



News and events

Saving Nemo: Researchers hope to reduce mortality in marine ornamental fish

A 30 March 2007 story in the *Bend Weekly* (Oregon, USA) reports on the work of researchers at Oregon State University to examine and mitigate the causes of mortality of marine ornamental fish, from the point of capture to the point of purchase by hobbyists. See: <http://www.bendweekly.com/Science/4161.html>

Low mortalities with live fish transport system

The May 2007 issue of *Fish Farming International* magazine includes an article on a recent development by an Australian company of a live fish airfreight transport system with demonstrated mortality rates of less than 1%.

CITES rejects proposal to list Banggai cardinalfish

At its triennial conference in The Hague from 3–15 June 2007, the parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) considered 40 proposals to amend the trade rules for specific species. Among these was a proposal by the United States to include the Banggai cardinalfish (*Pterapogon kauderni*) on Appendix II of the CITES, which would call for strict monitoring and control of its trade. The Banggai cardinalfish, endemic to a small area of Indonesia, has been popular in the aquarium trade since 1995, with 700,000–900,000 fish collected annually. The proposal cited its limited geographic range, small population and particular reproductive habits (it is a paternal mouth brooder) as making it especially vulnerable to overexploitation. The parties to CITES rejected the proposal, finding that international trade was not threatening the species' survival.

Poaching in Palawan

Several incidents in the Philippine's Palawan Province involving the arrest of foreign fishermen and the seizure of their vessels have caught a lot of media attention. In one incident in December 2006, at Tubbataha Reef, 30 Chinese nationals were arrested and tons of live fish were found on board the vessel, including hundreds of humphead wrasse (*Cheilinus undulatus*), a species protected in the Philippines and listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Tubbataha Reef, in the Sulu Sea, is a national marine park and a World Heritage Site. See an account of the incident by WWF-Philippines at: <http://www.wwf.org.ph/newsfacts.php?pg=det&id=66>

In a series of opinion pieces in the *Manila Standard Today*, attorney Rita Linda V. Jimeno comments on this and other cases and how they reflect the state of law enforcement in the Philippines. See: http://www.manilastandardtoday.com/?page=ritaLindaJimeno_jan15_2007 and http://www.manilastandardtoday.com/?page=ritaLindaJimeno_jan29_2007

Twenty grouper species found to be threatened with extinction

A workshop involving 20 experts from 10 countries convened in early 2007 at the University of Hong Kong to assess the status of groupers worldwide. The group found 20 species of grouper to be threatened with extinction unless effective management measures are established. See: http://www.iucn.org/en/news/archive/2007/03/6_coral_reefs.htm

Chinese hunger for reef fish emptying Asian seas

A March 2007 Reuters story looks at the live reef food fish trade and the steps Hong Kong is taking to monitor and control the trade of humphead wrasse (*Cheilinus undulatus*), now a CITES Appendix II-listed species. See: <http://www.alertnet.org/thenews/newsdesk/HKG58924.htm>

Creating new rural livelihoods from sustainable culture of ornamentals in Solomon Islands

Source: *MAC News*, 4th Quarter 2006

Out of the 27 participants in and around Gizo who attended the first workshop held last May on post larval fish and invertebrate capture and culture, only some participants from 4 communities (Titiana, Babanga, Vorivori and Saeragi) were supplying lobsters and shrimp to the Aquarium Arts Solomon Islands (AASI) on a regular basis. The supply of lobsters and shrimps from these communities mostly came from the coconut logs also called stump.

To improve the trade of those species and their outcome, this past semester the average productivity per community has been studied. The results have shown that the Babanga (Maeraki) farmers supply eighty (80) lobsters and shrimp per week, the Titiana ones about forty (40), and the Saeragi and Vorivori farmers about twenty (25) [sic] each. Those figures can be explained as apart from the aquarium trade, these collectors also participate in other activities such as fishing, pig farming, and growing cash crops for sale at the local markets.

From September 25th to 29th, 15 fishermen with among them two women, from different communities around Gizo attended the Coral Culture Workshop at Nusa Tupe. The first days of the workshop were focused on general presentation given on the collection and culture methods for soft and hard coral using environmentally friendly methods. Information about the aquarium trade and an introduction to the MAC certified chain of custody “from reef to retail” were also provided, along with practical information on responsible methods used to collect and transport marine ornamentals to Honiara, where an exporter is located.

After these general presentations, the remaining four days were organized around hands-on practical sessions. Participants were provided the opportunity to see different types of corals that were planted as broodstock, and to handle soft and hard corals and to pack them using best handling practices for export facilities.

In November and December, communities focused their activities on establishing coral broodstock in their respective areas. Broodstock is held on steel trestles and cuttings are allowed to attach to small discs. *Acropora* spp. is the species the most commonly cultured, even if several species of soft corals are also being farmed. Communities culture corals by adopting the cuttings techniques highlighted in the guideline of the Mariculture and Aquaculture Management (MAM) international Standard.

[MAC] Director's Note

Source: *MAC News*, 1st Quarter 2007

MAC's mission is “to conserve coral reefs and other marine ecosystems by creating standards and certification for those engaged in the collection and care of ornamental marine life from reef to aquarium.” MAC works to deliver on its mission based on measurable outputs, some of which are outlined below.

The facts speak for themselves. MAC certified collection areas and collectors are supplying an increased volume, variety and quality of marine ornamentals from managed reefs and fisheries, using environmentally sound practices that support sustainable livelihoods. MAC certified marine ornamentals from culturing facilities are also now available. An increasing number of MAC certified exporters, importers and retailers are delivering MAC certified marine aquarium organisms to hobbyists – and demand for MAC certified marine ornamentals is growing. Marine aquarists and the marine ornamental industry now have a choice in shaping the future of the hobby and industry.

Reef area for which management is being developed	22,947 hectares of reef (in the Philippines and Indonesia alone)
MAC certified reef area, i.e. reef management in place	15,085 hectares of reef (in the Philippines and Indonesia alone)
Number of collection areas where MAC is working	14 (Philippines: 10, Indonesia: 4)
Number of MAC certified collection areas	16 (Philippines: 7, Indonesia: 4, Fiji: 5)
Number of collectors and traders trained in non-destructive collection methods and prepared for third party certification assessment	718 (Philippines: 483, Indonesia: 235)
Number of MAC certified collectors and traders	426 (Philippines: 247, Indonesia: 179)

Number of collectors, traders, local government units and NGO workers trained in business skills	382 (Philippines/Indonesia total)
Number of MAC certified organisms from MAC certified collection areas to exporters	132,473 (Philippines/Indonesia total, July–December 2006)
Percentage of MAC certified organisms exported	In Fiji, shipments from one exporter to the US are regularly 100% MAC Certified organisms
Mortality (average fish mortality rate of MAC certified deliveries to exporters, July–December 2006)	Philippines: 0.31% Indonesia: 3.0%
Number of MAC certified species available	110 species of MAC Certified fish were recently available in the US
Number of MAC certified exporters, importers and retailers	43 total (Indonesia 6, Philippines 11, Fiji 2, Singapore 3, Canada 1, France 6, Germany 1, Netherlands 2, UK 3, US 8)
Number of MAC certified culture facilities	3 total (UK 1, US 2)

The communities, collectors and companies that have made the commitment to be sustainable and responsible providers of marine ornamentals deserve your support. The marine ornamental trade and hobby can be known either as contributing to the destruction of coral reefs, the poor treatment and death of fish, and the poverty, disability and possibly even the death of marine ornamentals collectors — or it can support the conservation of reefs, the sustainable management of marine ornamental stocks, the use of best practices to ensure fish health and sustainable livelihoods for impoverished fishers in rural villages.

The choice is yours.

Solomon Islands tsunami impacts MAC and the aquarium trade

Source: *MAC News*, 1st Quarter 2007

On 2 April a tsunami struck Gizo town and surrounding areas of the Western Province of the Solomon Islands. We were concerned about anyone that suffered from this, but were particularly concerned about MAC consultant Greg Bennet and the staff of our project partners in the area from World Wildlife Fund (WWF) and the WorldFish Center. These people are all based in the Gizo area and have been implementing the project on sustainable marine aquarium fisheries and aquaculture that is regularly reported on in *MAC News*. On 10 April, we thankfully were able to confirm that they were safe and sound. The aquaculture training facility in Gizo suffered significant damage. Many coastal communities in the area that harvest marine ornamentals were also hard hit by the tsunami. The home of Greg's family was destroyed and we encourage you to support the reconstruction needs in the Solomon Islands.

The tsunami highlights again the difficult and dangerous living conditions of many of the coastal communities involved in the marine aquarium trade. The collection and export of marine ornamentals provides one of the few potentially sustainable livelihood options in many of these areas, which usually have very limited social services for the local communities. Collectors deserve to work in safe conditions and be adequately compensated for their efforts, as this is often the only means they have to support themselves and their families.

Solomon Islands: Creating rural livelihoods through environmentally friendly aquaculture of marine ornamentals

Source: *MAC News*, 1st Quarter 2007

A *Tridacna* clam culturing workshop was held from 30 January–2 February 2007 at Nusa Tupe in Gizo, Solomon Islands. This was the third series of marine livelihood workshops made possible by the support of New Zealand – as part of the Solomon Islands partnership of MAC, the WorldFish Center and World Wildlife Fund (WWF) South Pacific. This workshop delivered the long awaited first batch of hatchery reared giant clams to the twelve (12) workshop participants from Gizo communities and nearby islands who now have the opportunity to become clam farmers and seek MAC Certification.

Upon consultation with project partners, two sites were selected: Babanga (Maeraki) and Saeragi for the development of a Mariculture Area Management Plan (MAMP). During February and March, visits were made to three farmers and to other members of their communities to gather information for the MAMP.

The fragmented corals from the project have been quite popular with the exporter, Aquarium Arts Solomon Islands (AASI). Since early January, the Nusa Tupe facility has sent about one hundred forty-five (145) hard and soft corals to AASI. In general, there is a preference for bright color ones (blue, pink and yellow) as well as for the ones with nice branches and being of appropriate size and well attached to the substrate.

Establishment of Non-Detriment Findings and hard coral quotas for Fiji

Source: *MAC News*, 1st Quarter 2007

As Fiji is a major exporter of live coral under CITES, developments are underway to establish quotas regulating the quantity of coral exported. At present, the export quotas for Fiji are set at arbitrary levels. The aim of this new effort is to provide scientific information towards the establishment of a comprehensive export quota for live hard corals that fulfils the CITES Non-Detriment Finding (NDF) requirements.

This work will be able to build on efforts undertaken by MAC in 2005 to develop proposed NDF methods and provide information to help ensure that the coral and live rock trade in Fiji were environmentally responsible and in compliance with CITES. Following two workshops, MAC developed potential methods for Fiji to use in assessing live coral and live rock resources and managing both the extraction operations and impacts. Field assessments were conducted in four (4) collection areas: Kalokolevu, Moturiki, Vitogo/Naviti/Marou and Vatukarasa. In addition, a system was proposed for ranking key attributes of the collection area and coral species under consideration, providing an adaptive framework for developing quotas as better information becomes available. An extraction rating system was also proposed as a method for establishing live rock quotas in Fiji, based on the extraction rate calculated from exported quantities over a certain period and the standing stock as determined from field surveys.

The work by MAC was undertaken for the Secretariat of the Pacific Regional Environment Programme (SPREP), based on a request to SPREP from Fiji. Recommendations from the project included:

- Capacity building in Fiji to undertake resource assessments and interpret results with training of local scientists and government officials.
- Resource assessments in all live coral harvesting areas and live rock extraction areas in Fiji to assist in the establishment of scientifically (resource) based quotas using the proposed methods for live coral and live rock.
- Site-specific management planning for all collection areas.

A copy of the MAC report to SPREP is available upon request to: info@aquariumcouncil.org.

Pulau Seribu [Indonesia] management plan to cover wider marine resources

Source: *MAC News*, 2nd Quarter 2007

Training for collecting techniques and post-harvest continues in Pulau Seribu, as over twenty (20) collectors were trained there early this year. The Pulau Seribu government will also give financial support to the local suppliers of Pulau Seribu, by helping them to upgrade their holding facilities.

The implementation of the marine ornamental fish management plan for Pulau Seribu District has now been replicated by the local government to cover other marine resources, including fishery management for the live reef fish food trade. One of the management tools being replicated includes harvest monitoring using logbooks. The management plan, which was originally developed only for marine ornamental fish, is now being updated and revised to become the management plan for other marine resources. MAC local non-governmental organization partner, the TERANGI Foundation, has requested MAC to assist them in facilitating the process of developing the management plan for marine resources in the DKI Jakarta Province.

Fiji stakeholders meeting

Source: *MAC News*, 2nd Quarter 2007

On May 7, MAC attended the regular Aquarium Trade Stakeholder Meeting organized by the Fiji Fisheries Department to discuss current issues, including the live rock situation and a local non-governmental organization's new coral culturing project.

The live rock situation encouraged suggestions to be given about the necessity to gradually phase out the collection of wild harvested live rock in favor of cultured rock. Indeed, cultured rock has lately gained better market acceptance, even if this activity still represents additional investment and costs for exporters compared to wild collection. In addition, there were some concerns about the tagging issue of coral cultured by this local NGO as only F2 generation is CITES exempt. These concerns will be transmitted to the Fiji CITES Scientific Council for further consideration.

Creating rural livelihoods from sustainable culture of ornamentals in the Solomon Islands

Source: *MAC News*, 2nd Quarter 2007

After two years of implementation of this project, a review meeting will be held in July. All partners should provide an update about the activities' past years, and the forecasted ones for this coming year. MAC will continue to assist local communities in capacity building with training in best practices and the development of a Mariculture Area Management Plan to achieve MAC Certification.

This meeting is important for the island due to the post-tsunami situation in Gizo. This crisis encouraged the WorldFish Center to conduct assessments on all project sites to determine the impact of the tsunami on the coral reef ecosystem.

SOPs for health certification and quarantine measures for the responsible movement of live food finfish within ASEAN

Source: *Asia-Pacific Marine Finfish Aquaculture e-News*, No. 39 (10 August 2007)

ASEAN Standard Operating Procedures (SOPs) have been developed to reduce the risk of spread of transboundary diseases of aquatic animals by the movement of live food finfish (LFF). These SOPs are a set of documents for health certification and quarantine measures to be used by Competent Authority for the responsible movement of LFF by land, sea and air among ASEAN Member Countries. These SOPs have been developed under the AADCP:RPS Project 370-018, Operationalise Guidelines on Responsible Movement of Live Food Finfish. This project is coordinated by ASEC, NACA and AusVet for Cardno ACIL who manage the AADCP:RPS program for ASEC and AusAID. The document can be downloaded at <http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=5&lid=830>

Giant grouper facts

Source: *Asia-Pacific Marine Finfish Aquaculture e-News*, No. 39 (10 August 2007)

E. lanceolatus is the largest reef-dwelling fish in the world. The species can grow as large as 2.7 m (9 ft) long, weighing up to 600 kg (1320 lb); there are unconfirmed reports of it growing much bigger. It is also the largest and most widely distributed among all groupers but is locally rare. It occurs throughout the Indo-Pacific region from the Red Sea to Algoa Bay (South Africa) and eastward to the Hawaiian and Pitcairn Islands throughout Micronesia. Being such a large predator, it is rare even in areas unexploited by fishing and it has been severely depleted in many locations. It is much sought after for the live reef fish trade with Hong Kong import statistics revealing import of around 2.4 tonnes of giant grouper in 2004. Although Taiwan has had some success in breeding, and sells giant grouper fingerlings in SE Asia, the amount of hatchery reared fish available is thought to be small, and the proportion of traded individuals from wild versus hatchery production is unknown. Indonesia and Thailand are known to be conducting research on the breeding of this species. The species is now listed as "vulnerable" on the IUCN Red List.

References:

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- Fish Base - <http://www.fishbase.org/Summary/SpeciesSummary.php?id=6468>
- Taiwan fish seed industry paper (outdated but interesting, with links to seed suppliers) <http://www.aquafind.com/articles/seed.php>

Code of practice on the import and sale of live marine fish for human consumption

Source: *Asia-Pacific Marine Finfish Aquaculture e-News*, No. 39 (10 August 2007)

Ciguatera fish poisoning is reported in Hong Kong from time to time and it is mainly associated with the consumption of coral reef fish shipped live from the Pacific. Fish accumulate ciguatera toxin in the body through eating small fish that consume toxic algae in coral reef areas. People that are affected by ciguatera may show symptoms of numbness of the mouth and the limbs, vomiting, diarrhea and pain of the joints and muscles. If excessive toxin is consumed, the circulatory and nervous systems can be affected. The Food and Environmental Hygiene Department of Hong Kong SAR has devised a Code of Practice which lists the minimum requirements in importing and selling live fish for human consumption to ensure food safety, especially in terms of the prevention and control of ciguatera fish poisoning. The Code is applicable to all importers, wholesalers and retailers who import or sell live marine fish. For further details or a copy of the Code visit http://www.cfs.gov.hk/english/whatsnew/whatsnew_fsf/whatsnew_fsf_fish_cop.html

Sustainable marine finfish aquaculture in the Asia-Pacific region

By Mike Rimmer

Source: Abstract of a presentation at Indonesian Aquaculture 2007, held in Bali, 30 July–2 August 2007, as presented in *Asia-Pacific Marine Finfish Aquaculture e-News*, No. 40 (19 September 2007)

Marine finfish aquaculture continues to expand rapidly in the Asia-Pacific region. Based on FAO production data, over the last 10 years regional marine finfish production has grown at around 10% per annum and in 2005 reached 1,143,719 tonnes valued at USD 4.1 billion. Value of marine finfish production has increased at around 4% per annum, although the most recent figures (2005) show a 9% increase in value in 2004–2005, suggesting that markets for marine finfish remain relatively strong. The largest producer remains China, with 659,000 tonnes of production in 2005 valued at USD 662 million, followed by Japan with 256,000 tonnes, valued at more than USD 2 billion. In 2005, Indonesia reported about 19,000 tonnes valued at USD 23 million. Milkfish (*Chanos chanos*) remains a popular commodity in Indonesia and the Philippines: production of milkfish increased from 514,666 tonnes in 2004 to 542,842 tonnes in 2005. However, value of production decreased from USD 627 million to USD 552 million over the same period. Worldwide, grouper production (most of which is from the Asia-Pacific region) increased from 59,146 to 65,362 tonnes from 2004 to 2005, an increase of 11%. In contrast, total value of production decreased by 12%, from USD 208.5 million to USD 183.6 million over the same period. This may reflect increasing market saturation by farmed product, particularly by some lower-value grouper species, and consequent price decreases. Although China is the largest producer of cultured grouper, Indonesia is also a major producer. Barramundi (*Lates calcarifer*) production (from marine and brackishwater only) stayed relatively steady at 26,584 tonnes, up slightly from 25,399 tonnes in 2004. Total value of production increased slightly from USD 65.08 million to USD 68.52 million. Thailand remains the largest producer of farmed barramundi. More recently, increasing demand for barramundi has seen many shrimp farmers in Thailand and the Philippines change to barramundi production in 2007. Cobia (*Rachycentron canadum*) is an emerging species of considerable interest to farmers in the Asia-Pacific region. Presently, China and Taiwan Province of China are the only two countries in the Asia-Pacific region to report production of cobia. In 2004–2005, cobia production increased from 20,461–22,745 tonnes. Total value of production increased from USD 36.2 million to USD 41.2 million. Most aquaculture development has focussed on small-scale producers, who mainly target the high-value (local or export) live fish market. However, this focus on small-scale production has in some cases provided only limited industry expansion. Some species, such as cobia, are not suitable for small-scale aquaculture but are ideal for large-scale commercial farming. Linkages between more mature aquaculture industries (e.g. in Europe) and start-up ventures in Asia, are becoming more common. Constraints to the sustainability of marine finfish aquaculture in the Asia-Pacific region include:

- consistency of supply and quality of hatchery-produced fingerlings, and continuing reliance on wild-caught fingerlings for some species;
- continued use of “trash” fish for feeding and limited uptake of formulated diets, particularly by small-scale farmers;
- environmental impacts of large-scale cage farming in coastal areas.

These constraints to the long-term sustainability of marine finfish farming in the Asia-Pacific region are being addressed through a regional program to develop Better Management Practices for marine finfish aquaculture in the Asia-Pacific region, coordinated through the Network of Aquaculture Centres in Asia-Pacific (NACA) under its Marine Finfish Program.

Live-fish market grows, stripping reefs

By Michael Casey, with Dikky Sinn

Source: The Associated Press, 24 January 2007

Kota Kinabalu, Malaysia – Amid banks of bubbling aquariums, Hong Kong resident Kerry To sat back and admired his plate-size steamed grouper plucked from one of the tanks in this Malaysian restaurant and cooked live. “It is very special,” said the 45-year-old To, who flew to the northwest coast of Borneo Island for a holiday featuring a chance to sample the rare delicacy. “These fish are so big and taste so good. I’ll be telling my friends.”

What he and other diners don’t realize is that their appetite for live reef fish — a status symbol for many newly rich Chinese — has caused the populations of these predators to plummet around Asia as fishermen increasingly resort to cyanide and dynamite to bring in the valuable catch. Entire reef ecosystems, already endangered by pollution and global warming, are at risk.

A study released Wednesday about the trade in Malaysia found that catches of some grouper species and the endangered Napoleon wrasse fell by as much as 99% between 1995 and 2003, a period coinciding with soaring economic growth in countries where the exotic fish are a delicacy.

“The removal of these large, predatory fish might upset the delicate balance of the coral reef ecosystem,” said Helen Scales, who co-authored the study for the Swiss-based World Conservation Union. The study appeared in the online edition of *Proceedings of The Royal Societies*, a respected scientific journal.

“With all the threats the reefs already face, these fishing practices take us one step closer to losing these reefs,” she said.

The study of daily fish catches and sales quantifies what conservationists have said for a decade — that hunger for live reef fish in Hong Kong, Taiwan and mainland China is causing populations of wrasse, grouper and coral trout on coastal reefs to plummet in Malaysia, Indonesia, the Philippines and Papua New Guinea.

There is also a growing live reef fish trade off the coast of California, where everything from rockfish to eels are caught and sold, mostly in Asian restaurants along the coast, according to Scot Lucas of the California Department of Fish and Game. But unlike Asia, the trade is heavily regulated and fishermen are not known to use the same destructive methods.

The U.N. and the World Conservation Union released a report last year warning that human exploitation of the high seas was putting many of its resources on the verge of extinction.

It noted that 52% of global fish stocks are over-harvested and that populations of the largest fish such as tuna, cod and swordfish declined as much as 90% in the past century. The report also said destructive fishing practices — including bottom trawling, illegal longline fishing and an increase in large industrial vessels — have led to the deaths of tens of thousands of seabirds, turtles and other marine life.

“Well over 60% of the marine world and its rich diversity found beyond the limits of national jurisdiction is vulnerable and at increasing risk,” Ibrahim Thaiw of the World Conservation Union said last year.

Reef fish — which are caught mostly by small fishermen who sometimes use cyanide poison to stun their catch — are prized mostly because they are cooked live. Traders are careful to ensure they arrive that way, packaging them in bags of water and placing them in coolers for trips that often stretch for thousands of miles.

In restaurants, diners can pay as much as USD 50 a pound for the fish. Business dinners and weddings in Hong Kong and other Asian cities routinely serve live reef fish alongside such delicacies as sharkfin soup.

“Most Hong Kong people now choose to eat grouper because of the firm flesh. It’s tastier,” said Ng Wai Lun, a restaurant owner in Hong Kong. “Farmed fish is less tasty and fresh.”

The World Wide Fund for Nature's Annadel Cabanban, who studies the trade in Malaysia, agreed with the study's finding that the numbers of reef fish were on the decline due to increasing demand. She said destructive fishing practices were as much to blame for the decline as overfishing because they destroy crucial reef habitats.

"There are no predators to check the fish that eat the plants and the shellfish," Cabanban said. "There is a cascading effect on the reef. With so many herbivores, the plant population declines and fish run out of food and they die."

Scales, the study's co-author, said it was impossible to quantify how many fish were taken by explosives or cyanide because fishermen refuse to say. But she said the cause of the decline was definitely the live reef fish trade, since reefs in the areas had been damaged by other environmental factors such as bleaching.

"These severe declines were rapid, species specific," Scales wrote.

Conservationists fear the growing demand for live fish — an industry worth more than \$1 billion a year — is increasing pressure on coral reefs already threatened by warming oceans, development and pollution.

Eighty-eight percent of Southeast Asia's coral reefs face destruction from overfishing and pollution, the US-based World Resources Institute estimates. Most threatened are reefs in the Philippines and Indonesia, home to 77% of the region's nearly 40,000 square miles of reefs.

Fishermen in Kudat — a South China Sea port in Malaysia that depends almost entirely on fishing — acknowledged that catches have declined. Their boats now travel to the Philippines for reef fish.

The fishermen argue there are plenty of fish and that they have few options.

"This is our livelihood," said Ismail Noor, 45, adding that he sometimes spends three days at sea in search of fish. "If we stop, we would have no income."

Noor and other fishermen insist they use only hooks and lines or nets. But the local fisheries department said the use of explosives is widespread, despite campaigns warning of the danger of losing arms, legs and hands.

"Most villagers are stubborn and have always done bombing since they were children," said fisheries official A. Hamid Maulana. "It is difficult to change attitudes."

Conservationists say the answer is to establish international standards for managing the import and export of reef fish. They also say consumers must be educated about the need to avoid certain endangered fish and promote captive breeding.

No international body has been willing to endorse standards commissioned by the Asia-Pacific Economic Cooperation forum, a group of Pacific Rim governments, that would ban explosives and cyanide in fishing, boost monitoring and enforcement, and label fish caught by conventional means.

"Traders are interested in ensuring they have a constant supply of product," said Geoffrey Muldoon, an Australian expert. "Their idea of a constant supply is not to say we have to protect this area, but that we need to find a new area because we have fished this one out."