimp, chopped these finely, and fed the fish once to twice daily to bring individuals to a higher standard of health. Fish were screened daily and specimens deemed too weak or unlikely to return to good health despite feeding were returned to the ocean. Once cared for properly fish mortality dropped to zero at the facility. These fish were subsequently exported to the USA (LAX) with a registered loss upon arrival of less than 1%.

We provided local staff with training in fish food preparation, feeding techniques, and quantities to add to individual cubicles, as well as discussed general guidelines as to when it is appropriate to feed fish and when feeding should not be undertaken, how long to feed fish for and when to stop fish feeding prior to shipping.

A company-specific Fish Care data sheet summarizing some of the key points to implement and monitor was developed and supplied to the exporter (see Annex I).

QUALITY REEFLIFE MARINE TONGA

Plumbing

Detailed inspection of the facility's (Figure 3) plumbing set-up revealed that improvements could only be achieved with considerable effort and financial input, unavailable at the time. Specifically, the problem consisted of the pump only being able to draw water between mid and high tide and therefore only recirculating system water either side of low tide. As the plumbing had already been optimized for this problem there were no "quick" fixes.



Figure 3 - Quality Reeflife marine Tonga

Screening of corals for quality, cosmetic imperfections, and health

In general, the coral selection process was adequate. Adjustments to improve upon the quality of specimens and other recommendations had been made by the importer and communicated by means of detailed reports sent to the exporter. Specifically, these reports outlined which corals were desirable and those that were not, with a mix of pictures and written descriptions. Unfortunately, these were not being passed on by the exporter to local collectors and facility staff. We therefore spent time addressing this process to ensure a mechanism could be set up to pass on reports from the manager in town to key staff at the facility. It is hoped that this has now been resolved. In parallel, we also brought out two reports to the facility to discuss these in detail with one of the lead company members, highlighting some simple steps that could be taken to optimize customer satisfaction. In addition, before each pack we went to the facility to discuss the selection of corals (Figure 4) with the aim to send only desired corals to the importer and properly return all other specimens to the reef.



Figure 4 - Specimen inspection and quality control prior to export

In general the selection, screening, and return process was considered acceptable.

Coral System Maintenance

Our review of system maintenance showed that it was being carried out as recommended by the exporter and in general coral health of specimens held at the facility reflected this.

Packing

ECOLOGICAL REEF FARMS INTERNATIONAL

We attended packs on September 13, 17, and 24. Based on observations made at these packs we drafted a set of recommendations and provided staff with on-site explanations and demonstrations of best practice procedures to be adopted. The September 13 shipment was not uplifted due to airline freight limitations that day, providing for an excellent opportunity to unpack and observe the fish the next day and look at how the pack could be improved upon. The temperature range of the packing water was highly variable, depending on the tide, weather, and time of day, and was usually outside of acceptable range. Recommendations were made to cover both scenarios.

Water samples taken from the facility's vats and from the tap used for the packing water were sent in for bacterial analysis. Results showed high coliform counts. This problem could be addressed through UV treatment of the water, but funding limitations currently preclude deployment of such a system.

Observations made during the packing process showed that staff were untrained and unskilled in all packing aspects – from preparing bags for shipping, to choosing the adequate bag size based on fish size, filling a bag with adequate amount of water, or filling bag with oxygen. At all three packs efforts were extended to demonstrate and discuss how to implement each step in the packing process most efficiently and according to best practice. Time was allocated to repeat steps where necessary and provide hands-on training. Specifically, advice given to staff included how to organize materials for the pack; prepare packing water; choose adequate bag size based on fish size; handle fish for packing purposes; fill correct amount of water into the bag; fill bags with oxygen; place ready to pack bags prior to stacking in box; box preparation and lining; adequate density of bags inside the box; and export documentation preparation. A limiting factor in the training process was high staff rotation, meaning that only 1 to 2 staff remained the same between packs, reducing the effective capacity building and information retention process.

Please view Annex I “EcoReef Farms Company specific Fish Care” for more information.

QUALITY REEFLIFE MARINE TONGA

A review of packing procedures (Figure 5) and recommendations on bag size and water amount was undertaken during a pack at the facility on September 10. Further follow-up was not undertaken as the procedures were considered very good; this was also reflected in the less than 1% loss upon arrival in the USA. Loss of animals was chiefly attributed to leakage problems in a specific bag size. We recommended a solution to resolve this issue prior to the next shipment.

Although not a technical packing issue we found that airline freight space was severely tight on days of planned exports. Reserved space was cancelled and one shipment was not uplifted during our stay in Nuku'alofa. Following multiple meetings with the carrier, recommendations were made with regards to shipment rescheduling, holding, and packing practices. It should be

noted that this is an ongoing problem and that this threatens both the viability and the size of the marine aquarium trade in Tonga as a whole.



Figure 5 - Packing

At the time of our visit, winter, we found the water temperature to be acceptable for both shipping purposes and in the coral vats. However, as the shipping water container is exposed to direct sunlight, it is likely that packing water will be too warm during summer months. To minimize this problem the shipping water container should be covered.

Financial Viability

To assist with financial viability of the business Ecological Reef Farm International kindly provided access to setup and operating costs, other incurred expenses and expected income based on price list and orders. We found that accepted accounting procedures, balance sheets, and tracking of fixed and non-fixed expenses were generally not in place. Considerable time was spent in explaining how each factor affected overall business viability. We drafted simple spreadsheets to ensure all expenses were accounted for and to determine viability and showcase the impact cost increases or profit gains can have on various business aspects. The final result was a spreadsheet with (i) a very reasonable pricing structure for fish species collectable locally and desired in the marketplace; (ii) very reasonable wages paid to the collectors (especially when compared to income earned in other professional activities that we enquired about in Tonga); (iii) clear accounting of all costs, all the more important in Tonga where prices for packing materials, fuel, government charges, etc... are high; and (iv) very reasonable profit margins for the exporter overall. Based on figures and information available, or provided to us, it became quickly apparent that although according to current operations and procedures the export of aquarium fish and corals was not viable, small changes could easily be implemented to change the situation around. Below we highlight some of the points that stood out as key for promoting financially viable exports of fish and coral exports in the aquarium trade in Tonga.

Aquarium Fish

Expatriate collectors

Currently there are very few if any full time Tongan fish collectors. So an exporter must bear the cost of bringing in expatriate collectors. This imposes a high cost in travel and housing thereby increasing the cost of fish. It also reduces flexibility in a seasonal business and what should be a variable expense becomes a fixed expense or the exporter runs the risk of having the collector move to another company. In addition, these collectors may have low incentive to collect as per instructions or may collect bêche de mer legally or illegally³ instead of collecting fish.

Fish pricing structure

We found that collectors and exporters had an unreasonable expectation of what constitutes fair income to be derived from fish collection / export – an attitude that was exacerbated by looking at fish online retail prices. The gap between the price paid to an exporter and that of a fish sold online can be explained by the number of expenses that need to be accounted for between the port of export and final selling point, including but not limited to freight and associated expenses, import expenses, acclimation and holding at the import end, transport fees, etc... Unreasonable expectations based on exporters looking at retail prices to derive their pricing structure result in uncompetitive export pricing (and or collector pricing). This also results in miss-directed collecting activities trying to get specimens perceived to be of high value but that may not be. A good example of this is flame hawkfish (*Neocirrhites armatus*) that can be found to retail online at a price of USD45.00 (www.liveaquaria.com/). High quality specimens of this species are available from Fiji, an island which, unlike Tonga, benefits from non-stop flights and low freight rates to mainland USA. By looking at retail prices an exporter in the Pacific region may be tempted to target this fish, and to mark it up on his price list. However, an importer will not be interested in purchasing this species from him, if valued well above regional pricing, as quality is likely to be lower when compared to fish out of Fiji and freight rates will certainly be higher. The Free on Board (FOB) export price in the region for this species varies between USD8.00 and USD9.00 whereas the Tonga FOB price was USD19.50. Establishing a price list based on the USD45.00 .00 online retail price rather than the more realistic regional export price of USD9.00 FOB (for a high quality fish) will make an exporter uncompetitive. An experienced exporter will usually know the international pricing of a species he wishes to sell. Unfortunately, a starting company will not have this information and there is no standard way to acquire it. Nevertheless, trying to determine export price from retail prices in the market country is deeply flawed.

Due to freight space constraints and limited species available an exporter in Tonga cannot hope to undertake a high volume low margin business as found in Bali. However, based on species and stocks and known regional export prices, our calculations show that a fish export business could be sustainable and viable, provide livelihood opportunities for Tongans and provide export revenues to Tonga.

Productivity

Collection rates by collectors for all but a handful of species were very low. Unfortunately, as we were not able to dive with the collectors for liability reasons, we were unable to fully determine

³ This was found to be the case while we were there

the cause of this. Observations based on incoming catches however led us to believe that it was the result of a combination of collectors' choice of depth, overall profile throughout a dive, location, and targeted species. The latter were driven by internet pricing, not by actual demand and competing export prices in the region.

Based on the above and the resulting collated spreadsheet we have the following financial recommendations:

- Train local collectors to lower expenses associated with bringing in and housing of expatriate collectors. Providing such training would also build, develop and expand the local capacity base and increase the total number of collectors available at any given point in time. Local collectors are unlikely to move on to other destinations once trained while expatriate collectors may decide to move on to another company or another country. Immigration services should also see to it that any expatriate worker coming in to work for a specific company be granted a visa that ties him/her to that company (i.e., that individual cannot, under the same visa, go work for another company).
- Undertake a review of regional export prices, freight, and packing charges to bring pricing in line with competing countries. Avoid the use of online available retail sector prices in the destination/import country to determine fish export value.
- Export both fish and corals to have sufficient volume to pay overhead expenses.
- Implement Best Practices from collection through to shipping as they significantly and demonstrably contribute to overall business viability. For example lowering loss in the facility is a win-win for the fish, venture sustainability, and the bottom line.
- Develop simple accounting practices to determine profitability and pinpoint lost profitability. This also would promote finding ways to cut expense that do not lower quality as is sometimes the case.

The report highlights steps taken during the 3 weeks on location to implement best practices and promote sustainability and overall business viability, with significant advances made on several fronts within the remit of local resource constraints and staff availability. As a result, Ecological Reef Farm International resumed fish shipments during our stay and continued for another twelve shipments after our departure. Unfortunately, they eventually ceased due to collectors moving on to a new company that established itself after our departure. However, it is important to place this fact in context, namely that the overall long term viability of the business was threatened anyways due to the company's inability to sustain sales in their corals.

Aquarium Coral

In the case of coral, unlike for fish, skilled labour is available for the collection of specimens for the aquarium trade. The adherence to best practices was also more evident in the collection of live corals and exports.

Quality Reeflife Marine has a reasonable pricing structure and accounting system in place. The business is currently established and functions around weekly shipments. Ecological Reef Farm International as indicated above did not have adequate accounting practices in place, which contributed to overall lack of transparency in determining overall business viability. As with fish, its pricing structure relies heavily on expected income returns based on retail online pricing, resulting in uncompetitive prices, a limited customer basis, and only intermittent shipments that can be over a month apart. Both companies would benefit from weekly exports

combining fish and corals, rather than just one product. Air freight space may be a limiting factor.

Conclusion

A sustainable marine aquarium fishery focusing on the collection and export of live aquarium fish and corals and providing livelihood opportunities at the local level and foreign revenue for Tonga is possible based on known market demands and resources available. Unless airline cargo space issues improve it may be limited in size, which would provide an indirect insurance to the sustainability of the fishery. Regardless of cargo availability, the current management plan and associated regulations need to be revised⁴ and most importantly enforced. To achieve a viable, sustainable fishery that contributes to the economy will require funding and training of local collectors from a source capable and willing of providing both. As Tonga has exported live aquarium fish and corals for many years there is a resource of individuals in Tonga with prior experience in the fishery. In working with these individuals it was evident that many of them simply required being updated to current packing, handling, and general implementation of best practice procedures.

There are currently three issues limiting the viability of the aquarium trade in and out of Tonga:

1. The biggest issue is the current lack of qualified and skilled aquarium fish collectors (and adequately certified collectors in general). Providing locals with these skills would require adequate funding and substantial amounts of time.
2. Lack of funds to implement changes to current operations to raise them to a competitive standard.
3. Lack of expense efficiency to ensure businesses are viable. For example, if a company were to import their own container of insulated boxes and shipping plastic bags as opposed to buying them locally at a high price, these packing materials should be exempt of stamp duty (as they're being imported to be re-exported). Such a scheme would improve the likelihood of Tonga being competitive on the marine aquarium market, promote the development of local business opportunities, and stimulate economic returns from the trade to Tonga. This is common in other exporting countries in the region (e.g., Fiji).

References

Matoto S., Ledua E., Mou-Tham G., Kulbicki M., and P. Dalzell (1996) The aquarium-fish fishery in Tongatapu, Tonga. Status and recommendations for management. South Pacific Commission. 25p

Wabnitz C., Taylor M., Green E. and T. Razak (2003) From ocean to aquarium: The global trade in marine ornamental species. UNEP-WCMC Biodiversity Series No. 17. 64p

⁴ Currently ongoing

Annex I – Eco Reef Farms company specific recommendations

ECO REEF FARMS INTERNATIONAL LTD. COMPANY SPECIFIC RECOMMENDATIONS FOR PACKING & EXPORT OF TONGA MARINE AQUARIUM FISH

PACKING

SHIPPING WATER

SHIPPING WATER & TEMPERATURE:

- ✓ KEEP SHIPPING WATER CONTAINER CLEAN & COVERED – RINSE WELL BEFORE EACH USE
- ✓ IF POSSIBLE FILTER WATER WITH FILTER BAG, BE SURE THE FILTER BAG IS CLEAN
- ✓ IF FISH VATS ARE 70°F to 80°F (21°C – 26.7°C) SHIPPING WATER SHOULD BE 76°F (24.5°C)
- ✓ IF FISH VATS ARE ABOVE 80°F (26.8°C) SHIPPING WATER SHOULD BE 78°F (25.5°C)
(HEAT OR COOL WATER AS NEEDED TO REACH CORRECT TEMPERATURE)

SHIPPING WATER MEDICATION:

- ✓ 1 LEVEL SPOON AS PROVIDED OF NITROFUZAZONE TO ONE LITER OF FRESHWATER. SHAKE WELL.
¼ CUP OF MIXED SOLUTION IN A 32 U.S. GALLON BUCKET
- ✓ ALTERNATIVELY 1 ML OF NITROFUZAZONE TO 15 LITERS OF SHIPPING WATER



BOXES

DOUBLE LAYER BOX USING YOUR STANDARD TALL BOX. TO MAKE THE SUPPORT CROSS FOR TOP LAYER:

- ✓ HEIGHT OF CROSS 5 INCHES (12.5 CM) OR 50% INTERNAL HEIGHT OF BOX
- ✓ CROSS SHOULD SPAN DIAGONALLY FROM CORNER TO CORNER
- ✓ CROSS SHOULD BE WAXED CARDBOARD OR PUT PLASTIC BAG OVER EACH SECTION OF CROSS
- ✓ PLATFORM ON TOP OF CROSS SHOULD FIT SNUGGLY ON ALL SIDES

LABELING THE BOX FOR EXPORT:

- ✓ PLACE "UP" ARROW LABELS AND "LIVE ANIMALS" LABEL ON BOX'S LONG SIDES
- ✓ CIRCLE FISH ON "LIVE ANIMALS" LABEL & WRITE LIVE TROPICAL FISH AT THE BOTTOM
- ✓ LABEL BOX WITH YOUR COMPANY NAME/ADDRESS AND CUSTOMER NAME/ADDRESS
- ✓ LABEL BOX WITH SPECIES NAMES OF THE FISH INSIDE AND QUANTITIES OF EACH



BAGS

- ✓ PLACE BAGS OF A GIVEN SIZE IN INDIVIDUAL CONTAINERS FOR EASY AND QUICK ACCESS DURING PACKING
- ✓ KEEP BAG CONTAINERS EASILY ACCESSIBLE FOR FISH PACKER
- ✓ PUT NEWSPAPER LINING IN ALL BAGS SO THAT IT GOES COMPLETELY AROUND THE BAG
- ✓ REMOVE ALL AIR FROM BAG BEFORE FILLING WITH OXYGEN
- ✓ ALWAYS KEEP BAG UPRIGHT
- ✓ PACK IN BOX AS SOON AS POSSIBLE

TRANSFER OF FISH FROM VAT & FISH BASKETS TO BAG

- ✓ USE SOFT SMALL-MESHED NET TO REMOVE FISH FROM BASKET
- ✓ LIFT BASKET BEFORE NETTING THE FISH TO PREVENT THE FISH FROM JUMPING, BUT LEAVE ENOUGH WATER IN THE BASKET FOR THE FISH TO SWIM. DO NOT HAVE THE FISH DRY IN THE BASKET
- ✓ CHANGE WATER IN CONTAINER BRINGING FISH TO PACKING TABLE EVERY TIME YOU BRING FISH – OR AT LEAST EVERY 20 MINUTES
- ✓ KEEP ANGELS AND FISH THAT FIGHT SEPARATELY WHEN BRINGING FISH TO PACKING TABLE
- ✓ SCREEN FISH ONE LAST TIME BEFORE PUTTING INTO BAG
- ✓ DO NOT SHIP FISH THAT HAVE BEEN DROPPED ON FLOOR

HOLDING TIME FOR FISH

Fish size	Number of days prior to packing
Small (< 2in or < 5cm)	2-3 days
Medium (2 - 4in or 5 – 10cm)	3-4 days
Large (4 – 6in or 10 – 15cm)	4-5 days



FOLLOW BEST PRACTICE GUIDE FOR BEST QUALITY FISH

ECO REEF FARMS INTERNATIONAL LTD.
COMPANY SPECIFIC RECOMMENDATIONS FOR SYSTEM & HOLDING OF TONGA
MARINE AQUARIUM FISH

FISH HOLDING & SYSTEM

CURRENT SYSTEM DETAILS

- ✓ **SIZE:** TWO VATS EACH MEASURING 197.5 IN X 59.5 IN X 24 IN
- ✓ **SYSTEM VOLUME:** 163 U.S. GALLONS OR 617 LITERS PER VAT. **TOTAL SYSTEM:** 326 U.S.GALLONS OR 1,234 LITERS AT 24 INCH DEPTH. THE DEPTH VARIES AND THE SMALL GLASS RESERVOIR BY THE BIOFILTER CAN AFFECT VOLUME
- ✓ **SEMI OPEN SYSTEM WITH BASKETS TO SEPARATE FISH**



FISH

- ✓ **SCREEN FISH DAILY**
- ✓ **MARK PROBLEM FISH WITH MARBLE OR OTHER IDENTIFYING MARKER TO CHECK CAREFULLY THE NEXT DAY**
- ✓ **FISH THAT ARE DAMAGED SHOULD GO BACK TO THE OCEAN TO REDUCE SYSTEM LOAD AND GIVE FISH BETTER CHANCE TO HEAL**

FISH MIXING IN BASKETS (IT IS BEST TO NOT MIX FISH, BUT IF YOU HAVE TO MIX, MIX SMALL & MEDIUM FISH)

- ✓ **BUTTERFLY AND ANGEL – OK**
- ✓ **WRASSE AND ANGEL - OK**
- ✓ **TANG AND ANGEL – OK**
- ✓ **GOBY AND ANGEL - OK**
- ✓ **CANARIES - OK TOGETHER IN ONE BASKET**
- ✓ **CLOWNFISH DO NOT MIX - 1 PER BASKET UNLESS PAIR**
- ✓ **RED HAWK & STARCKI - DO NOT MIX; 1 PER BASKET**



AFTER SHIPMENT SYSTEM MAINTENANCE STEPS

- 1) **DRAIN BOTH FISH VATS COMPLETELY**
- 2) **THOROUGHLY CLEAN FISH VATS**
- 3) **REFILL WITH CLEAN OCEAN WATER**
- 4) **ADD MEDICINES IN APPROPRIATE MEASURED QUANTITIES FOR SYSTEM VOLUME**
- 5) **IF USING CUPRAMINE COPPER ADD 12 CC TOTAL OR 6 CC PER VAT (USE 1 CC PER 100 LITERS). THIS SHOULD PRODUCE A COPPER READING OF 0.1 ppm**
- 6) **COPPER TEST THE WATER AFTER COPPER IS FULLY MIXED IN SYSTEM. COPPER LEVEL SHOULD BE BETWEEN 0.06 AND 0.1 PPM. ADJUST IF NOT WITHIN THESE PARAMETERS**
- 7) **RINSE BASKETS OR IF VERY DIRTY CLEAN BASKETS AS NEEDED**
- 8) **CLEAN SKIMMER**

DAILY MAINTENANCE

- ✓ **CHECK SKIMMER AND IF NEEDED ADJUST AIR INFLOW AND/OR CLEAN**

INCOMING FISH

- ✓ **PLACE ALL FISH THAT FIGHT (E.G., CORAL BEAUTY; STARCKI; CLOWNFISH) IN INDIVIDUAL BASKET**
- ✓ **FISH THAT ARE NOT DECOMPRESSED PROPERLY SHOULD BE PLACED AT THE BOTTOM OF THE RESERVOIR FOR 24 HOURS.ENSURE INCOMING FISH ARE NOT CROWDED IN BOAT/TRANSPORT BINS (SEE BELOW).**

Fish size	Number of fish
Small (< 2in or 5cm)	[1L per fish]
Medium (2 - 4in or 5 – 10cm)	[2 to 3L per fish]
Large (4 – 6in or 10 – 15cm)	[3 to 5L per fish]



FOLLOW BEST PRACTICE GUIDE FOR BEST QUALITY FISH