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Mbawuike Belema
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Kassim Olayemi Idowu
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Kolawole-Daniels Aghogho
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Anjonu Ndubuisi
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Adejumobi Oluwakemi
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Ukaonu Stella
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Correspondence
Mbawuike Belema
Nigerian institute for oceanography and marine research, P.M.B 12729, Lagos, Nigeria

Handling and packaging of ornamental fishes for successful transportation

Mbawuike Belema, Kassim Olayemi Idowu, Kolawole-Daniels Aghogho, Anjonu Ndubuisi, Adejumobi Oluwakemi and Ukaonu Stella

Abstract
This study was carried out in Lagos state, Nigeria. Surveying the trend of handling, packaging and transportation of ornamental fishes both locally and internationally. Two privately owned ornamental fish exporting outlets were visited, observation and oral interview conducted on method of packaging, steps in packaging which include the packaging process to mitigate against mortality and injury to the fish for successful transportation, the materials needed for packaging include Polythene transparent bag, Dissolved gas, Styron foam, Rubber band and Antibiotics. 2kg of ornamental fishes can be placed in 20 liters of water inside a polythene bag at about 10ºC with dissolved oxygen to fill the space above it and anesthetics and anti-biotic such as tetracycline and nitrofurazone can be added to prevent infection.

Keywords: Ornamental fish, Transportation, Mortality, Polythene transparent bag (PTB)

Introduction
The ornamental fish trade has gone beyond the infant stage [1]. Ornamental fishes destined for marketing, both domestic and export have to use modern post-harvest technology or modify the current post harvest technology to improve the post-harvest survival and post shipment survival that is critical to the industry. It is in this context that the significance of packaging and transportation came to light. To avert the problem of high mortality of fish species at their different stage during transportation, it becomes imperative to evaluate the most suitable and ideal condition for transportation. At present, the mortality rate during fish catching, collection and transportation is very high [2]. Due to the lack of the use of appropriate technology for fish packaging and transportation/shipment there is high mortality [3]. However, post-shipment mortality (death-on-arrival) from exporter to importer has been greatly reduced to less than 5% [4]. According to Dupree and Huner [5] the transportation of live fish is not successful until the fish arrives at the stocking or receiving site in healthy conditions. The transportation of ornamental fish over long period involves the use of polyethylene bags containing water under high pressure [6, 7]. Global trade in ornamental fish is a multibillion-naira business. The success for all of which depends on effective packaging techniques and careful handling practices prior to and during shipment with minimal mortality.
Trans-shipping involves the use of cargo vessel which were not available in the past [1]. It is now a regular practice in Nigeria to export ornamental fishes via different cargo vessels and airlines to reduce the mortality rate of the fishes.

Aims of Study
To study the method of packaging process employed by the exporters of ornamental fish.
To study the factors to be considered in transporting ornamental fishes.

Materials and Methods
Fish Farm Studied
Visits were made to two privately owned export outlets (Avis Aquarium and Heritage Aquarium) in Ikorodu, a suburb of Lagos in Nigeria were studied around 5th to 7th of June 2017. Ornamental fishes found at these outlets were captured from different locations in Nigerian water bodies.

Table 1

Scientific Names	Common English Names	Common Local Names
Alestes nurse	Silversides	Paraffin
Malapterus electricus	Electric Fish	Electric Fish
Mastecembelus argus	Spiny eel	Marble Spiny eel
Pantodon buchholzi	Freshwater Flying Fish	Butterfly Fish
Schibe mystus	Butterfish	Dibawe
Tilapia spp	Tilapia	Tilapia

Observations of the handling techniques and procedures employed during packaging by the exporters were made at the two study sites. Oral interviews were also conducted.
Two privately owned export outlets (Avis Aquarium and Heritage Aquarium) in Ikorodu, a suburb of Lagos in Nigeria were visited and the method of packaging was observed as shown below.

Method of Packaging Ornamental Fish for Export
Closed system having sealed airtight carriers with oxygen.
Before transporting to long distances, fish were conditioned (not fed and kept to defecate) in order to get rid of excreta to avoid contamination of water that could lead to DOA. They were also acclimated to allow for successful transportation ensuring a conducive transporting environment.
The transportation of ornamental fish involved the use of oxygen, transparent polythene bags, an insulating box, cello tapes, rubber bands, antibiotics, styrofoam and water. The fish in the oxygenated transparent polythene bags are then packed in boxes and can be transported as cargo by road, rail or air.

Steps in Packaging of Ornamental Fishes for Export
Preparing fish for export
A few days before export, weak and diseased or dead fishes are removed. The active live fishes are then separated into clean water tanks according to species. Subsequently, the fishes are not fed for several days. Very small fish are stopped from feeding 12 to 24 hours before trans-shipment while for middle sized fish, it is 48 hours and larger fish should not be fed for 3 days before shipment. Thereafter, fish should be carefully transferred into TPB with oxygenated water for transport with minimal disturbance.

The packaging process
Ornamental fish are packed in transparent polythene bags (thickness not less than 0.1mm) filled to 1/5 of its volume. The polythene to be chosen for the live fish export should satisfy the needs like,

- High oxygen retainability
- Tensile strength
- Tearing strength

The TPB are filled with five parts oxygen to one part water. After filling with water and putting fish according to species, the upper part of the polythene bag is compressed to drive out air and then inflated with oxygen .The top of the bag is bent and tied with two or three rubber bands, then placed in Styrofoam boxes. The molded Styrofoam (thermo cool) boxes, seems to have revolutionized packing. Today the most acceptable packing material all over the world is either a complete molded Styrofoam box or a carton lined with Styrofoam of minimum 15 mm thickness.

Results
The following aspects of packaging process and transportation of ornamental fishes have been dealt with below

1. Density
2. Temperature
3. Dissolved gases
4. Anesthetics

1. Density: Densities of around one tenth are better to ensure that the health and well being of the fishes are preserved. As an appropriate guide 2 kg of fish can be placed in 20 liters of water inside a polythene bag, with large oxygen filled space above it, and at 10ºC, can be carried for 5hours without the need for further oxygenation

2. Temperature: Temperature influences the activity and the oxygen consumption of the fish, as well as the oxygen carrying capacity of the water. High temperature especially may also be directly lethal to fish. Frozen blocks or Ice packs are advisable during transportation.

3. Dissolved Gases: To maintain fish in healthy state, there must be sufficient oxygen in the water. In addition the buildup of carbon dioxide and ammonia must be prevented. Gas concentration can become critical under transport conditions where the fish are stressed and their oxygen requirement is greatly elevated. Fish are provided with well aerated water with an air space above it.

4. Anesthetics (Anti-Biotics): Increased physical activity during transport can adversely affect the health of the fish in several ways. First is physical damage by the abrasion with the packing container, second is by a physiological reaction to a physical activity and other environmental factors such as low dissolved oxygen. Such reaction is manifested in high blood lactate levels, which can cause serious debilitation or death. The level of physical activity of the transported fish must be kept to the minimum. Some antibiotics are employed to reduce the damage done on the fish such as tetracycline and nitrofurazone. The tetracycline about four-five tablets per one hundred and fourty liters of water (140L), while the nitrofurazone is given one spoon full per one hundred liters (100L).

Discussion
Several ornamental fish species which are indigenous to Nigeria's water bodies are exported for their hard currency value to numerous countries all over the world [8]. Also it has been established that mortality of captured fish from the wild can be species dependant because some species are hardier than others and can withstand stress better than the others. For example, mortality has been estimated to be high (e.g., 80%) in some marine tropical fish such as the Banggai cardinal fish to as low as 6% for some freshwater fish species such as the cardinal tetra [2, 9, 10, 11, 12, 13]. To reduce injury and mortalities incurred in storage and post-shipment mortality, several of the

larger importing wholesalers have established their own guidelines for fish collection, standardized handling procedures, and even assembled their own gathering stations or warehouses at major exporting centers worldwide. Local community-based organizations and international institutions have also been formed to achieve market-driven product, quality standards and sustainability in the marine aquarium industry.

Conclusion

In conclusion, with proper guidelines and procedures, there is reduction in the mortality of the exported ornamental fishes due to improve packaging and fast means of transporting system employed by the exporters. Although, the dosage of the antibiotics used by the exporters can be alarming and it's also reported that nitrofurazone is more effective than tetracycline but not as common and available in the market as tetracycline.

References

1. Mbawuike BC, Nwadukwe FO, Ayaobu-cookey IK. Handling and Transportation of Ornamental fish in Lagos state, Nigeria, African Journal of Applied Zoology &Environmental Biology. 2007; 9:38-43.
2. Vagelli, A.A. and M.V. Erdmann. First comprehensive ecological survey of the Banggai cardinal fish, Pterapogon kaudern. Environmental Biology of Fishes, 2002; 63:1.
3. Mbawuike BC, Ajado E. Assessment of ornamental fish species and fishing methods in Ibaiajegbende, Lagos state, Nigeria. African Journal of Applied Zoology & Enviromental Biology. 2005; 1(7):23-27.
4. Lim LC. Ornamental fish packing system for air transport: reduction of post-shipment mortality through quality enhancement, Opportunity for Improvement. 2005; 48:94-100.
5. Dupree, Huner. Transportation of live fish in: third report to fish farmers. US Dep. Of Interior, Fish and wildlife Services. 1984, 165-175.
6. Sado EK, Ita EO, Udu UOC. Preliminary experiment on live fish, 1987.
7. Mbawuike BC, Chukwurah DI, Ajetunmobi OM. Ornamental fish transportation in Nigeria, African Journal of Interdisciplinary Studies. 2004; Vol. 5, No. 1, pp 131-135.
8. Mbawuike BC, Pepple PCG. Inventory of locally available ornamental fish species in Nigeria export trade. Journal of Sustainable Tropical Agricultural Research (JONSTAR). 2003; 403:1-7.
9. Chao NL, Petry P, Prang G, Sonneschien L, Tlusty M. *Conservation and Management of Ornamental Fish Resources of the Rio Negro Basin, Amazonia, Brazil-Project Piaba*. Manaus, BR: Editora da Universidade do Amazonas (EDUA), 2001.
10. Cato JC, Brown CL. Marine Ornamental Species: Collection, Culture, and Conservation. Ames, IA: Iowa State Press, 2003.
11. Lunn KE, Moreau MA. Unmonitored trade in marine ornamental fishes: the case of Indonesia's Banggai cardinal fish (*Pterapogon kauderni*). Coral Reefs. 2004; 23:344-351.
12. Chapman FA. Ornamental Fish Culture, Freshwater. In: R.R. Stickney (ed), *Encyclopedia of Aquaculture*. New York, NY: John Wiley & Sons, Inc. 2000, 602-610.
13. Chapman, F.A., S.A. Fitz-Coy, E.M. Thunberg, and C.M. Adams. United States of America trade in ornamental fish. Journal of the World Aquaculture Society. 1997; 28:1-10.