Marine Aquarium Trade
Best Practices

E. Cohen[1], G. Hodgson[2] & M. Luna[2,3]
[1]Sea Dwelling Creatures, Inc. [2]Reef Check Foundation, [3]Comunidad y Biodiversidad
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CONTRIBUTORS

We are grateful to the following people for their important contributions to this manual:

Andrea Sáenz Arroyo – Comunidad y Biodiversidad
Francisco Javier Fernández Rivera Melo – Comunidad y Biodiversidad
Laura Escobosa – Eco Alianza Loreto
David Cripe - Monterey Bay Aquarium
Jack Jewell - Shark Reef at Mandalay Bay Casino and Resort
Gresham Hendee - Reef Nutrition
Scott Cohen - Sea Dwelling Creatures, Inc.
Brad Remmer - Sea Dwelling Creatures, Inc.

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INTRODUCTION

Climate change, ocean acidification, pollution, and overfishing are some of the factors, that are currently threatening marine ecosystems and the economies on which they depend. A solution to limit the deterioration of these ecosystems consists in promoting healthy populations that can better respond to the challenges ahead.

The marine sector of the aquarium industry is relatively a new hobby compared to it's counterpart of freshwater fish keeping. Even when the growth of the marine aquarium trade has been fast, in the present there still exists a need to standardize the manner in which traded organisms are handled, from the process of collection to home aquarium.

This manual, along with a fisheries management plan, are tools created to help the marine aquarium trade become more transparent, and to follow scientific recommendations to ensure its success and that of the ecosystems in which it is based. This manual is a collaboration among multiple commercial and non commercial operators, and presents some of the best well-known and successful procedures, here referred to as Best Practices, to best handle marine organisms.

The responsible enterprise is characterized by the use of Best Practices (BP). Best Practices can be applied to different activities and are defined as the processes, practices and systems that generate exceptional results and that are widely recognized for maximizing yield and efficiency in specific areas.[1] The correct application of best practices facilitates:

- Reputation improvement
- Risk management
- Strengthening of competitive position
- Expanded access to credit and capital
- Increase in profits and expense reduction
- Long-term sustained growth
- Acquisition of international respect[2]

This manual discusses Best Practices for the handling of marine ornamental organisms. It is important to highlight that the sustainability of the trade and the quality of organisms is the result of all components in the delivery chain. Through many processes in the ornamental chain, if one part of the chain is neglected, the result in low quality or high mortality may lessen the reputation and economic benefit, and may affect negatively the marine environment.

FISHERY MANAGEMENT

Responsible management of an ornamental fishery should include:

- Legal permits and licenses.
- Collection areas legally and geographically defined.
- Establishment and implementation of marine protected areas (MPAs) inside collection areas.
- Underwater monitoring of collection sites and MPAs.
- Annual assessment and determination of quotas or Total Allowable Catch (TACs) per species and collection site.
- A tracking system to track organisms collected per site.

Please contact Reef Check for advice on how to develop and implement items 3-6.

Reef Check Foundation
PO Box 1057 (mail)
17575 Pacific Coast Highway
Pacific Palisades, CA 90272-1057 USA
T: 310.230.2371, 310.230.2360
F: 310.230.2376
E: rcinfo@reefcheck.org
www.reefcheck.org

COLLECTION

Organisms captured for the marine aquarium trade must be handled with extreme care to reduce stress and minimize injury. Organisms will be exposed to stress during: the collection process, quarantine period before export, and transportation until reaching final destination. All these factors can contribute to unnecessary stress and higher than average mortality.

The industry demands a high quality product. All organisms should be screened prior to export to ensure near perfect quality and health on the organism. Only these organisms should be selected and shipped to each customer. Failure to follow strict quality procedures will result in elevated costs for the importer and ultimately the exporter. Imperfect organisms also have higher incidence of disease and mortality.

Collection techniques

BP: Ensure all fishers are using non-destructive fishing techniques and avoid damage to the marine environment at all times. Avoid using any substance of biological or chemical origin to capture ornamental species (i.e. cyanide, clove oil, quinaldina, or rotenone). In addition to being unlawful, such practice is harmful to the marine environment and to the human body (some are suspected carcinogens). Return removed rocks to their original position.

BP: All fishing gear should be picked up at the end of a work day. Picking up gear such as hand nets, barrier nets, weights etc, helps prevent incidental catch or unnecessary mortality in the marine environment.

BP: When anchoring at a collection site, avoid damaging elements on the ocean floor such as coral heads with the anchor, boat, or engine. If there is a permanent buoy available in the fishing area, use it.

BP: Aggressive organisms or organisms with rough skin should be kept separated to avoid injury. Cups, and containers with compartments should be used during collection and handling.

BP: Schooling or compatible fish should not be overcrowded in containers. A 20 gallon bucket should contain a maximum of 10-15 fish 2-4 inches in length.

BP: During the collection process 50% of the water in the holding containers should be changed every 15-20 minutes. Fishes filter dissolved oxygen in the water through their gills. Constant water changes help to maintain a healthy level of oxygen and constant temperature, as well as to dilute the concentration of biological waste.

BP: The organisms should not be exposed to air during any process. Smaller containers should be used to move species from one container to another.

BP: Maintain the organisms' temperature constant by keeping them in the shade during the work day. Water temperature should not vary more than 2º F (1ºC) per day. If your

vessel is not equipped with fixed compartments such as a cabin, an umbrella or canopy can be used. Extreme changes in temperature can negatively affect an organism's health.

BP: Fishes must be collected with enough time in advance before the packing date. Larger fish should be collected during the first days followed by the smaller fish, and the invertebrates last. This is to ensure fish have enough time to "purge" and clean out their stomachs. When a fish is packed too "fresh" there is a greater chance that its health is affected due to the higher concentrations of biological waste such as ammonia inside the bag. Common results of inappropriate purging are damaged fins, cloudy eyes and bacterial diseases. Best practice for purging times for ornamental fish being shipped in 48 hours or less are:

- Smaller fish 2 – 3 days
- Medium fish 3 – 5 days
- Larger fish 5 – 10 days

Common sense should be used when determining time periods before being shipped. Longer transportation times should also be factored. Shipment results from buyers will be needed to make adjustments.

If the organisms are kept in holding pens in the sea it is normal that they consume a small amount of food taken by the currents. It is important to clean the holding pens often to avoid a buildup of algae and other organisms that may become food for the captive ones.

BP: Organisms must be inspected on the vessel before being transported away from the collection site. Sick, injured, or deformed animals should be returned to the sea immediately. Dead organisms must be disposed of in a safe manner.

BP: Organisms should be logged within 24 hrs. Keep an accurate record of the number of organisms per species captured, the mortality, and the remaining quota; these can be written in the fishing logs.

Decompression

Similar to humans practicing SCUBA diving, a fish brought up from deep water must be allowed to decompress appropriately to avoid affecting its health. Floating or abnormal swimming behavior are the most obvious symptoms of inappropriate decompression. Erratic behavior, inability to submerge, internal and external bleeding, protruding eyes, protrusion of internal organs through mouth and anus, and gas embolisms (sudden blockage by gas bubbles of blood vessels, gills, skin and brain) are other symptoms of poor decompression. Death can result from gas embolisms and internal organ damage.[3]

A variety of fishes have an internal organ called the swim or gas bladder. It contains gases that a fish can adjust to change its depth in the water column. Remember that pressure increases with depth. When a fish is swimming in a shallow area these gases are expanded due to less pressure. To move to a greater depth the fish deflates its bladder (similar to releasing air from a buoyancy compensator). The fish then starts to sink as the increasing pressure compresses its body even more. At a greater depth the gases in the bladder are more compressed and to avoid an overexpansion, migration to shallow water has to occur gradually.

BP: When collecting fishes deeper than 30 feet (10 m), raise holding containers at a rate no faster than 3 feet every 10 minutes. A good measurement is equivalent to 1 pull on the rope every 10 minutes.

BP: The use of a sharp instrument to deflate the swim bladder, a procedure known as "fizzing,"[3] or "needling" is not advisable. If fizzing must be conducted, the steps below are recommended:

1. Identifying where the swim bladders are on each species is critical, and you can find out for yourself. When a fish dies accidentally, dissect it laterally and investigate where the swim bladder is in relation to the position of the mouth, fins, anus, eye, etc. If possible make a sketch and keep it for future reference.
2. Maintain fish underwater at all times.
3. Use an ultra thin hypodermic needle to avoid it gets clogged with the fish tissue.
4. Locate the anal opening as one point, and the middle of the soft and spiny dorsal fins as the second point. Draw a line between these two points and locate the midpoint.
5. Remove a scale from the midpoint.
6. Insert needle at a 45º angle.
7. Gently squeeze the fish belly making sure not to release too much gas (listen and watch the escaping bubbles).
8. If bone is encountered do not puncture any deeper.
9. Count 1-2 scales down and try again if not successful the first time.[3]

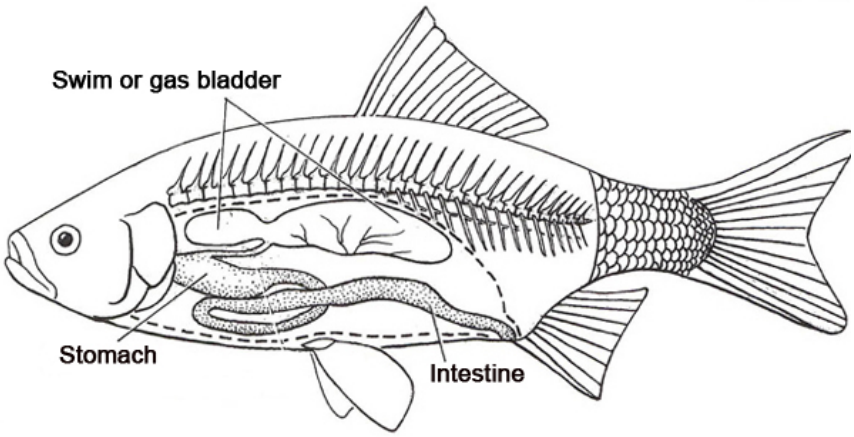

Figure 1. Swim bladder (Illustration adapted from S. J. Kerr, 2001).

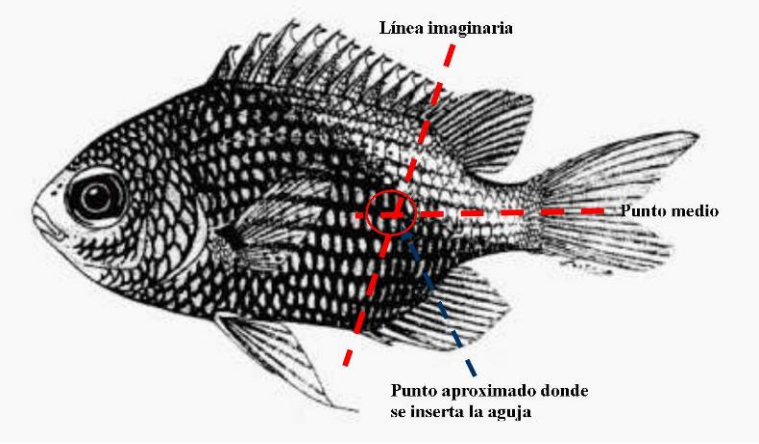

Figure 2. Approximate point of insertion (Illustration adapted from S. J. Kerr, 2001 and Encyclopedia of Life - http://eol.org/pages/205838)

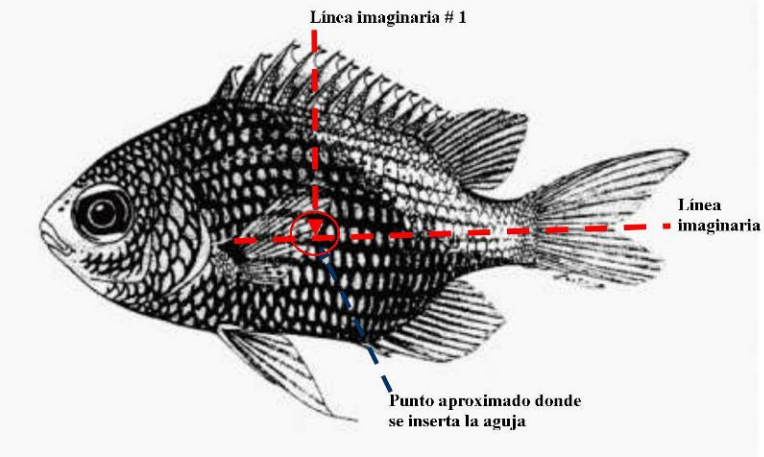

Figure 3. Approximate point of insertion (Illustration adapted from S. J. Kerr, 2001 and Encyclopedia of Life - http://eol.org/pages/205838)

HOLDING

The first hours after collection are the most critical and will determine the overall future health of the organism. Newly collected animals will excrete the most urine and feces within the first few hours, and then decreasing over time. This means that **it is most important that best practices are followed from the very beginning**. The majority of organisms are kept separately after immediate collection. Non aggressive fish, however, can be kept together in the appropriate size containers, or performing regular water changes if fish are bagged in plastic with oxygen.

BP: All holding pens, tanks, plastic bags, and containers used to maintain organisms must be clean and without sharp edges or rough areas. Holding pens must be cleaned on a regular basis, preferably every 2 weeks or after every shipment when they are not in use.

BP: Holding pens in the ocean must be set up in sites where the water is clean and circulates well; and at least 3 feet below the water surface where the temperature remains more constant. Direct exposure to the sun should be avoided.

BP: Organisms should be handled appropriately per species and kept separately based on:

- Aggressiveness
- Skin/scales (soft or rough)
- "Freshness" – by collection day

BP: Non-compatible species must be kept separately inside containers that are appropriate for the animal size, and that allow plenty of water to thoroughly circulate within. Compatible species such as schooling fish should not be overcrowded when kept together.

BP: Soft-skin and rough-skin species must be kept separate from each other. To find out which is which, run a finger delicately over the skin of the fish from the head towards the tail. If soft and rough skin fish are kept closely together, they will scratch each other causing damage. The consequences, such as cloudy eye and other bacterial infections, will start to show in the fish appearance in 3-5 days.

BP: Separate fish by collection date. This will the tracking of collection information, appropriate feeding should a delivery date be postponed, and better understanding of mortality trends.

BP: Feed organisms appropriately; small to medium fish under 4" should be fed after 5 days of collection date, and bigger fish should be fed after 8-9 days of collection date. In case the shipment date is postponed and organisms need to remain in the holding facility these must be fed or irreversible damage will occur to their digestive system. Fish that are not shipped or fed after 3 weeks or more should be returned to the sea.

BP: Fish that are not shipped or fed after 3 weeks or more should be returned to the sea.

BP: Inspect organisms after each collection day. This should be done under good lighting or assisted with a flash light. Dispose of dead organisms immediately in a cleanly manner. If an organism is injured it can:

- Be held for about a week to see if it heals.
- Be returned to the sea where its possibilities to survive are higher.

BP: Outbreak and spread of disease should be prevented. Dead organisms should be disposed of safely and hygienically. Aquaria, holding pens, and other gear must be disinfected regularly using fresh water. Disease outbreaks and treatments should be recorded.

PACKING

BP: do not expose organisms to air during any process. Smaller containers should be used to move species from one container to another. Anglers, puffers, seahorses and sponges can never be exposed to air. It has been studied that it could take 30 days for a fish to fully recover physiologically from a few seconds of exposure to air.

NOTE: An exception to this BP occurs when a fishing permit, and by default the government, require that a number of organisms are measured and weighed per shipment. In this case the information must be collected exposing the organisms to the air as little as possible.

BP: Assign specific tasks to each person involved in the packing process. For example one person in charge of animal screening, another in charge of bag sizing per organism, etc.

BP: Ensure you have all the needed materials ready before the packing day. Organizing and planning activities with enough lead time can avoid the need to skip procedures, and help reduce costs and risks. Writing a list can help, for example: airline booking for reserved space, boxes, bags, tape, oxygen, etc. Do not leave organisms in the sun and pack in a protected area.

BP: Do not overcrowd fish during the packing process.

BP: Incompatible species should continue to be kept separated (aggressive and rough skin/scale organisms).

BP: The size of the bag must be calculated based on the size and habits of the fish or invertebrate. In most cases a fish has to be able to swim and turn around inside bag. Sedentary or perching fish can be packed in smaller bags with less water. Hawk fish, for example, tend to sit on the bottom of bag, so they can be packed in smaller bags with low water levels.

BP: When packing larger fish that require bags size "full" it is recommended to first put the bag inside the box, add a little water, then add the fish, and then cover the fish with water. Given that this generally requires double bagging, the inside bag should be sealed first with 2-3 rubber bands; then proceed to close the outer bag with 2-3 rubber bands.

See the **Bagging and Sizing Chart** in Appendix I.

BP: Inspect organisms before packing them. Ensure that the fish or invertebrate is in good physical condition by verifying that ALL its parts are intact (eyes, fins, legs, arms etc) and that the animal is behaving normally. Deformed, injured, or unhealthy organism should be returned to the sea as soon as possible. Injured or sick organisms are more susceptible to stress and to dying during transportation. It is better to send an incomplete order than to risk loss by sending product of low quality.

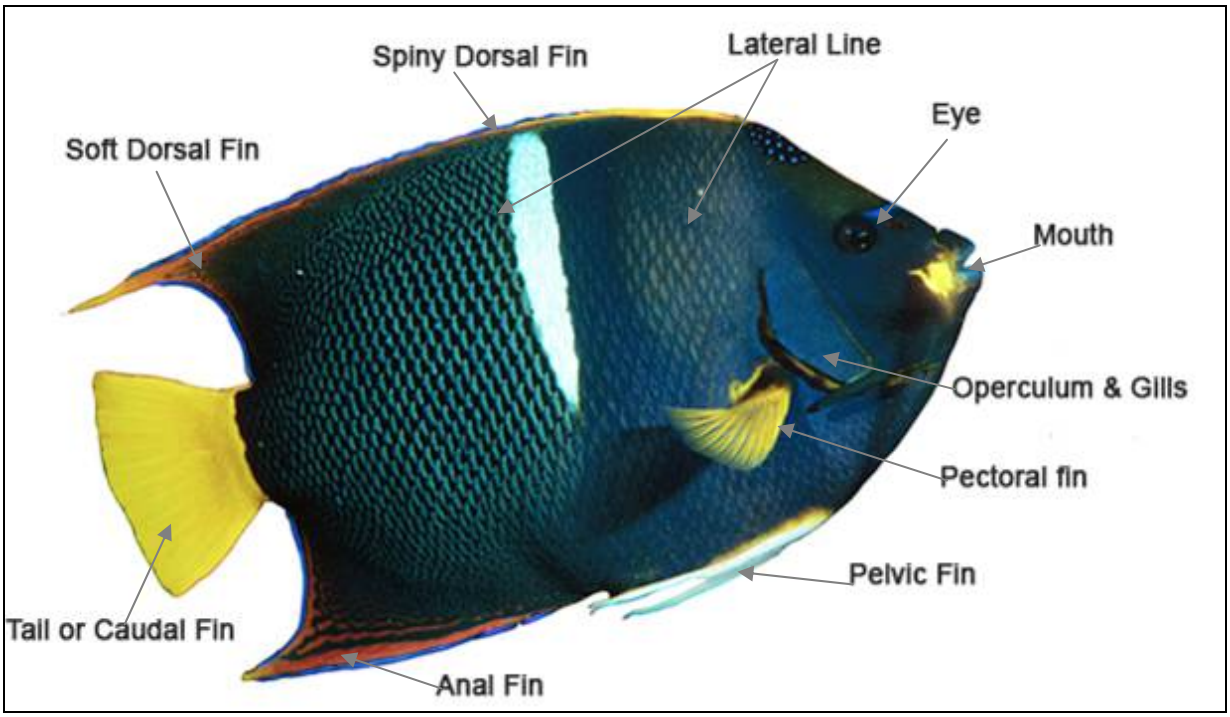

Figure 4. Part of a fish to be inspected for signs of stress.

BP: Area and materials used for packing should be clean, and free of sharp edges and rough areas.

BP: All persons must wash their hands very well and avoid using lotions and fragrances.

BP: Keep contact with organisms to a minimum. This applies more specifically to the fish; larger and stronger fish have a higher risk of injury during handling.

BP: Water used for packing should be uncontaminated. It is advisable to transport it from clean ocean sites, and to treat it using any combination of protein skimming and ultraviolet or ozone sterilization, or filter it with a micron bag or clean fabric (mechanical filtration). Cover containers while not in use. Sterilization will aid in keeping bacteria out of shipping bag water.

BP: Water level does not need to exceed 1 inch above the fish. Typically a bag is filled with enough water to cover the fish and about an inch more; the rest is filled with oxygen. This should correspond to approximately 1/3 water and 2/3 oxygen. Unlike invertebrates which are generally packed with no oxygen, larger fish will need more oxygen than smaller fish.

BP: Bigger fish and invertebrates with sharp spines should be packed in three sets of lined bags. This equals 6 bags and 3 liners, every 2 bags with a newspaper or plastic liner in between each bag.

General steps to pack an organism:

- Make sure the bag and the water level are appropriate for the size of the organism placed inside.

- Take all the air out of the bag by gently pressing downward.
- Wrap 2 or 3 fingers around the top of the bag and insert oxygen hose.
- Add oxygen to fill bag stopping at the desired bag height.
- Twist the bag 1 or 2 times and spin it slowly; if this is done too fast the organism can get injured or stressed, and/or puncture the bag.
- Seal it very well with rubber band or clip mechanism. Wet rubber bands are easier to use and don't rub harshly on the bag or fingers.

BP: Insert a protective box liner inside the box to retain any water spilled inside during transport. In case that one of the bags is punctured, the inner box liner will keep the water from spilling out. A wet box could cause the airline to reject the shipment either at the airport of drop-off or during transit if the shipment has a connecting flight.

BP: Use insulation. Boxes can be lined with newspaper in all 5 sides and above to create insulation. Place newspaper between cardboard box and plastic liner bag. Styrofoam insulated boxes are always the best way to maintain water temperature during transport.

BP: Place large and heavy bags inside the box first and then add smaller bags on top and in between bags to maximize box space. This helps reduce cost and stabilize organisms.

BP: Use ice packs or heat packs as needed to maintain temperature within 2º F (1ºC). As a general rule, use 1 heat pack for every 15ºF of difference between origin and destination; maximum of 4 heat packs (each an 8 oz chemical heat pack) per 24 inch cubed box. Ice packs can be made by filling small plastic bags with water and putting them in a freezer one day or more before packing. After packing a full box, close the box liner inside of the box, and cover the top with newspaper. Add ice bags wrapped in newspaper in each corner and close the box. One to 4 ice packs can be used per box depending on temperature. It is better to be a little cold, than too hot.

BP: Ensure you have all the requirements – national and of the country of export - needed prior to shipment:

- Notification of 48 hours or more given to US importers so that U.S Fish and Wildlife appointments can be made without violation.
- Detailed packing list, box by box, describing species by common and scientific name, number of organisms, and sizes packed in each box.
- Summary invoice.
- Export permits (all original documents should be sent with shipments).
- Photo copy of airway bill including flight number and estimated time of arrival.
- Copies of any other documents mentioned by email, phone or fax; sent at convenience but no later than airline flight departure.
- Confirmation that all documents were received.

TRANSPORT

BP: Maximum shipping time is typically 48 hrs including land and air transport. Check with your airline freight department for times that shipments need to be tendered. Normally boxes need to arrive to airlines at least 4 hours prior to flight time. Always leave some extra time for any unexpected events that may delay arrival to the destination.

BP: All buyers, government agents, airlines, and other relevant people should be contacted with enough time in advance to confirm that all documents are up to date before every sale or shipment, and that the product will leave or will be picked up on time. Submit all documents in advance if possible.

BP: For each shipment always bring to the airport originals and copies of permits and documents.

BP: A repair-kit to repack organisms with punctured bags should be available that includes: a small oxygen tank, a container with filtered seawater, bags of different sizes and extra cardboard boxes.

BP: Maintain water temperature within 2º F (1ºC). Do not expose the animals to direct sunlight, and during the warm season keep them in a shaded area or inside a place with air conditioning.

BP: Unpacking during transport should be restricted to solving emergencies or to legal requirements. Inspection of shipment during transport should be done in a place with dim lighting so that the organisms are not shocked by sudden light changes.

IMPORTER

BP: Confirm that 48 hour notice was given to US Fish and Wildlife Service for appointment time of arriving shipment. If using a customs broker, make sure they are also notified of shipment and have the shipment paperwork as early as possible.

BP: Confirm that all necessary documents to receive shipment have been received on time and have been sent to broker.

BP: Shipment should be picked up from airport within 4 hrs of arrival. It usually takes 2 hrs for the shipment to be available by the airlines, and then some time for the inspection or customs process.

BP: Begin acclimation process (see details below).

BP: Count organisms and record mortality upon arrival. Take notes of all water parameters and gather other information helpful in creating a shipment report for the supplier. This is also a good time to calculate costing for each item. Best practice to calculate individual costs are to weigh each bag, and estimate how many of that size bag could fit in each box; by adding other fees and box charges etc, you can calculate the cost per item.

MP: Any shipment above 10% mortality should be reported within 24 hrs. Anything under 10% mortality can be reported within 48 hrs. All mortality reports must include pictures of all dead fish and invertebrates regardless of the number e.g. regardless of whether 1 or 100 died.

BP: Prevent outbreak and spread of disease. Dispose of dead organisms safely and hygienically; quarantine and treat sick ones. Disinfect tanks, and gear e.i. through UV or ozone treatment. Record outbreaks and treatments used.

BP: New arrivals should not be exposed to bright light, strong aerations, or irritating chemical agents. These should remain separated from established organisms until normal feeding behavior and physical appearance are reestablished, or for at least 48 hours.

BP: Keep track of species by placing them in tanks labeled with common names as well as the geographic location and the supplier's name or code assigned.

BP: Inspect species before sale to avoid shipping sick organisms.

BP: Use antibiotics only when necessary.

Acclimation

BP: Acclimate organisms into importer's facility by slowly mixing water of facility with water from the bag where the organism is packed. This is a 1-4 hr process depending on length of transportation or "bag time" (time organism has spent in the bag); the longer the bag-

time the longer the acclimation. Acclimation methods include using a drip line, a measuring cup or other device to slowly add the aquarium water.

BP: Keep highly stressed fish near the water surface where oxygen concentration is highest.

BP: Before adding new water to shipping water, neutralize ammonia in fish water and test to make sure there is zero ammonia in the water fish are in. Ammonia levels should not climb over 1 ppm (1mg/L) when new fish are introduced into a closed system with biological filters. Frayed fins and cloudy eyes can be caused by excess ammonia in the water.

BP: pH should be raised on new arrivals no faster than 0.5 ppm every hour. Most shipments with over 24 hour transit times will arrive with pH at 7 and will need a minimum of 2 hours of acclimation time before the pH is raised to it's normal level of 8 or higher.

BP: Using Methylene blue during acclimation is very helpful. Follow recommended dosages from manufacture.

Husbandry

BP: Temperature should be held constant based on the optimal temperature range of the species, and not varying more than 2ºF (1ºC).

BP: Salinity (specific gravity - sg) should be maintained between 1.021-1.023. For fish the ideal range is 1.019-1.021, and for invertebrates 1.021-1.025.

BP: UV or copper sterilization is required. Nitrofurazone is optional. Chelated (cupramine) or free ionic cooper should be kept constant between 0.08-0.15 ppm (0.15-2.0 ppm; with a maximum of 0.25 ppm for short periods); nitrofurazone at 25 ppm mixing 250-500 mg per 20 gallons. When in doubt always follow directions of dosage suggested by the manufacturer. Other treatments include flushing system daily with formalin or malachite green.

BP: The maximum concentration of Nitrite (NO_2) should be 0.125 mg/l, and Nitrate (NO_3) 40 mg/l absolute.

BP: Biological filtration and protein skimming (foam fractionation) should be used to strip the water of undesirable waste by-products and organics.

BP: Organisms should receive a minimum of 6 hrs of "sunlight" or ambient light each day.

BP: Organisms should be fed their proper diet each day.

BP: Water circulation within holding system should completely cycle 2-4 times per hour; e.g. in a 1000 gallon system, 2000-4000 gallons are fully re-circulated each hour.

RETAILER

BP: Shipment should be picked up from the airport within 4 hrs of arrival. It usually takes 2 hrs for the shipment to be available.

BP: Count organisms and record mortality upon arrival. Dispose of dead organisms in a safe, hygienic manner.

BP: Neutralize ammonia. Frayed fins and cloudy eyes can be caused by excess ammonia in the water. Dosing the acclimation water with a good ammonia neutralizer is the first step to reverse the ammonia levels in the incoming fish water.

BP: Re-acclimate organisms into retailer's facility by slowly mixing water of facility with water from the bag where the organism is packed. This is a 1-4 hr process depending on "bag time" (length of time organism has spent in the bag); the longer the bag time the longer the acclimation. Acclimation methods include using a drip line, a measuring cup or other device to slowly add the aquarium water.

BP: Keep track of species by placing them in tanks labeled with common and scientific names as well as the geographic location, and supplier's name or code assigned if possible.

BP: Organisms should be fed daily depending on needs.

BP: Customer purchases should be discussed for experience level and sustainability. Although all customers should be offered advice, special attention should be given to new aquarium owners to ensure:

- Organisms purchased have a suitable aquarium with the appropriate species density, mix, and establishment period.
- New aquariums are not overstocked.
- Proper acclimation of purchased organisms.
- Awareness of species characteristics such as venomous or non-reef friendly.

BP: Aquarium water should be tested before a sale; this applies more importantly to customers new to the hobby. If the water quality is low, retailer should provide advice on the products and basic procedures to correctly start off an aquarium and explain the denitrifying bacteria process of an aquarium.

BP: Retail shop employees should be properly trained with BP (See Appendix II).

BP: Reference information should be available for employees and customers.

CAPTIVE RAISED SUPPLIERS

BP: All captive raised organisms are deemed "Best Practice" and should be labeled accordingly to promote and educate retail customers.

TRANSHIPPING

BP: Although transhipping is not considered "Best Practice", it is highly recommended that organisms are re-bagged at location of import before being shipped again. New packaging and new water should be used during the re-bagging process (see Acclimation in the Importer section)**.**

APPENDIX I. BAGGING AND SIZING CHART

Adult Angelfish, Groupers, Parrotfish, Rabbits & Foxface, Snappers, Large Puffers (Dogface/Arothron types), and non-reef Wrasses

Size	Inches	Bag Size
Tiny	Less than 2”	6”
Small	2”-2.5”	7”
Small-Medium	2.6”-3.5”	8”
Medium	3.6”-4.5”	9”
Medium/Large	4.6”-5.5”	10”
Large	5.6”-6.5”	12”
Extra Large	6.6”-7.5”	14”
Double Extra Large	7.6”-8.5”	16”
Show	8.6”+	Full Bag

Anglers, Anthias, Batfish, Butterflies, Filefish, Goatfish, Hogfish, Lions, Scorpions, Squirrels, Sweetlips, Tangs & Triggers

Size	Inches	Bag Size
Tiny	Less than 1”	5”
Small	1”-1.5”	6”
Small-Medium	1.6”-2.5”	7”
Medium	2.6”-3.5”	8”
Medium/Large	3.6”-4.5”	9”
Large	4.6”-5.5”	10”-12”
Extra Large	5.6”-6.5”	12”-14”
Double Extra Large	6.6”-7.5”	16”-half bag
Show	7.6”+	Full bag

Small Angelfish (Centropyge), Jawfish, Boxfish, Hamlet, Hawfish, Flasher Wrasses, Blennies, Gobies, Cardinal, Clownfish, Small Pseudochromis, Basslet, Small Hogfish

Size	Inches	Bag Size
Tiny	Less than 1”	5”
Small	Up to 1”	5”
Small-Medium	1”-1.5”	6”
Medium	1.6”-2”	7”
Medium/Large	2”-2.5”	7”
Large	2.6”-3”	8”
Extra Large	3”-3.5”	8”
Double Extra Large	3.6”+	9”

Eels, Sharks

Size	Inches	Bag Size
Tiny	Up to 6”	6”
Small	Up to 6”	6”
Small-Medium	Up to 6”	6”
Medium	6”-10”	7”
Medium/Large	6”-10”	7”
Large	10”-14”	8”
Extra Large	14”-18”	12”
Double Extra Large	18”-22”	16”
Show	22”+	16”

Anemone

Size	Inches	Bag Size Small Anemone	Bag Size Large Anemone (Saddle, Carpet, Ritteri)
Tiny	Less than .5”	5”	
Small	.6”-1”	5”	
Medium	1”-2”	5”	
Large	2”-3”	6”	
Extra Large	3”-4”	7”	
Double Extra Large	4”-5”	8”	
Show	5”+	9”-10”	12”-14”

Brain, LPS Coral, SPS Coral, Polyp, Xenia, Misc Coral

Size	Inches	Bag Size
Small	Up to 2.5”	5”-6”
Medium	2.5”-3.5”	7”
Large	3.5”-4.5”	8”-9”
Extra Large	4.5”-5.5”	10”
Double Extra Large	5.5”-6.5”	10”-12”
Show	6.5”+	12”-14”

Soft Coral, Leather, Plants (same as brain etc. But pack taller)

Size	Inches	Bag Size (pack taller)
Small	Up to 2.5”	5”-6”
Medium	2.5”-3.5”	7”
Large	3.5”-4.5”	8”-9”
Extra Large	4.5”-5.5”	10”
Double Extra Large	5.5”-6.5”	10”-12”
Show	6.5”+	12”-14”

Sponge, Gorgonian (no air, all water)

Size	Inches	Bag Size (pack taller)
Small	Up to 3”	7”
Medium	3”-4.5”	8”
Large	4.6”-6”	9”-10”
Extra Large	6”-7.5”	10”-12”
Double Extra Large	7.5”+	12”-14”

Mushroom, Bisma

Size	Inches	Bag Size
Small	1-5 leaves	5”-6”
Medium	6-10 leaves	7”
Large	11-15 leaves	8”-9”
Extra Large	16-20 leaves	10”
Double Extra Large	21-29 leaves	10”-12”
Show	30+ leaves	12”-14”

Small Stars & Urchin

Size	Inches	Bag Size
Small	Up to 1.5”	5”
Medium	1.5”-2.9”	6”
Large	3”-4.5”	7”
Extra Large	4.5”-6”	8”-10”
Double Extra Large	6”+	10”-12”

Regular Stars

Size	Inches	Bag Size
Small	Up to 2”	4”
Medium	2”-4”	6”-8”
Large	4”-6”	8”-10”
Extra Large	6”-8”	10”-12”

Lobster and Shrimp

Size	Inches	Bag Size
Small	Up to 1”	5”
Medium	1”-2”	6”
Large	2”-3”	7”
Extra Large	3”-4”	7”-8”
Double Extra Large	4”-5”	8”-10”

APPENDIX II. CARE GUIDE FOR GULF OF CA SPECIES

SERGEANT MAJOR

Family: Pomacentridae
Scientific name: *Abudefduf sp.*
Maximum size recorded: 6 in.
Minimum tank size: 50 – 55 gallons
Care level: Easy
Reef safe: Yes
Diet: Flake food, brine shrimp, algae, and meaty foods.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

CARDINALFISH

Family: Apogonidae
Scientific name: *Apogon* sp.
Maximum size recorded: 4 in.
Minimum tank size: 30 gallons
Care level: Easy
Reef safe: Yes
Diet: Requires a well-balanced and vitamin-enriched diet of meaty foods such as feeder shrimp, marine flesh, bloodworms, and live feeder fish for larger specimens.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

MEXICAN HOGFISH

Family: Labridae
Scientific name: *Bodianus diplotaenia*
Maximum size recorded: 30 in.
Minimum tank size: 300 gallons
Care level: Easy - moderate
Reef safe: No
Diet: Meaty foods such as krill, silversides, and squid.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

SPOTTED SHARPNOSE PUFFER

Family: Tetraodontidae
Scientific name: *Canthigaster punctatissimus*
Maximum size recorded: 4.3 in.
Minimum tank size: 20 gallons
Care level: Moderate
Reef safe: No
Diet: Omnivore; squid, krill, clams, and hard shelled shrimp.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

CHROMIS

Family: Pomacentridae
Scientific name: *Chromis* sp.
Maximum size recorded: 5.1 in.
Minimum tank size: 55 gallons.
Care level: Easy
Reef safe: Yes
Diet: Feed several times a day with a varied diet of meaty foods, herbivore flakes, and frozen preparations. Vitamin-enriched foods may help to preserve body colorations.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Pixy/Spotted Hawkfish

Family: Cirrhitidae
Scientific name: *Cirrhitichthys oxycephalus*
Maximum size recorded: 3 in.
Minimum tank size: 30 gallons
Care level: Easy
Reef safe: With caution, should not be kept with smaller fish or invertebrates.
Diet: Krill, silversides, and squid.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Porcupine Puffer

Family: Diodontidae
Scientific name: *Diodon holocanthus*
Maximum size recorded: 1 ft. 6 in.
Minimum tank size: 90 gallons
Care level: Moderate
Reef safe: No
Diet: Varied diet of meaty foods including; squid, krill, clams, and hard shelled shrimp to help maintain average size of its continuously growing teeth.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Red head goby

Family: Gobiidae
Scientific name: *Elacatinus puncticulatus*
Maximum size recorded: 2 in.
Minimum tank size: 10 gallons
Care level: Moderate
Reef safe: Yes
Diet: Variety of live and frozen brine shrimp, frozen mysis shrimp, table shrimp, and frozen food preparations for carnivores. If kept in a reef tank, it should be fed once per day.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Zebra Moray Eel

Family: Muraenidae
Scientific name: *Gymnomuraena zebra*
Maximum size recorded: 5 ft.
Minimum tank size: 125 gallons
Care level: Moderate
Reef safe: With caution
Diet: Sizeable portions of meaty foods, fresh fish including clams, squid, scallops, and shrimp.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Chestnut moray

Family: Muraenidae
Scientific name: *Gymnothorax castaneus*
Maximum size recorded: 4 ft. 9 in.
Minimum tank size: 47 gallons
Care level: Moderate
Reef safe: With caution
Diet: Live and frozen meat, crustaceans and fishes.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Passer Angel
Family: Pomacanthidae
Scientific name: *Holocanthus passer*
Maximum size recorded: 14 in.
Minimum tank size: 55 gallons
Care level: Easy - moderate
Reef safe: With caution; may nip at sessile invertebrates including coral and tridacnid clams.
Diet: Omnivore, grazer, offer sponge preparations, meaty food and algae. It needs live rock for grazing.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Blacknose Butterflyfish
Family: Chaetodontidae
Scientific name: *Johnrandallia nigrirostris*
Maximum size recorded: 6 in.
Minimum tank size: 55 – 75 gallons
Care level: Moderate
Reef safe: No; tend to pick at sessile invertebrates and corals.
Diet: a combination of frozen and flake food fortified with vitamins. Suggestions include brine shrimp, water fleas (*Daphnia*), *Drosophila* (the larvae of the wingless or flightless fruit fly), and feeder fish (low cost live fish usually goldfish, rosy reds or guppies).
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Catalina Gobi
Family: Gobiidae
Scientific name: *Lythrypnus dalli*
Maximum size recorded: 2 in.
Minimum tank size: 10 gallons
Care level: Moderate
Reef safe: Yes
Diet: Frozen mysis shrimp, vitamin-enriched brine shrimp, sinking pellets and flake foods.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Jeweled Moray Eel
Family: Muraenidae
Scientific name: *Muraena lentiginosa*
Maximum size recorded: 2 ft.
Minimum tank size: 50 gallons
Care level: Easy
Reef safe: No
Diet: Frozen or freeze-dried krill, fish, shrimp, and most meaty foods.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Soldierfish
Family: Holocentridae
Scientific name: *Myripristis* sp.
Maximum size recorded: 8 in.
Minimum tank size: 70 gallons
Care level: Easy
Reef safe: With caution
Diet: Carnivore; feed live saltwater feeder shrimp when first caught/introduced. Shrimp, squid, clams, fish, and marine algae and vitamin-enriched herbivore foods
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Bluespotted jawfish
Family: Opistognathidae
Scientific name: *Opistognathus rosenblatti*
Maximum size recorded: 3.25 in.
Minimum tank size: 30 gallons
Care level: Moderate
Reef safe: Yes
Diet: Variety of marine fish, crustacean flesh, and mysid shrimp. It should be fed at least 3 times per day.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Boxfish
Family: Ostraciidae
Scientific name: *Ostracion meleagris*
Maximum size recorded: 6.3 in.
Minimum tank size: 50 gallons
Care level: Expert
Reef safe: No
Diet: Live brine shrimp, bloodworms, chopped squid, clams, mussels, and herbivore preparations.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

King Angel
Family: Pomacanthidae
Scientific name: *Pomacanthus zonipectus*
Maximum size recorded: 18.1 in.
Minimum tank size: 100 gallons
Care level: Moderate
Reef safe: With caution.
Diet: Spirulina, marine algae, shrimp and other meaty items, and high-quality angelfish preparations containing sponges.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

Cortez rainbow wrasse
Family: Labridae
Scientific name: *Thalassoma lucasanum*
Maximum size recorded: 6 in.
Minimum tank size: 55- 75 gallons
Care level: Easy - moderate
Reef safe: Yes, but not invert safe; will eat other aquarium crabs and shrimp.
Diet: Carnivore; frozen mysis shrimp, frozen brine shrimp, marine flake and marine pellet food.
Water parameters: 72-78° F, dKH 8-12, pH 8.1-8.4, sg 1.020-1.025

APPENDIX III. BEST PRACTICES FOR RETAIL EMPLOYEES

BP: All employees working with live animals should understand the basic care and maintenance of each animal being sold. Training manuals should be given to each employee and tested to their level of understanding and competence.

APPENDIX IV. DATA RECORDING FOR EXPORTERS

Record keeping

Keeping accurate records of financial transactions facilitates everyday activities, helps prevent and reduces risks and costs of a business.

Fishing logs

Fishing logs must be filled out correctly after every collection day. This will facilitate the completion of reports for technicians, buyers, and relevant government authorities.

Quota

The number of organisms remaining in the fishing quota must be calculated and recorded after every collection day or shipment.

Mortality & disease outbreak

A record should be kept of the mortality during collection, in holding pens, packing, and after arrival at the final destination (as reported by buyer). Disease outbreaks should be recorded along with treatments used.

APPENDIX V. LAW AND ETHICS

The responsible enterprise is characterized by complying with the law, and by following a code of ethics. Such enterprise serves as an example for society, and acts as its own regulatory authority, regardless of whether or not the corresponding authorities have the capacity to punish those who break the law. In the long term such behavior is likely to result in economic, ecologic, and social benefits for the enterprise and the community. Although the topics of law and ethics are complex, this section only includes aspects directly related to the ornamental organisms.

Collection areas

Fishing permits for the ornamental species specify the areas where collection of species is allowed. Inside these sites there are marine protected areas or restoration areas in which it has been agreed no fishing will take place. Respecting these sites is a characteristic of a responsible enterprise.

Annual quota

The fishing permits for the ornamental species specify the species, and the number of organisms per species that can be collected per year. Limiting collection and sale to these species and specified amounts is another characteristic of a responsible enterprise.

Illegal activities

The responsible Enterprise is also characterized for serving as a voice for the community and for working with government, private sector, and civil society leaders to improve the legal infrastructure. To report illegal activities (for example illegal collection or commercialization) to the relevant authorities and civil groups is a responsibility of such enterprise.

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