

Cyanide Fishing Makes a Comeback

This abhorrent practice is illegal in most areas, but it is still commonly practiced on the sly; many marine species in the hobby are severely affected by it — buyer beware.

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This marine aquarium fish collector squirts cyanide into a thicket of staghorn corals (*Acropora* sp.). This destructive technique is illegal in most areas but poorly enforced.
Photo courtesy of James Cervino, Ph.D.

The use of cyanide on coral reefs to capture aquarium fish — principally for export to the United States, the United Kingdom, Germany and France — was first documented in the early 1960s in the Philippines. Cyanide fisheries expanded to the live reef food fisheries in the 1970s and over the next two decades it spread throughout Southeast Asia and into the Pacific islands. Cyanide fishing has been confirmed in 15 countries.

Most commonly, sodium cyanide is dissolved in seawater in plastic squirt bottles. Divers using hookah dive equipment squirt the milky solution at the target fish, which often then retreat into crevices in the reef or within coral thickets.

These corals may be subsequently broken apart by the diver to capture the fish. Cyanide tablets may also be secured to sticks and held close to a fish, or cyanide is mixed with bait and thrown overboard or placed into fish traps. There are also reports that fishermen occasionally pump the cyanide into the water from surface boats, mainly to target grouper spawning aggregations.

The stunned fish are then captured with handnets or attached to lines and hauled to surface-support boats, where they may directly enter the trade or be held in floating cages until export.

Live Reef Fish Trade

The live reef fish trade consists of two very different markets. The live reef food fish trade (LRFFT) targets a relatively small number of species, about 30 in all, most of which are large groupers, coral trout, barramundi cod and the humphead wrasse. However, the trade is much larger at least in terms of the biomass of fish that are collected.

At its peak in 1997, the volume of fish in the LRFF trade was estimated at about 50,000 metric tons. More recently, annual trade is about 30,000 metric tons per year, with about 60 percent imported into Hong Kong and the remainder destined for China, Taiwan, Japan and other Asian markets. Until the 1970s, LRFF areas were mainly confined to areas in the South China Sea in close proximity to ports in Hong Kong and China. The trade spread from the Philippines to Indonesia in the 1980s and continued to expand to countries in the Pacific and Indian oceans during the 1990s. Cyanide use has followed the expansion of the LRFF trade. One of the reasons for the rapid expansion of this trade is that live fish can fetch prices that are substantially higher than dead fish of the same species.

The total retail value of the LRFF was around \$350 million per year from 1997 to 2001. By 2002, it increased to about \$486 million for Hong Kong and \$810 million for the entire trade. Individual fish can sell for up to \$180 per kilogram, depending on species, taste, texture, availability and time of year. **The Problem With Cyanide**

Cyanide fishing is an example of a destructive fishing technique that is widely used to capture coral reef fish live, including species destined for the marine aquarium and live reef food fish trades. Cyanide causes unacceptable levels of mortality during the collection and transport phases, and it kills nontarget invertebrates and fish. Corals exposed to cyanide have been shown to bleach and die, and significant habitat impacts are associated with cyanide fishing, as divers often break apart corals to extract fish stunned by cyanide.

Marine Aquarium Trade

Unlike the LRFFT, the marine aquarium trade consists of a high diversity of fish, most of which are taken from the wild. More than 1,400 species of reef fish are traded worldwide for home aquaria at an annual volume of about 30 million fish, with approximately 16 million imported each year into the United States. Between 50 to 60 percent of these are from Indonesia and the Philippines, where cyanide use is most widespread.

The marine aquarium industry as a whole is worth an estimated \$200 to \$330 million annually. When examined by weight, aquarium fish are valued at \$500 a kilogram or more, considerably higher than a similar weight of food fish.

Cyanide Fishing Concerns

Cyanide fishing is a nonselective, destructive fishing technique that adversely impacts coral health and kills nontarget organisms, such as other invertebrates and fish.

Exposure of corals to cyanide causes rapid signs of stress and bleaching, and at high concentrations, progressive tissue sloughing that can lead to colony mortality. Fishermen often spray cyanide into crevices and coral thickets where fish often hide, and then they break apart the corals to access the stunned fish, which leads to substantial damage to the habitat.

Large percentages of the target fish captured with cyanide die during collection or in transit due to their weakened state, which requires fishermen to capture significantly higher numbers of fish than would otherwise be needed. In fact, some studies indicate that as many as 75 percent of fish collected with cyanide die within hours of collection, and another 30 percent of the survivors die prior to export. In addition, more than half of those fish exported may die shortly after arrival in the U.S. due to a combination of the poisons used in the capture and the stress associated with handling and transport.

Cyanide fishing is also risky for divers, who often go to considerable depths for extended periods of time without following the proper dive procedures.

Addressing Cyanide Fishing

Cyanide fishing is illegal in most countries, but poor law enforcement capabilities and high levels of corruption have allowed the use of cyanide to continue. In 1989, the Haribon Foundation and Ocean Voice initiated a program to train fishermen in the use of nets as an alternative to cyanide.

A second more aggressive program was implemented in the Philippines in the early 1990s by the International Marinelife Alliance (IMA), in partnership with the Philippines government's Bureau of Fisheries and Aquatic Resources.

Through a combination of the right policies and laws, improved enforcement, enhanced public awareness, training of cyanide fishermen in cyanide-free-fish-capture techniques, development of livelihood alternatives, community-based resource management programs, and cyanide testing of live fish exports through the implementation of a network of cyanide-detection laboratories (CDT) labs, this program helped to successfully reduce cyanide fishing within the Philippines, at least temporarily.

Kicking Cyanide to the Curb

We have identified a series of major steps that are required to curtail the use of cyanide:

- 1) Research to better characterize background levels of cyanide in coral reef fish and to determine rates and pathways of cyanide metabolism after exposure in fish.
- 2) Policy reform in exporting countries.
- 3) Local conservation and training efforts targeted at collectors, middlemen and exporters.
- 4) Improved monitoring of the trade and sharing of information between exporting and importing countries.
- 5) Creation of networks of cyanide-detection facilities to verify the absence of cyanide.
- 6) Validation of existing cyanide tests and further development of methodologies to detect cyanide metabolites.

During a period of eight years the IMA tested 48,000 aquarium fish and food fish for the presence of cyanide. Cyanide was detected overall in about 25 percent of all aquarium fish and 44 percent of the food fish. The testing appeared to serve as a deterrent, at least in the initial years, as the proportion of aquarium fish that tested positive declined from about 43 percent in 1996 to 8 percent in 1999. Unfortunately, the numbers of fish testing positive for cyanide has increased in recent years, and most CDT labs were closed in the mid 1990s.

In the United States, the issue of unsustainable trade in coral reef species was first highlighted in 1998 in Executive Order 13089 on Coral Reef Protection. This order called for the creation of the U.S. Coral Reef Task Force (CRTF). Over the next two years, CRTF members developed a road map for coral reef conservation — The National Action Plan to Conserve Reefs (NAPCR) — which outlines the key threats affecting reefs and identifies specific actions to mitigate those impacts.

The NAPCR includes a section on international coral reefs and the role of the U.S. as a major consumer of coral reef species. This section identifies seven key strategies to advance a sustainable marine ornamental fishery, one of which specifically calls on the U.S. to improve capacity for enforcement, both in the U.S. and internationally.

The Task Force has also adopted three resolutions on trade since 2004. The most recent, from May 2006, requested that the U.S. government identify existing or potential cyanide-detection tests that could be used to determine if fish have been exposed to cyanide and develop a strategy to mitigate the use of cyanide for fishing.

In response to this resolution, the National Oceanic and Atmospheric Administration (NOAA) convened an international workshop this past February in Orlando, Florida, to advance cyanide-detection methods for the live reef fish trade. The primary objective of the workshop was to review the state of testing methods and identify simple, cost-effective, rapid and internationally accepted tests to detect cyanide or its metabolites at different points along the supply chain, from point of collection and export to ports of import in the United States.

Conclusions

There is a recognized need and general support by three major exporting countries — Philippines, Indonesia and Vietnam — for establishing networks of CDT facilities. But there are major limitations that need to be overcome for this to happen. At points of export there is a need for sustainable funding to support costs associated with testing, and new approaches are needed to successfully prosecute offenders that use cyanide for the capture of fish or trade in cyanide-caught fish.

There are also technical problems with cyanide testing in live fish, some of which are related to the rates of metabolism of cyanide, detection of metabolites and the sensitivity of existing tests. Cyanide testing at points of import presents the greatest challenge. In one year there are more than 11,000 shipments of non-CITES-listed reef fish into the United States.

In addition to a limited capacity to inspect each shipment, verification of cyanide use is problematic because fish may be imported several weeks after being caught, and cyanide is known to rapidly break down into sodium thiocyanate and other metabolites.

Testing for the presence of cyanide metabolites is possible, but it is much more costly and time-consuming, and there are limitations in the amount of time a shipment of fish can be detained, as these are live animals that will die if not transferred to aquaria fairly quickly after arrival in the United States.

The United States, with the support of the NOAA's Coral Reef Conservation Program, is working with partners to address science questions pertaining to cyanide and to test and validate cyanide-detection methods.

Marine aquarium hobbyists can also play a key role in ensuring sustainability of the marine aquarium trade by requesting cyanide-free fish from dealers and selectively purchasing fish caught in an environmentally friendly manner.

Andrew Bruckner is a coral reef ecologist conducting research on the impacts of natural and anthropogenic stressors and how these stressors vary across gradients of human activity. He works closely with government and nongovernment groups in the United States and internationally to enhance coral reef conservation through legislation, international regulations, development of management guidelines and on-the-ground monitoring, research and restoration activities.