MANAGING THE AQUARIUM TRADE

History

The aquarium trade is any action in which aquatic species (including, but not limited to: Fish, Echinoderms, Crustaceans, and Corals) are taken from their habitats and sold for one of several uses, including, but not limited to, being sold for exotic pets, sold to aquariums, and sold as delicacies in foreign countries. The trade arose globally in the 1930's, and has been growing since. [1] Since its emergence, the aquarium trade has figuratively exploded in the last two decades. [1]

Global Economic Impacts

Export

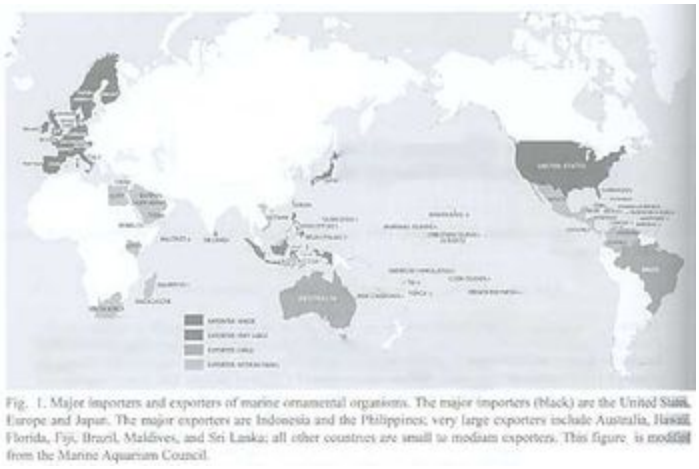


Fig. 1. Major importers and exporters of marine ornamental organisms. The major importers (black) are the United States, Europe and Japan. The major exporters are Indonesia and the Philippines; very large exporters include Australia, Hawaii, Florida, Fiji, Brazil, Maldives, and Sri Lanka; all other countries are small to medium exporters. This figure is modified from the Marine Aquarium Council.

Major Importers and Exporters of aquarium organisms globally.[2]

Export in the aquarium trade is mostly comprised of developing coastal countries, in part because of a lesser developed economy. [3] Poorer coastal countries often rely upon the trade as a major source of income. [3] The majority (90%–99%) of ornamentals are obtained from coral reefs surrounding about 45 countries including: Brazil, Maldives, Vietnam, Sri Lanka, Hawai'i, the Caribbean, and the principal suppliers, Indonesia and the Philippines. [1]

Import

Import in the aquarium trade is most common in developed countries with expendable income. [3] Globally, the market for exotic aquatic species is dominated mostly by the USA, which constitutes 60% of global demand.[1] Western Europe, Japan, and Australia are also major importers of exotic species. [1] It is interesting to note that Australia is one of the few countries with both a substantial export and import aquarium trade market.

Overall global impact

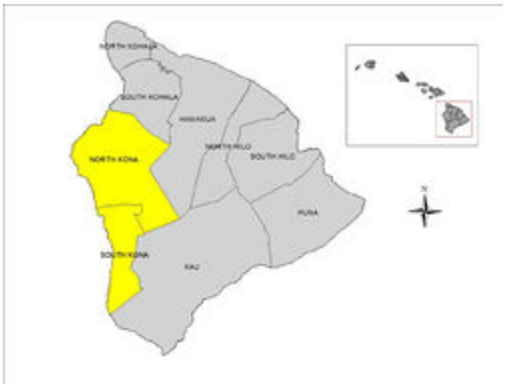
Despite being a relatively new market, the aquarium trade is an expanding market globally, and contributes a great deal to the value of reefs and the souvenir & tourism, aquarium collecting, and exotic dining industries. [1] The trade has become so large

that it involves 350 million fish annually. [4] As recently as 2002, the industry has been valued at $963 million. [4]

Effects on Wild Populations

Aquarium collecting has been shown to significantly affect local populations of target fish. The effect on other aquatic species largely depends on fishing practices used to collect aquarium species. Dangerous fishing practices can harm the entire ecosystem or seriously disrupt trophic interactions.

Case Study: Hawaiian Islands



Map of Kona, Hawaii.[5]

Brian Tissot and colleagues were the one who first performed a significant study on the effect of aquarium collecting on natural populations. [4] Their experiment was a large scale study on Kona, Hawaii, in which they surveyed 10 aquarium species population in addition to a few non-aquarium species and coral populations along the coast. They found that 7 of 10 species surveyed were significantly affected by collecting for the aquarium trade. [4] Their measurements for these affected species showed that abundances were lowered significantly, ranging from 38% to 75% lower in abundance than control sites that had no collecting.[4] The group also determined that very few non-target fish were affected by collecting practices from the aquarium trade. With only 2 non-aquarium species significantly affected by collecting practices, they determined that collection practices in Hawaii were not consistent with over-fishing practices, and thus only significantly affected populations of targeted fish.[4] Upon examination of the coral and macroalgae populations as well, they found that there was no significant change in either population between control and experimental sites and no significant additional damage to coral was found at experimental sites.

Case Study: Banggai Cardinalfish

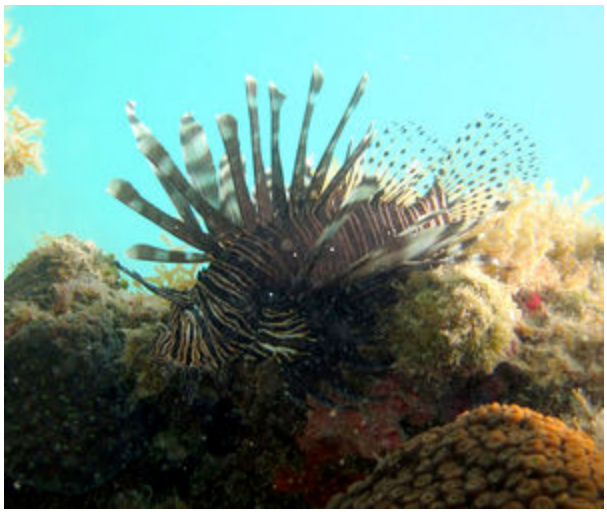
The Banggai Cardinalfish, subject under study.[6]

A study conducted in the Banggai archipelago of Indonesia showed that fishing practices which may not necessarily be destructive, like cyanide and dynamite fishing are, but can still produce a negative impact on wild populations. [7] The study selected 8 different locations under varying fishing pressures and monitored population density, age distribution and habitat quality for each of the locations. What was found was that there was a negative impact on fish density and a significant negative impact on group size for both the Banggai cardinal fish and an organism that it closely interacted with, a species of sea urchin. [7] It was also discovered that traps with sea urchins in them were used to catch fish, and both populations were effected as a result. [7] While the practice is labeled as not destructive, it clearly harmed both species, as both populations suffered from the practice.

Aquarium Trade as an Invasion Pathway

The aquarium trade has been shown to negatively affect ecosystems indirectly as well as directly through poor fishing practices. The industry is a potent source of exotic species invasion into non-native habitats.[3] [8] Aquarium species that are released accidentally, as in the case of lionfish, or intentionally by owners who have decided that they don't want their exotic pets anymore, have the potential to survive and reproduce in a predator-free environment. Because these species are released in waters in which they are not native, no predators have yet evolved to curb population growth; if an exotic species released through the aquarium trade somehow finds itself in favorable conditions to survive and proliferate, their population will grow exponentially and could threaten the ecosystem they have invaded. Invasive species are dangerous to ecosystems because they can throw off naturally occurring food webs, disrupt trophic interactions between native organisms, and thus affect species composition balance. One of the biggest issues involved with this particular invasion pathway is that it often goes unnoticed, frequently overlooked in favor of more prevalent invasion pathways, such as ballast water. Additionally, re-release regulation and accidental releases are both hard factors to control when thinking about management solutions.

Case Study: Lionfish



A lionfish off the coast of St. John, USVI.

One of the most notable examples of the aquarium trade serving as an invasion pathway is the lionfish. The first documented lionfish sighting off the coast of non-native North Carolina was in 2002. [9] The release was originally thought to be insignificant as a threat because the latitude that far north was thought to get too cold in the winter for the lionfish to survive—they thought they would be go locally extinct before any significant damage occurred. However, since 2002, the lionfish population has steadily increased. [9] During a 2004 research expedition, NOAA scientists collected 155 lionfish at 19 different locations off the North Carolina coast during the summer alone. What was startling was that lionfish smaller than those sold for aquariums were spotted, indicating that they were thriving and breeding.\

It is believed that the Aquarium trade is the major vector for the invasion of the lionfish into Atlantic waters, citing Hurricane Andrew as the reason for an accidental release. [9] Another vector would come from owners; The Philippines is a big exporter of lionfish to the United States, so it is believed that customers would buy lionfish for home aquariums and then decide they do not want them anymore and release them into the ocean. Some marine scientists suggest ballast water as the vector of invasion, however there is no evidence to support this theory (but since ballast water is to blame for other fish invasions, it is also hard to completely rule this out). In addition, it is very unlikely that the lionfish naturally migrated through the panama canal as they probably would not survive the journey between two oceans.\

It is hard to tell usually how a species will adapt to its new environment, and little is known how native species will adapt to the new species of lionfish. However, lionfish are believed to pose risks to reef communities because of their predation of economically and ecologically important species. [9] In addtion, native fish do not have experience dealing with lionfish, which could make it a more effective predator. [9]\

The invasion is so widespread that it is feared that it cannot be halted in the southeastern United States, as large scale removal is expensive and impractical, but there may be hope for the Caribbean area, as the invasion is not as threatening in that region. [9] It is likely that because they have essentially no limiting factors to their growth, lionfish populations will continue to grow. [9]

Prevention or Management Methods and Future Impacts

The aquarium trade has important ecological effects on aquatic systems around the globe, such as being a source for exotic species invasion and having the potential to negatively affect species diversity, and thus is an important target for prevention and management strategies.

Prevention or Management Methods

One management solution to the problems that aquarium trading imposes on aquatic systems is to continually check reefs. Reef check programs check "indicators" of ecosystem health, usually a select group of species, and monitor them to determine the health of the reefs at different locations.[10] The reef check program is active in more than 300 reefs in 31 countries, [10] but it is by no means a global effort to monitor all reefs. If this management method were to show promise, a more comprehensive monitoring system will be needed.\

Another method to prevent destruction of reef habitats via aquarium trading practices and manage their impact is through quarantine methods. This means essentially to quarantine areas in which exotic species have invaded to limit the effected area and halt the spread of the invasion. With this method, it is necessary to locate hot spots of non-native species in order to maximize the effectiveness. [8]\

Less effective methods, but methods that must be thought of as well, would be regulation on re-release and on collection. Both methods are hard to enforce because records on collection may or may not be accurate and re-release is far too simple of an act to detect and prevent [1]. To help make collection regulation more efficient, it would benefit to educate the major exporters on sustainable fishing practices, and to encourage more accurate data on collecting practices. Similarly for re-release, efficiency would benefit from educating major importers on the dangers of releasing non-native species into foreign habitats.\

The MAC's logo.[11]

The Marine Aquarium Council (MAC) is a non-profit organization that was founded in 1998. MAC works to provide voluntary standards and an eco-labeling system for the marine aquarium trade. Since 1998, MAC has successfully created certification programs at 21 fisheries across the world, including the Philippines, Hawaii, Fiji, and Indonesia; these programs monitor collection methods and holding facilities. [12] The main goal of the Marine Aquarium Council is to establish standards and certification, in hopes of ensuring that the marine aquarium trade remains and safe and sustainable practice.[12] The Marine Aquarium Council's mission statement promises to "provide value to the industry through the creation of conservation benefits and also work to alleviate poverty and promote sustainable livelihoods for some of the world's poorest communities." For these goals to be met, MAC claims that many things need to happen, including hobbyist demand for sustainable and certified products, the implementation of penalty system for negligent exporters, importers, and retailers, as well as the education of fishers concerning sustainable practices and monitoring processes.[12]

Future Impacts

While prevention of negative impacts is a challenge, correct management of this growing industry can be beneficial for both parties involved. According to J. Murray: "The marine aquarium industry has great potential to generate jobs in low-income coastal communities creating incentives for the maintenance of a healthy coral reef, if effectively managed." [1] However, one problem that has been previously mentioned is that there are several data gaps and inaccuracies involved in measuring aquarium trade and fishing practices. [1] Such inaccuracies as imperfect collecting numbers prevent implementation of effective management practices and can lead to the opposite of what Murray suggests, which would mean negative impacts for both those employed and the ecosystem targeted by aquarium trade.

References in Popular Culture

Famous scene in which Nemo is taken from his natural habitat by a diver to be used in his personal aquarium.[13]

- Finding Nemo
  - Sparked interest over the relatively unheard of industry.
  - People now want "Nemo" or "Dory" fish
- The Spongebob Squarepants Movie

Notes

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8. [↑ 8.0 8.1 Semmens, Brice X. "A hotspot of non-native marine fishes: evidence for the aquarium trade as an invasion pathway." MARINE ECOLOGY PROGRESS SERIES. 266. (2004): 239-244. Print.]{#cite_note-hot_spot-8}
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12. [↑ 12.0 12.1 12.2 "Marine Aquarium Council." Marine Aquarium Council. Marine Aquarium Council, 2009. Web. 15 Apr. 2014. <http://www.aquariumcouncil.org/default.aspx>.]{#cite_note-MAC-12}
13. [↑ http://www.mobygames.com/game/windows/disneypixars-finding-nemo/screenshots/gameShotId,181620/]{#cite_note-nemo-13}

External Links

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