# Collaborative Resource Management:
# Models for the Live Reef Food Fish Trade

April 2001

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## Executive Summary

Within the last two decades, the global community has devoted increasing attention to the issue of sustainable development. Indeed, the impact of human activity on the world's environment has been a growing concern for governments, businesses, non-governmental organizations and consumers alike. Such concern has led to the adoption of management programs based upon common principles and standards as a means to conserve resources, regulate quality and promote trade. This paper provides a general overview of selected industry standards and management programs currently in practice throughout the world. Such models show that collaborative resource management strategies have been successfully applied to a range of different areas, industries, and products. Although the unique nature of the live reef food fish trade must certainly be considered, it is believed that the LRFFT is not unsuitable to such methods. Furthermore, given current threats to the world's coral reef systems, a comprehensive management strategy appears to be critically necessary.

A number of different models are considered in this paper. These include: Certification and Eco-labeling (section II); Voluntary Codes of Conduct (section III); National and Regional Management Plans (section IV); and Industry Standards and Control (section V). Each section offers unique lessons for the LRFFT and stakeholders contemplating collaborative resource management. However, a number of common themes emerge. These may be summarized as:

- Successful management programs are generally based on agreed-upon standards developed through collaborative processes involving every interest concerned. This includes participation and representation by as many stakeholder groups as possible. Special attention is also devoted to groups which are often excluded from decision-making processes.

- Management programs have increasingly adopted an incentive-based approach which rewards businesses that uphold a set of agreed-upon standards. Market incentives —including an increasing willingness on the part of consumers to

make environment-friendly decisions— are used to encourage industry to participate in such programs. Indeed, the development of strategic partnerships between the business sector and conservation-oriented groups emerges as a critical component of successful plans.

- Industry standards and management have been both embraced and initiated by business groups which have recognized the beneficial results that management programs bring to both consumers and producers alike.

This paper aims to provide stakeholders with practical models to consider for the development of a management scheme suitable for the LRFFT. Among the many programs discussed in this paper, certification of aquaculture appears to be a particularly appealing option for the LRFFT. Additionally, the UN Food and Agriculture Organization's Code of Conduct for Responsible Fisheries provides an obvious model for the LRFFT. Stakeholders may be particularly interested in the Code's general principles and specific guidelines as well as the way the Code has been adapted and used at the national level.

Development of a management program for the LRFFT will ultimately be achieved by stakeholders themselves. However, it is hoped that this paper may provide those involved in this process with useful models and/or thinking-points which will stimulate discussion and facilitate creative thinking which will benefit both the future of the live reef food fish trade and Asia's coral reef ecosystems.

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## I. Introduction

Throughout the world stakeholders[1] in a number of industries have begun to participate in the management of natural resources. The rationale for such participation is that collaboration between a resource's vested interests is likely to lead to better management and more sustainable trade and development. A number of management programs based on agreed-upon principles have indeed succeeded in protecting resources, guaranteeing quality, and promoting trade. As a result, environmentalists, industry participants and end users alike have embraced such methods, recognizing the mutually beneficial objectives and results of these plans.

Collaborative resource management is needed for the coral reef ecosystems in the Asia-Pacific region. Rich in biological diversity, coral reefs in Southeast Asia, the Western Pacific and the Indian Ocean provide millions of people —from fishing communities to restaurateurs— with their livelihood.[2] Indeed, the live reef food fish trade alone is worth an estimated $US 600-700 million annually.[3] Unfortunately, the trade in live reef food fish has also contributed to the serious degradation of coral reef systems. Over-fishing and destructive fishing practices, which are partly driven by a growing demand for live food fish, have progressively depleted coral reef fish supplies in the waters of Southeast Asia. Consequentially, the live reef food fish trade has begun to expand to distant regions ranging from as far as Fiji to the Seychelles. The current state of affairs threatens existing reef resources and endangers the sustainability and future growth of what could be a profitable industry benefiting millions of people in the Asia-Pacific region.[4]

This paper examines the issue of collaborative resource management with a view towards applying such methods to the live reef food fish trade (LRFFT). A number of different approaches adopted by various industries are considered, including: certification and eco-labeling; codes of conduct; regional and national management schemes; and industry control and standardization. This overview provides practical models for the LRFFT. It further illustrates both the feasibility as well as the environmental and economic appeal of such practices. While noting particular challenges in applying such methods to the LRFFT, this paper concludes that the

[1] The term "stakeholders" is defined in this paper according to the definition developed by the Marine Aquarium Council which is: "any individual or group of individuals whether at an institutional or personal level that have an interest or claim which have the potential of being impacted by or having an impact on a given activity. This interest or claim can be stated or implied and direct or indirect. Stakeholders and stakeholder groups can be at the household, community, local, regional, national or international levels."

[2] APEC proposal, "Developing Industry Standards for the Live Reef Food Fish Trade."

[3] Yvonne Sadovy. "The Live Reef Fish Food Trade in Hong Kong: Problems and Prospects" in B.C. Paust and A.A. Rice (eds.) 2001, *Marketing and Shipping Live Aquatic Products: Proceedings of the Second International Conference and Exhibition*, (November 1999; Seattle, Washington) University of Alaska Sea Grant, AD-SG-01-03, Fairbanks.

[4] APEC proposal.

development of industry standards and management is both possible and critical for the future of the live reef food fish trade and Asia's coral reef ecosystems.

## II. Certification and Eco-labeling

Programs aimed at sustainable resource exploitation have been developed and successfully implemented in a number of industries including fisheries, timber and manufacturing. The common innovative trait which these programs share is the development of strategic partnerships between business and environment. Industry and conservation-oriented groups work together in these programs towards the same goal: sustainable use of a resource. This is primarily achieved through an incentive-based approach which rewards businesses that uphold a set of agreed-upon standards and conduct their businesses accordingly. Market incentives —including an increasing willingness on the part of consumers to make environment-friendly decisions— are used to encourage industry to participate in such programs. An overview of this approach is provided below.

### *Fisheries*

Sustainable fisheries and responsible fishing practices have been promoted through The Marine Stewardship Council's (MSC[5]) certification and eco-labeling program. To date, MSC has successfully certified three fisheries: The Western Rock Lobster fishery encompasses thousands of square kilometers along the western coast of Australia. MSC certification ensures that lobster is fished with a specific type of trap. The certified Alaska Salmon fishery also uses approved methods to capture five species of salmon. This fishery includes several hundred individual fishers. The MSC-certified Thames Blackwater Herring fishery ensures that fisherman specifically target Thames Herring, a particular sub-stock of North Sea Herring. The success of MSC's program suggests that the LRFFT may find an instructive model in its principles and process described below.

MSC's certification procedure is initiated by a fishery —usually made up of a number of stakeholders— that has reviewed MSC Standards ("Principles & Criteria for Sustainable Fishing"[6]) and agrees to manage itself according to these guidelines. These standards promote three key principles:

[5] The Marine Stewardship Council (MSC) is a not for profit, non-governmental organization founded by Unilever and WWF in 1996. MSC is headquartered in London with a satellite office in Seattle Washington. The information in this section is derived from the MSC website located at: http://www.msc.org. More information regarding MSC may be found at this location.

[6] A copy of MSC's Principles & Criteria for Sustainable Fishing may be found at: http://www.msc.org/templates/downloads.

*"**Principle 1:** A fishery must conduct itself in a manner that does not lead to over-fishing or depletion of the exploited fish population. For those that are depleted, the fishery must be managed in a manner that leads to recovery.*

***Principle 2:** Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically-related species) on which the fishery is dependent.*

***Principle 3:** A fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable."*[7]

To become certified as a business that practices responsible fishing, the fishery must undergo an assessment by an independent professional certification company. The certification company itself must be accredited as competent to carry out assessments.[8] The certification procedure can be divided into a 3-step process: pre-assessment, full-assessment and final decision.[9] During the first step, a confidential evaluation of a fishery is undertaken to determine whether the fishery is suitable for full certification. This evaluation may include suggestions on how the fishery must improve before certification could be awarded. The second step involves a full evaluation of the fishery by a team of fisheries experts including stock assessment, ecosystem impact, fishery management and local fisheries knowledge. An on-site visit and consultations with fishery stakeholders provide the assessment team with information that is analyzed according to a performance indicator and scoring guidepost approach. The final decision on whether to grant certification is then made according to an assessment report compiled by the evaluation team. This report is reviewed by the client fishery as well as independent peers. The results of the report are also made public. Certification is good for five years with annual audits by the certifier to ensure that the fishery continues to abide by certification requirements.

Certification is promoted on the demand-side through use of the MSC logo. Any importer, processor or retailer may choose to label fish products from a MSC-certified fishery with the MSC logo. The MSC logo ensures that the labeled product

[7] "What defines 'sustainable' and how is sustainability measured?" located at: http://www.msc.org
[8] Accreditation is carried out by MSC and involves desk top review of a certifier's procedures, onsite assessment at a certifier's offices and observation of the certifier undertaking fishery certifications. Once accreditation is awarded, ongoing monitoring is conducted on an annual basis. Accreditation is valid for a 5-year period.
[9] Cost of certification depends on the size and complexity of the fishery. Costs of pre-assessment range from $2,000 to $20,000. Full assessment costs vary from less than $10,000 to more than $100,000.

originated from a MSC-certified fishery. It guarantees that the product has been separated from non-certified goods at every stage of production and transportation. The MSC logo suggests that the product is the best environmental choice. However, it does not indicate that the fish product is of any particular quality.

To use the MSC logo, a business must commission and pay for a chain of custody certification.[10] Like fishery certification, chain of custody certification is also carried out by an independent, accredited certifier who considers and reviews every part of the supply chain. The certifier determines which parts of the supply chain require on-site visits and which parts can be assessed through a review of documentation.

The MSC certification and labeling program encapsulates the benefits of collaborative resource management. That is, it benefits all the stakeholders and motivates participation through incentives: fisheries receive recognition for responsible practices; retailers are able to demonstrate their commitment to buying from sustainable sources; and consumers are able to distinguish between fish that are caught in a responsible manner and those that are not.

Industry representatives have recognized the benefits certification and labeling may bring to business. For instance, Roger Berkowitz, president and chief executive officer of Legal Sea Foods (a Massachusetts-based restaurant chain participating in the MSC's labeling program) has said that he was eager to use the MSC logo because "sustainable seafood protects my future."[11] He has stated, "Realistically, we want to be in business 20, 30 years down the road."[12] Bernie Rogan, public relations director for Shaw's Supermarkets (another MSC participant) has said the MSC logo allows the company to address customer concerns of sustainability. "We see this as an opportunity to convey to them our policies. It's a matter of being able to affix them directly, with the help of the MSC, at the point of sale."[13] This interest has been echoed by other industry participants as well. Norquest Seafoods manager Brian Amend has said that if "his company is able to affix the council's fish logo to its products, Norquest will attract additional customers."[14] Industry interest in certification has also been driven by expected economic profits. Recently, "shares in

[10] Costs of chain of custody certification vary depending upon the complexity of the supply chain. Use of the MSC logo involves payment of a license fee to MSC International (the trading arm of MSC). The On-Product fee is 0.05% of product value ($500 per $1,000,000 of product) with a minimum charge of $500. Off-Product fee is set at a level to cover administrative costs of the licensing system.

[11] Milford Prewitt, "Seafood depletion issue pits chefs' boycotts vs. opponents' claims of 'junk science," *Nation's Restaurant News*, July 26, 1999.

[12] Eric Thorsen, "Retailers Join Restauranteurs in Sustainable Seafood Effort," *Supermarket News*, May 10, 1999.

[13] Ibid.

[14] Steve Wilhelm, "'Certified' salmon attracts interest," *Puget Sound Business Journal*, September 15, 2000.

New Zealand's biggest listed fishing company, Sanford, rose to an all-time high."[15] This was partly attributed to certification of its hoki fisheries by the MSC. Indeed, JP Morgan reportedly "upgraded its valuation of Sanford from $5.90 to $7.25, partly because of the recent designation of New Zealand's hoki fisheries as a sustainable resource."[16]

***Community-Based Certification***

Developed by the Worldwide Fund for Nature (WWF[17]), community-based certification follows the same standards and procedures as MSC's certification program described above. That is, attention is paid to the state of the fishing stock; the impact on the ecosystem; and the management system. Assessment is also conducted according to scoring guidelines. For community-based certification, scoring takes into consideration the unique differences between various fisheries. Community certification further maximizes the use of local knowledge in the certification process and relies on partnerships between fishers and stakeholders to collect information needed to determine if a fishery is sustainable.

Additionally, this program involves an assessment of domestic and international markets for products from certified community fisheries. This component looks at different ways the certified community can "secure economic benefits from certification by identifying new markets, highlighting existing buyers who would be more satisfied with a certified product, and defining opportunities to enhance market stability and profitability."[18] WWF also conducts a parallel communications component which highlights the benefits of certification as a conservation method, brings media attention to progressive companies involved in the process, and raises awareness among consumers.

Community-based certification is facilitated by WWF, MSC, partner organizations or consultants who work with communities throughout the certification process. It is one way to bring together independent fishermen or fishing communities and encourage their participation in a program that draws upon their knowledge for the certification process and utilizes the certification process to identify and/or enhance market opportunities. Notably, industry representatives of the LRFFT have responded favorably to this type of program and have expressed enthusiasm to participate.[19]

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[15] Melanie Carroll, "Prospects buoy Sanford shares," *The Dominion*, March 21, 2001.
[16] Ibid.
[17] The WWF US Marine Program and the Endangered Seas Campaign aims to certify 10 community-based fisheries in Global 200 marine eco-regions in the next three years.
[18] WWF "Community-based Fisheries Certification: A proposed methodology," April 1999, p. 5.
[19] Interview with Patrick Chan, Hong Kong Seafood Chamber of Commerce, February 17, 2001.

***Marine Ornamentals***

Certification based upon established standards is also envisioned for the marine ornamentals industry. The Marine Aquarium Council (MAC) was established to facilitate the involvement of stakeholders in the process of developing standards and creating a mechanism to certify compliance with these standards. Recently publicized, the MAC's draft standards and procedures offer a useful model for the LRFFT.[20]

To expedite implementation of the certification program, the MAC has developed a set of "Core Standards" which will be used in a series of "test certifications." These Core Standards are composed of three separate Standards Documents which each address a different dimension of the marine ornamentals trade. These include:

> ***Ecosystem Management Practices*** *(EMP) which focuses on "the sustainable management of the marine ecosystems where fish, corals and other marine invertebrates and plants are harvested through non-destructive means for the marine aquarium trade."*[21]
>
> ***Collection and Fishing Practices*** *(CFP) which "addresses the sustainable, non-destructive, harvesting of fish, corals and other marine invertebrates and plants for the marine aquarium trade from a certified collection area."*[22]
>
> ***Handling and Transportation Practices*** *(HTP) which discusses "the handling, husbandry, and transport of fish, corals and other marine invertebrates and plants for the marine aquarium trade."*[23]

Each of these three standards are accompanied by a set of Best Practices documents which provide guidance on specific actions that should be taken to comply with the standards. In addition to clarification, background information and examples of how compliance can be achieved, the Best Practices documents also describe the type of evidence that certifiers will look for when assessing compliance with the standards. In essence, the Best Practices documents are "teaching tools" both for certifiers and for those seeking to be certified.[24] Ultimately, feedback from test certifications employing these documents will be used to finalize a set of "Full Standards" which contain the

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[20] The information in this section is based on the MAC website. Additional information and copies of MAC's draft standards and draft best practices documents may be found at: http://www.aquariumcouncil.org/standards.htm.

[21] MAC, "Core Ecosystem Management Practices International Performance Standard for the the Marine Aquarium Trade," Draft for Public Comment: Issue 1 –February 26, 2001, p. 6.

[22] Ibid.

[23] Ibid.

[24] MAC, "Best Practice Guidance for the Core Ecosystem Management Practices International Performance Standard for the Marine Aquarium Trade," Draft Issue 1, p. 4.

three standards listed above and an additional document on Mariculture and Aquaculture Practices.

The Marine Aquarium Council approaches the standards/certification process in a unique manner. Unlike the MSC which has developed one general set of principles, the MAC has formulated four distinct standards that address different aspects of the marine ornamentals trade. Furthermore, it enhances these principles with specific details in the Best Practices guidance documents. While the MAC's approach may facilitate practical application of the standards for a multi-dimensional industry, the MSC's method recognizes the holistic and interrelated nature of trade. Both approaches are suitable for the LRFFT.

***Timber***

An international labeling scheme has also been developed by the Forest Stewardship Council (FSC). This system is similar to those discussed above in that it is based upon a set of recognized standards ("FSC Principles and Criteria of Forest Stewardship"[25]), implemented through a certification process and identified and/or promoted by a label on timber or timber products identifiable to end users. Unlike the MSC or the MAC, however, the FSC's Principles and Criteria are not intended to be used as the basis for certification in the field. Instead, the FSC's Principles and Criteria provides a framework for the development of local forest management standards. Once endorsed by the FSC, these standards are used in the certification process.

The FSC's standards contain ten principles which apply to all tropical, temperate and boreal forests.[26] These principles are generally:

> ***Principle 1:*** *Compliance with the laws of the country in which forest management is located;*
> ***Principle 2:*** *Demonstration of long-term tenure and use rights to the land and forest resources;*
> ***Principle 3:*** *Recognition of the rights of indigenous people's to use and manage their lands and resources;*
> ***Principle 4****: Maintenance or enhancement of the long-term social and economic well-being of forest workers and local communities;*
> ***Principle 5:*** *Encouragement by forest management of the efficient use of the forest's multiple products and services to ensure economic viability;*

[25] Information in this section is based on the FSC website located at: http://www.fscoax.org. A copy of FSC Principles and Criteria of Forest Stewardship may be found at: http://www.fscoax.org/principal.htm.

[26] Many of the principles also apply to plantations and partially replanted forests. While mainly designed for forests managed for wood production, they are also applicable to forests managed for non-timber products and/or services.

***Principle 6:*** *Conservation of the forest's biological diversity, maintenance of the forest's integrity and ecological functions;*
***Principle 7:*** *Implementation of a clearly written management plan;*
***Principle 8:*** *Monitoring to assess forest conditions, management activities and their social and economic impacts as well as chain of custody;*
***Principle 9:*** *Management activities that maintain or enhance the attributes of high conservation value forests;*
***Principle 10:*** *Management of plantations that complement and promote the restoration and conservation of natural forests.*

Regional standards, based on the above principles, are tailored to local ecological, social and economic circumstances. To receive the FSC endorsement, regional or local standards must be consistent with the FSC's Principles and Criteria, and must be developed through a comprehensive consultative process approved by the FSC.[27] Further, the FSC Board of Directors must be satisfied that the standards are compatible with similar standards for neighboring regions which have similar forest ecosystems.

In order to receive certification, an evaluation team ascertains whether the production and distribution of a particular type of lumber or timber product is sustainably managed according to the standards of a particular region. When deficiencies are observed, the evaluation team can make specific suggestions to the certification applicant. Decisions not to award certification may be challenged through an appeals process.

For lumber, a certifier will use either a plantation or a natural forest standard. For live fish, analogous standards could involve a mariculture or open ocean standard. Criteria which are used in timber certification which might have implications for live fish certification include: (1) Actual harvest versus predicted harvest; (2) Species composition of actual harvest versus predicted species composition; (3) Historical rates of harvest versus present rates of harvest; (4) Average annual harvest rate compared to growth levels; (5) Regeneration of resource including any stocking; (6) Product wastage; (7) Environmental damage; (8) Harvesting decisions driven by short-term low value gain versus long-term productivity; and (9) Extent to which areas of ecological significance are afforded protection.

[27] *Required* features of the consultative process include: (a) shared ownership of process; (b) clearly defined working group procedures; (c) fair decision-making processes; (d) transparency and accountability; (e) participation and representation by as many stakeholder groups as possible; (f) a mechanism for future revision; (g) clear grievance procedure. *Recommended* features include: (a) design and implementation of the consultative process should be appropriate to the scale of the region; (b) consultative process should include a 'learning process approach' to incorporate new knowledge; (c) incorporate a diverse group of perspectives; (d) special attempts should be made to include stakeholder groups which are often excluded from decision-making processes.

Chain of custody must also be established. From the forest to the mill, all logs must bear a tag indicating the forest of origin. They must be scaled before leaving the point of departure, and separated from non-certified logs. Furthermore, all certified logs must be segregated in the green yard, dry kiln, and final storage yard. From the primary mill to the secondary mill, all certified wood must be separated in processing, storage and shipment. Chain of custody receipts including customs certificates, bill of landing and invoices are also kept on file for monitoring purposes.[28]

The FSC's timber certification scheme has been warmly received by environmental groups, industry and consumers alike. A number of companies in the United States, Japan, Brazil and Europe have formed "buyer groups" which have committed themselves to selling only FSC-approved certified timber and timber products. One example is Britain's 1995 Plus Group which represents an estimated one-quarter of the country's tropical timber market. The Group has pledged to purchase only FSC-certified products beginning in 1999.[29] Together with the FSC Trademark, this will allow consumers to identify and buy products that originate from a forest that is managed according to internationally agreed-upon principles. Research also supports the belief that consumers are willing to pay more for sustainable goods. For instance, findings of the European Forestry Institute indicate that "European consumers are willing to spend 10% more for certified timber products, while certification adds less than 1% to a producer's costs."[30]

The FSC offers the live reef food fish trade an interesting example. That is, it has created a general set of principles and criteria upon which local or regional standards are developed. These standards are then endorsed by the FSC, an independent body. Given that the LRFFT may be geographically divided into the sub-regions of Southeast Asia, the Western Pacific and Greater China, this approach may be of interest to LRFFT stakeholders. The FAO Code of Conduct may be considered as guiding principles upon which local or regional standards may be further developed.

***Application to the LRFFT***

Developing a certification and labeling program for live reef food fish must certainly take into account the unique nature of the LRFFT which involves considerably large volumes of many different fish species. In 1999, an estimated total volume of 50,000 metric tonnes of live reef food fish was imported into Hong Kong,

[28] FSC website, located at: http://www.fscoax.org.

[29] Bruce Gilley, "Environment: Sticker Shock: Westerners' calls for labelling of forest-friendly wood imports are putting pressure on Asian timber products," *Far Eastern Economic Review*, January 14, 1999.

[30] Bruce Gilley, "Malaysia –Green Light in the Forest: Leading timber exporter Malaysia is trying to strike a deal with environmentalists to win eco-friendly credentials and impress buyers," *Far Eastern Economic Review*, September 7, 2000.

China.[31] Although groupers, Humphead Wrasse and snappers are the commonly consumed fish species in Hong Kong, China (the largest importer of LRFF),[32] the Harmonized Code System includes a total of 13 fish categories.[33] Some may note that the large volume of trade coupled with the diffuse nature of the industry (i.e., many unorganized and individual actors) and the uniquely "live" aspect of the product in question are barriers to utilizing a certification/labeling program for the LRFFT. Monitoring and enforcement issues such as corruption in source countries and the potential for fraud are also major concerns regarding a certification system for the LRFFT.

Such concerns are legitimate. However, it should be noted that any certification/labeling program created for the LRFFT could be specifically tailored to address the particularities of the trade. For instance, community-based certification is an example of how MSC's basic program was refashioned to meet the special needs of individual, small-scale fisheries in the developing world. While certifying wild-caught live reef food fish may be problematic for the reasons stated above, certifying aquaculture appears to be both reasonable and viable.

Applying certification and eco-labeling to aquaculture would be one way to practically implement and monitor compliance with industry standards for the LRFFT. Guidelines for aquaculture certification could include the following:

- ***Hatcheries.*** Aquaculturists should be encouraged to buy, use and/or produce hatchery-reared fish (as opposed to capture and grow-out of wild-caught juveniles).

- ***Pellet feed.*** Aquaculturists should be encouraged to use pellet feed as an alternative to trash fish.

- ***Siting.*** Certification could be used to guarantee responsible siting and management of aquaculture so as not to destroy existing mangroves, shorelines or neighboring aquatic ecosystems.

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[31] Sadovy, Y. "The Live Reef Food Fish Trade in Hong Kong: Problems and Prospects," in B.C. Paust and A. A. Rice (eds) 2001 *Marketing and Shipping Live Aquatic Products: Proceedings of the Second International Conference and Exhibition*, (November 1999; Seattle, Washington) University of Alaska Sea Grant, AD-SG-01-03, Fairbanks.

[32] McGilvray and Chan, "The Trade in Live Reef Food Fish: A Hong Kong Perspective," (International Marinelife Alliance; January 2001), p. 1.

[33] The 13 fish categories in the Harmonized Code include: 1) Giant grouper, *Epinephelus lanceolatus*; 2) High-finned grouper, *Cromileptes altivelis*; 3) Green grouper; 4) Tiger grouper; 5) Flowery grouper; 6) Leopard coral trout; 7) Spotted coral trout; 8) Other groupers; 9) Humphead wrasse, *Cheolinus undulatus*; 10) Other wrasse and parrotfish; 11) Snooks and basses; 12) Mangrove snapper; 13) Other marine fish.

- ***Pollution.*** Certification could be structured to prevent pollution of near coast zones due to extensive aquaculture and other practices such as discharge of effluents, and the use of drugs or chemicals.

- ***Health and Safety.*** Certification could also be a method to guarantee fish that are healthy and safe for consumption.

It is important to note that aquaculture may be an unsustainable practice if it is not conducted in a responsible, environmentally sound manner. An aquaculture study conducted under the World Bank's Marine Market Transformation Initiative (MMTI) has identified environmental problems that may potentially be caused by different forms of aquaculture. These problems and possible solutions to them are as follows:

**Environmental Problems and Solutions Related to Aquaculture[34]**

| PROBLEM | SOLUTION |
|---|---|
| Wild capture of broodstock | Breeding programs |
| Wild capture of fingerlings | Expansion of hatchery capacity |
| Trade in fingerlings and export of disease | Testing for disease |
| Lack of legal framework | Develop legal frameworks with the help of international organizations |
| Enforcement of laws and regulations | Introduction of positive and negative incentives to abide by the rules |
| Conflict of law enforcement and other government functions | Separate law enforcement and other government functions |
| Lack of effective land use allocation | Develop coastal zone management plans |
| Preservation of coastal areas | Develop coastal zone management plans |
| Lack of scientific research | Include research in national aquaculture development plans, including government funding for such research |
| Ambitious export plans for seafoods | Balance export plans with aquaculture development plans and food security plans for the nation |
| Discharge of effluents | Establish rules and proper procedures for discharge of effluents |
| Nutrients and organic matter | Establish rules and procedures |
| Drugs and antibiotics | Establish rules and procedures |
| Chemicals | Establish rules and procedures; training |

[34] Herman Cesar and Erik Hempel, "Opportunities and Constraints of Grouper Aquaculture in Asia," (East Asia Environment and Social Development Discussion Paper Series; October 2000), p. 14.

| | |
|---|---|
| | and extension programs |

Attention to these issues (and standards or guidelines concerning them) could form the basis of a certification program for responsible aquaculture.

Groupers are among the most popular live fish consumed in Hong Kong, China. These fish are said to be "good candidates for aquaculture" because of their rapid growth, good taste and ability to thrive in crowded environments.[35] Investors have also been eager to culture groupers because they command relatively high prices at market. Taking groupers has an example, aquaculture certification could be targeted at different points in the chain of production. The current trend in Chinese Taipei (which has one of the most sizable grouper farming industries in the world) is production specialization. In other words, grouper culture is divided into several stages of production, namely: 1) hatchery (where broodstock and fertilized eggs are produced); 2) nursery (where larvae and fingerlings are raised); 3) grow-out farms (where fish are brought to market size); and 4) distribution.[36] These production stages are logical points to monitor compliance with standards or guidelines specifically developed for these particular phases of development.

Although wild-caught fish continue to command higher prices at market, blind tests do not indicate that there is a difference in taste between wild-caught and aquaculture fish.[37] Furthermore, WWF has found that over 60 percent of Hong Kong consumers surveyed indicated that cultured live reef food fish would be an acceptable substitute for wild-caught fish because of the lower risk of ciguatera poisoning (73 percent of respondents) and lower prices (68 percent of respondents).[38]

Responsible aquaculture has been widely recognized as a viable alternative to wild-caught fish.[39] In addition to taking pressure off the live reef fish populations, aquaculture also provides a practical way for local communities to generate income from fishing, and is a means to supply consumers with healthy, disease-free food fish.

[35] Ibid, p. 2.
[36] Ibid, p. 6.
[37] Ibid, p. vi. Consumers indicate that they enjoy the good taste, good texture and freshness of LRFF. As long as aquaculture can satisfy these criteria, cultured fish are a viable alternative to LRFF.
[38] Noel Chan, "An Integrated Attitude Survey on Live Reef Food Fish Consumption in Hong Kong," (WWF: August 2000).
[39] Interview with Yvonne Sadovy, University of Hong Kong, Department of Ecology and Biodiversity, February 12, 2001. Also see, Herman Cesar and Erik Hempel, "Opportunities and Constraints of Grouper Aquaculture in Asia," (East Asia Environment and Social Development Discussion Paper Series; October 2000).

## III. Codes of Conduct

Largely in response to growing consumer concern, many companies throughout the world have created voluntary codes of conduct to show their commitment to better business practices. A number of prominent oil companies — including Texaco, Shell, Chevron, and British Petroleum— recently signed a voluntary code of conduct promising that their security operations will meet minimal human rights standards. This example is just the latest in a series of such corporate pledges.

As an enumerated set of business standards, codes of conduct are potential vehicles for instituting responsible management and sustainable trade. However, it should be noted that company codes of conduct have become increasingly controversial. Many codes are criticized for being overly vague, for failing to be adequately implemented and for lacking sufficient monitoring of compliance.[40] Any code of conduct must address these issues in order to be truly effective.

### *Certifying Codes of Conduct*

In the manufacturing industry, codes of conduct were developed to address labor issues and to improve workplace conditions in factories. To address valid criticisms of these codes, Social Accountability International (SAI[41]) developed a standard for workplace conditions and created a system for independently verifying factories' compliance.[42]

Similar to the MSC, MAC and FSC models, SAI bases its program on adherence to a set of standards. Developed through an international consultative process, this code of conduct incorporates widely-accepted principles on labor issues that have been delineated in international instruments such as the United Nations

[40] In some cases, company codes of conduct have been regarded as business marketing tools which are not created in good faith but rather are manipulated to deflect criticism of company policies and actions. See, Asian Labour Update, "Codes of Conduct" (Asia Monitor Resoure Center; Hong Kong: October 1997 - January 1998) Issue 26, and Earthrights International "Sincerity Test for Codes of Conduct," Editorial, January 28, 2001 located at: http://www.earthrights.org/news/codeconduct.html

[41] Social Accountability International (SAI) was founded in 1997 as the Council on Economic Priorities Accreditation Agency (CEPAA). It's mission is to further social accountability by convening key stakeholders to develop consensus-based voluntary standards; accrediting qualified organizations to verify compliance; and promoting understanding and encouraging implementation of such standards worldwide. The information in this section is based on the SAI website. More information regarding SAI and its programs may be found at this location: http://www.sa-intl.org

[42] SAI's SA8000 compliance scheme has also been harshly criticized by some labor monitoring groups which assert that the SA8000 program lacks transparency, has inadequate training courses for its auditors, offers no mechanism for monitoring multi-level subcontracting and fails to promote key labor rights. See, Labour Rights in China (LARIC) "No Illusions Against the Global Cosmetic SA8000," June 1999.

Convention on the Rights of the Child and the International Labour Organization Conventions. Known as Social Accountability 8000 (SA8000), this program is supported through independent certification of compliance at the facility level by accredited certification bodies. Currently, there are SA8000 certified production facilities in 12 countries including China, India, Indonesia and Pakistan. Companies involved in sales rather than manufacture may also participate in the SA8000 program through "Signatory Membership." As a SA8000 Signatory Member, a company must set goals for certifying a certain percentage of their suppliers and develop a plan which works toward the ultimate goal of using only SA8000 certified facilities for their supplies.

This two-pronged approach to compliance (i.e., directly certifying producing facilities and developing management plans for selling companies) provides a possible model for the LRFFT. That is, LRFFT stakeholders may consider a systematic method to assure compliance with agreed-upon principles regarding destructive fishing or mariculture practices on the supply-side, while developing a slightly different plan of compliance and involvement for the demand-side.

***Codes of Conduct for Responsible Fisheries***

*-International*

Following the International Conference on Responsible Fishing at Cancun, Mexico in 1992, the United Nations Food and Agriculture Organization (FAO) began to prepare a code of conduct for responsible fisheries practices through an international consultative process. This document was finalized and unanimously adopted on October 31, 1995 by the FAO Conference. The Code, which is based on voluntary participation, provides a framework for national, regional and international efforts related to sustainable use of marine resources. As such, it is an obvious model for the development of industry standards for the live reef food fish trade.

Generally, the Code "sets out principles and international standards of behavior for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity."[43] According to Article 2, the objectives of the Code are to:

- *Establish principles, in accordance with the relevant rules of international law, for responsible fishing and fisheries activities, taking into account all their relevant biological, technological, economic, social, environmental and commercial aspects;*

[43]UN Food and Agriculture Organization, "Code of Conduct for Responsible Fisheries," located at: http://www.fao.org/fi/agreem/codecond/ficonde.asp. Additional information regarding the FAO's Code of Conduct may be found at: http://www.fao.org/fi/agreem/codecond/codecon.asp.

- *Establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development;*

- *Serve as an instrument of reference to help States to establish or to improve the legal and institutional framework required for the exercise of responsible fisheries and in the formulation and implementation of appropriate measures;*

- *Provide guidance which may be used where appropriate in the formulation and implementation of international agreements and other legal instruments, both binding and voluntary;*

- *Facilitate and promote technical, financial and other cooperation in conservation of fisheries resources and fisheries management and development;*

- *Promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities;*

- *Promote protection of living aquatic resources and their environments and coastal areas;*

- *Promote the trade of fish and fishery products in conformity with relevant international rules and avoid the use of measures that constitute hidden barriers to such trade;*

- *Promote research on fisheries as well as on associated ecosystems and relevant environmental factors; and*

- *Provide standards of conduct for all persons involved in the fisheries sector.*[44]

In addition to establishing general principles on fisheries conservation (Article 6), the Code provides specific guidance on substantive issues including: fisheries management (Article 7), fishing operations (Article 8), aquaculture development (Article 9), integration of fisheries into coastal area management (Article 10), post-harvest practices and trade (Article 11) and fisheries research (Article 12). It is a comprehensive document which should provide useful guidance (both conceptually and technically) to LRFFT stakeholders examining the issue of industry standards and collaborative resource management.

[44] Article 2 of the Code of Conduct for Responsible Fisheries.

A number of countries have indicated that more effort must be devoted to disseminating the Code's guidelines to those involved in fisheries. In particular, the Code should be communicated to illiterate fishermen through creative means. As a result of these suggestions, a video of the Code has been developed in English, French and Spanish. [45]

*-National: Australia*

The Australian Seafood Industry Council (ASIC) has also developed a code of conduct which aims to promote the "ecologically sustainable development of the seafood industry and the sustainable use of living aquatic resources and their environments."[46] The Australian Code, which was initiated by the private sector, is intended to apply to the entire seafood industry including the wild-catch fishing sector, aquaculture and seafood processors and marketers. It is based on the FAO's Code of Conduct but is specifically tailored to apply to the Australian Seafood Industry.

Like the FAO Code, the Australian Code is based on a set of general principles. In these principles, the Australian seafood industry pledges that it will:

- *Strive to conserve and protect aquatic ecosystems;*
- *Participate in and comply with management regimes to ensure sufficient seafood resources for present and future generations in the context of ecologically sustainable development;*
- *Comply with all applicable laws and regulations governing their harvest and post-harvest activities;*
- *Promote the granting of secure access rights for commercial fishers and aquaculturists;*
- *Take all reasonable measures to minimize its impacts on the environment through any of their harvest or post-harvest activities;*
- *Implement clean production principles including minimizing any wastage of resource;*
- *Harvest, handle, process and distribute seafood and seafood products in a manner which will maintain the health and nutritional value, quality and safety of the products;*

[45] FAO website located at: http://www.fao.org

[46] The information in this section is based on the Australian Seafood Industry Council website, located at: http://www.asic.org.au.

- *Endeavor to ensure transportation and storage methods are environmentally sound and will facilitate the development and transfer of appropriate technologies, and provide incentives to ensure their widespread adoption;*

- *Resolve resource disputes in a timely and cooperative manner;*

- *Promote the consumption of seafood by recognizing and meeting customer requirements;*

- *Plan, prepare and implement appropriate and relevant training packages for those who work in the industry;*

- *Not tolerate damage to the sustainable productivity of fisheries by the illegal acts of others.*[47]

The Code also provides more detailed guidelines on the specific areas of: fishing operations; seafood quality assurance and food safety; and aquaculture.[48] As noted above, ASIC's Code was initiated by the seafood industry. It is also part of a series of other programs undertaken by the industry to ensure that it operates in an ecologically sustainable manner. These programs include training, research and development and participation in fisheries management.

-*Canada*

Representatives of Canada's fishing industry have also initiated the development of a national code of conduct based on the FAO model.[49] The Canadian Code is divided into two major parts. Part I outlines nine basic principles of sustainable fisheries. Part II focuses on the requirements of responsible harvesting and provides guidelines to fishermen in seven specific areas including: 1) protection of the resource and environment; 2) fishing gear; 3) vessels; 4) access and enforcement; 5) cooperation/ partnership; 6) education and research; and 7) public awareness.

The Canadian fishers and fishing associations involved in the development of the Code have agreed that the development and implementation process will be based on the following three conditions:

- *Development of the Code must be industry led and industry driven, and undertaken on a consultative basis;*

[47] Ibid.
[48] For more detailed information regarding these guidelines, see ASIC website at: http://asic.org.au.
[49] For more detailed information regarding the Canadian Code of Conduct for Responsible Fishing Operations, see http://www.ncr.dfo.ca/communic/fish_man/coderep/eng/index_e.htm .

- *Once finalized, the Code will be made binding by the appropriate federal o r provincial Minister on all participants in those fisheries where it has been voluntarily ratified by representative fishing organizations;*

- *The Code, after formal ratification, will be appended to relevant Conservation Harvesting Plans. Adherence to the Code will then become an explicit condition of fishing.*[50]

Accordingly, a draft Industry Consensus Code was developed by representatives from fishing organizations representing various fishing sectors throughout Canada. The draft was also reviewed through a process which included six regional industry consultations.

Recognizing the link between conservation and knowledge of new skills and practices, the New Brunswick Department of Fisheries and Aquaculture and the federal Department of Fisheries and Oceans initiated an Industrial Training Course in Responsible Fishing. This program is intended to educate fishers and fishing associations about "the Code of Conduct, resource management, the effects of fishing gear on stocks and the ecosystem, as well as broader environmental issues."[51] The first ten day course in this program was held in January 1995 at the School of Fisheries in Caraquet, New Brunswick. Plans were also made to institute similar programs in Newfoundland and British Columbia.

## IV. National Management Schemes

Beginning with the 1972 UN Conference on the Human Environment and the 1987 publication of "Our Common Future" by the UN World Commission on Environment and Development, the international community has devoted increasing attention to the issue of sustainable development —defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[52] International consensus on this issue was formally articulated in the 1992 Rio Declaration on Environment and Development which declared *inter alia* that: "States should reduce and eliminate unsustainable patterns of

[50] Canadian Code of Conduct for Responsible Fishing Operations, Summary Report, July 1997.
[51] Ibid.
[52] UN World Commission on Environment and Development, "Our Common Future" (The Brundtland Report), located at: http://www.rri.org/envatlas/supdocs/brundt.html

production and consumption."[53] Agenda 21, which was adopted by 179 nations also echoed this position stating,

> *"Governments should adopt a national strategy for sustainable development...Its goals should be to insure socially responsible economic development while protecting the resource base and the environment for the benefit of future generations."*[54]

A number of live reef food fish exporting countries —including the Maldives, Palau, and the Solomon Islands— have implemented management regimes which are based upon the principle of sustainable fishing practices. Common features of these plans include catch quotas, size limits, and seasonal or locational bans. Active monitoring coupled with licenses and/or permits which are conditioned upon observance of the plan's requirements facilitate successful implementation of these types of programs. A few examples of different national fisheries management plans are provided below.

***Papua New Guinea***

Since 1992, live reef food fish operations have been conducted in Papua New Guinea (PNG) in the following areas: Milne Bay, Bougainville, New Ireland and East New Britain Provinces.[55] Although handlines and traps have been the most common types of fishing gear utilized, investigations by PNG's National Fisheries Authority Board (NFAB) revealed that cyanide was also being used.[56] This led the FAB to impose a moratorium on the issuance of new live reef food fish licenses in 1997.[57] The last licensed operation ceased in 1998 thereby ending any activity in the trade until this year.

Recognizing that local village communities could benefit from engaging in the LRFFT, the NFAB initiated a consultative process among key stakeholders to examine lifting the moratorium and creating a management program for a LRFF fishery. Live reef food fish operators expressed their willingness to cooperate with the management

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[53] Report of the UN Conference on Environment and Development (Rio Declaration on Environment and Development), A/Conf.151/26 (vol. I) 12 August 1992, located at: http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm.

[54] Agenda 21 is a blueprint for global, national and local actions in areas where human activity impacts the environment. A copy of Agenda 21 may be located at: http://www.un.org/esa/sustdev/agenda21text.htm.

[55] The information in this section is based on Leban Gisawa and Paul Lokani, "Trial community fishing and management of live reef food fisheries in Papua New Guinea," *SPC Live Reef Fish Information Bulletin #8,* located at: http://www.spc.int/coastfish/News/LRF/8/LRF8-01-PNG.htm.

[56] Ibid.

[57] This was not the first time the LRFFT has been suspended in PNG. Having begun in 1990 at the Hermit Islands in Manus Province, the trade was suspended in 1992 following concerns by islanders regarding the destructive impact of over-fishing.

of the LRFF fishery. However, they also articulated their desire to fish spawning aggregations and use hookah gear.[58] Fishing communities involved in the consultation indicated that they were not aware of the destructive impact of the trade but realized that management was needed. Furthermore, they expressed their desire to obtain higher prices for fish; do their own fishing and sell or export to buyers; and be more involved in the management program.[59]

As a result of these meetings, in December 2000, the National Fisheries Authority Board decided to maintain the moratorium but also approve two trial LRFF operations. The licenses allow operations by two companies[60] at M' Buke Islands in Manus Province and Tingwon Island in New Ireland Province. The licenses are valid for a one-year period and are accompanied by intensive monitoring by a full-time observer in each location who will collect fishery data during fishing, buying/selling fish, and during the transshipment of fish from boats to cages.[61]

The two trial licenses are characterized by the following:

- *The LRFF operations must have no interference with traditional fishing*
- *Only fish from the villagers will be bought by the company, which will not undertake any fishing itself*
- *Only handlines and traps will be used for fishing*
- *Use, storage and transportation of explosives, noxious substances (including cyanide in any form) for the purpose of killing, stunning, disabling or capturing fish is prohibited*
- *Specific data must be recorded on the forms provided and submitted in a timely period as specified*
- *Free access shall be granted to observers to all company facilities while conducting their duties*[62]

A National LRFF Fishery Management Plan is intended to provide an overarching framework within which Area-Specific Plans will operate.[63] The National Plan will

[58] Ibid.
[59] Ibid.
[60] The company operating at M' Buke village in Manus is owned exclusively by the people of M' Buke Islands. The company operating in New Ireland Province is a national company owned by people from outside of Tingwon Islands.
[61] Ibid, p. 3.
[62] Ibid.

include: "total allowable catch limits for each fishery; closures of spawning aggregation areas; limits on fishing effort; and management of bycatch."[64] The Area-Specific Plans are intended to allow the communities themselves to manage the fishery. Current draft plans submitted by the fishery communities include: "closure of spawning aggregation areas; gear restrictions; size limits; total allowable catches and restrictions on fishing by foreigners and outsiders."[65]

If Papua New Guinea's fishery management program proves workable, it will offer the LRFFT an innovative management model that may be adopted in other parts of the region where small fishing villages are located.

***Australia***

An extensive system of marine protected areas is implemented in Australia. As the largest marine protected area in the world, the Great Barrier Reef Marine Park/ World Heritage Area has served as a model for the establishment of many similar projects around the world.[66]

Although it is a protected marine area, the Great Barrier Reef Marine Park (GBRMP) allows for commercial, recreational, charter and indigenous fishing activities. Commercial fishing, which amounts to an estimated $A200 million, is the "second most important activity in the GBRMP after tourism."[67] It consists of approximately 3,700 professional fishers and 1,400 vessels involved in trawl, line, net, trap and collection fisheries.[68] About 3,500 tonnes per year (35 to 45 percent of which is coral trout) of the commercial catch goes toward the live fish trade.[69]

The State of Queensland, which is responsible for fisheries management in the GBRMP, established the Queensland Fisheries Service (QFS) to undertake this role. To facilitate the development of informed fisheries management plans, the QFS created a system of Management Advisory Committees (MAC) which gather advice and expertise from stakeholders. The management programs established by the QFS are subject to review by the Great Barrier Reef Marine Park Authority (MPA), a

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[63] The plan has not yet been approved by the Board. A final draft was expected to be made available to the Board for consideration in April 2001.
[64] Ibid, p. 4.
[65] Ibid.
[66] Thomas Maniwavie, Hugh Sweatman, Paul Marshall, Phil Munday and Vagi Rei, "Status of Coral Reefs of Australia: Australia and Papua New Guinea," located at: http://www.reefbase.org/Summaries/pdf/GCRMN2000_CH9.pdf.
[67] P.L. Cadwallader, M.W. Russell, D.S. Cameron, M.H. Bishop and J.M. Tanzer, "Achieving Ecologically Sustainable Fisheries in the Great Barrier Reef World Heritage Area," Great Barrier Reef Marine Park Authority, (paper presented at the International Coral Reef Symposium, Bali, Indonesia) p. 2.
[68] Ibid.
[69] Ibid.

Commonwealth Government agency responsible for ensuring that all fishing activities in the GBRMP are ecologically sustainable.[70] The MPA has the authority to audit fisheries management and, if necessary, use its legislative mandate to override Queensland fisheries management if it is inconsistent with the conservation values of the Great Barrier Reef Marine Park and/or World Heritage Area.[71]

Unlike traditional fisheries management which focuses on the sustainable use of target species, the Australian Great Barrier Reef Marine Park Authority has advocated a "whole-of-ecosystem" approach. This approach looks at the "ecosystem effects of fishing" and promotes the sustainability of target species, non-target species and the entire ecosystem as well.[72] Guided by this approach, the MPA is working with Queensland fisheries managers to address a range of issues including: the increase of fishing effort in all GBRMP fisheries; technology creep (or the use of more efficient fishing gear and methods); the increase of recreational fishing; local area depletion; and indigenous access to resources. Compliance is another major issue in managing GBRMP fisheries. To address this, the QFS and MPA have adopted a strategy of monitoring coupled with increased penalties.[73]

As the largest and most economically important fishery in Queensland, the East Coast Trawl Fishery (ECTF) presents a good case study for the LRFFT. Key aspects of a management plan developed, in part, by the Great Barrier Reef Ministerial Council in 1999[74] include the following:

***A cap on total fishing effort:*** The Great Barrier Reef Ministerial Council agreed that the total fishing effort in the trawl fishery must be capped at a level

[70] Ibid.
[71] Ibid.
[72] Ibid, p. 9.
[73] According to the MPA, the monitoring strategy involves "enhanced patrol activities (in conjunction with Federal Coastwatch flights), development of an integrated intelligence system and use of new surveillance technologies" as well as a satellite-linked vessel monitoring system developed by the QFS. Furthermore, "legislation is being drafted to increase penalties up to $1 million for illegal fishing." The MPA is also "seeking to ensure that illegal fishing in the GBRMP is considered a serious fisheries offence under QFS fisheries management plans. Such provisions enable additional penalties, such as licence suspension, to apply to offenders under Queensland fisheries legislation." Ibid, p. 11.
[74] A draft management plan for the ECTF was first proposed by the QFS in June 1999. The MPA, which determined that this plan was inadequate, recommended a series of improvements. The matter was referred to the Great Barrier Reef Ministerial Council which formed a Task Force of officials from the MPA and the Queensland Government to reach a consensus on the issue. The QFS submitted another proposal in November 1999 which was again considered inadequate by the MPA. In response, the Queensland Government established a Working Group of stakeholders to resolve the issue. Agreement was thereafter achieved and an amended management plan created. The history of the ECTF management plan shows that effective schemes are often achieved through lengthy, consultative processes that involve considerable give and take from all parties concerned.

equivalent to the total effort recorded in 1996.[75] Each individual license holder would be given an "effort allocation." According to an agreement between the QFS and the MPA, the 1996 fishing effort would be determined by averaging each individual fisher's best four years from 1988 to 1998.[76] Implementation of effort allocations was to take effect by January 1, 2001.

***Specific levels and rates of effort reduction:*** As proposed by the Ministerial Council, the management plan aims to reduce the total fishing effort in the ECTF by 15 percent over three years (ending in December 2003).[77] In other words, by January 2004, the total effort in the ECTF will be the 1996 level of effort minus 15 percent. The plan seeks to achieve this objective by reducing effort by 5 percent each year. Annual reviews will keep the program on track.

***Assessment of ecological sustainability:*** An important aspect of the ECTF management plan will be a comprehensive assessment of the fishery's ecological sustainability. Due to be undertaken by the end of 2003, this assessment will evaluate the fishery against agreed-upon sustainability indicators and will examine sustainability in terms of the ecosystem as a whole.[78]

***Closure of trawling areas:*** In order to prevent the expansion of trawling, the ECTF management plan proposed by the Ministerial Council will close to trawling areas where no trawling has yet been recorded. Areas where trawling has occurred from between 1-20 days per year will also be closed to trawling.[79]

***A list of target and other species that may be retained:*** In addition to the target species —defined as prawns (Family Penaeidae), scallops (Family Pectinidae), bugs (*Thenus spp.)* and squid (*Loliolus sp., Nototodarus, Photololigo* and *Sepioteuthis spp*.)— a limited list of other retained species will be included in the management plan. Any other species not on this list may not be retained.[80]

***Use of bycatch reduction devises (BRD):*** The management plan provides for the mandatory use of bycatch reduction devises which are capable of excluding sharks, rays and turtles.[81]

***Development of sustainability indicators:*** The management plan proposes that ecosystem sustainability indicators should be incorporated into the plan by mid-2000.

[75] It was agreed that "effort units" would be defined in terms of "fishing days multiplied by hull units (a function of the length, breadth and depth of the vessel).
[76] Ibid, p. 18.
[77] Ibid, p. 14.
[78] Ibid, p. 15.
[79] Ibid, p. 16.
[80] Ibid.
[81] Ibid, p. 21.

Specifically, comprehensive stock assessment for all target species must be undertaken and based on "logbook and fisheries-independent information, including independent field monitoring and on-going research." [82] Furthermore, fisheries managers are required to annually report to the MPA on progress in achieving management plan objectives.

The Queensland Coral Reef Finfish Fishery is second only to the Trawl Fishery in terms of economic importance and potential impact to the ecosystems within the marine park. [83] A draft management plan for this fishery was released for public comment by the Queensland Fisheries Management Authority in July 1999. Key elements of the plan included:

- Slowing the continual growth in fishing effort;
- Reducing commercial latent effort;
- Reducing recreational catches;
- Improving protection of the breeding of key species; and
- Introducing a process to review the plan continuously with inputs of new information. [84]

The Great Barrier Reef MPA has also suggested ways in which the plan could be more effective and enforceable. For instance, the MPA suggested improving the qualifying criteria for commercial boats, devising more equitable possession limits and extending the area of proposed spawning closures. [85]

***United States***

Unlike Australia and Canada which have incorporated the FAO Code of Conduct for Responsible Fisheries into national codes, the United States has sought to implement the FAO Code through the work of the National Marine Fisheries Service

[82] Ibid, p. 17.
[83] Thomas Maniwavie, Hugh Sweatman, Paul Marshall, Phil Munday and Vagi Rei, "Status of Coral Reefs of Australia: Australia and Papua New Guinea," located at: http://www.reefbase.org/Summaries/pdf/GCRMN2000_CH9.pdf.
[84] Ibid.
[85] REEFMAC, Queensland's Management Advisory Committee for the Coral Reef Finfish Fishery, has been examining over 1,500 submissions it has received as part of the public review of the plan. Additionally, the MPA has commissioned a panel composed of independent experts, to review the issue and provide advice for the future management of the fishery and its program.

(NMFS).[86] Although this implementation plan was created to address the unique features of U.S. marine fisheries, it provides a useful example of how general principles and standards may be applied and practically used on a local or domestic level.

The implementation plan devised by the NMFS applies to "all sectors that use or culture U.S. marine fish resources, including commercial and recreational fishermen, the marine aquaculture industry, and processors and marketers of these resources."[87] The plan embodies nine themes related to sustainable marine fisheries, namely: 1) healthy fish stocks; 2) over-fished stocks; 3) overcapitalization; 4) by-catch; 5) marine aquaculture; 6) fish habitats and coastal area management; 7) fisheries science and research; 8) UN fisheries agreements; and 9) post-harvest practices and trade. Activities in these nine areas are guided by long-term goals summarized as:

*(1) Healthy wild resources and habitats that support those resources;*
*(2) A growing, environmentally sound marine aquaculture industry; and*
*(3) Enhanced social and economic benefits to the Nation provided by viable commercial and recreational fishing industries.*[88]

In each area, the NMFS specifies the relationship between its programmatic activities and the FAO Code of Conduct. For instance, fish habitats and coastal area management (theme six) is identified as both an objective of the Fisheries Strategic Plan (the NMFS's five-year programmatic mission) and a concern treated in Article 10 of the Code of Conduct.

The NMFS identifies specific goals it hopes to achieve in each area and suggests steps which may be taken to attain these objectives. For example, the Fisheries Strategic Plan hopes to eliminate the over-fishing of stocks within the five years beginning in 1997 and to rebuild over-fished stocks within the next ten years. The NMFS describes what measures the U.S. government has undertaken on this issue and further identifies measures which may help reduce over-fishing.[89] It should be noted that the specific steps in each area of this plan are intended to be further

[86] The information in this section is based on the National Marine Fisheries Service, "Implementation Plan for the Code of Conduct for Responsible Fisheries," (NMFS, National Oceanic and Atmospheric Administration, U.S. Department of Commerce), July 1997, located at: http://www.nmfs.noaa.gov/plan.html.
[87] Ibid.
[88] Ibid.
[89] With certain caveats, the NMFS suggests that the following measures *may* be helpful in reducing and eventually eliminating overfishing: "limited entry systems (including license limitations and moratoria and individual fishing quotas); scientifically based and rigorously enforced total allowable catch limits; and vessel and license buyback programs."

developed and implemented by the country's eight Regional Fishery Management Councils in cooperation with fishery stakeholders.[90]

The United States has actively addressed the specific issue of threats to coral reef ecosystems by establishing the "U.S. Coral Reef Task Force" which comprises members from the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior and other federal agencies. In March 2000, the Task Force publicly announced a National Action Plan which had, as one of its goals, the reduction of the adverse impacts of human activities on the coral reefs. In consultation with public and private stakeholders, the Task Force developed a plan which included:

- *Designating 20 percent of all U.S. coral reefs as no-take ecological reserves by 2010. With the fishing community and a broad range of other stakeholders, the existing network of coral reef protected areas will be expanded to ensure the survival of key sites.*

- *Mapping all U.S. coral reefs by 2009. [...] the first priority will be to complete ongoing mapping of Caribbean reefs and reefs on the eight main Hawaiian Islands.*

- *Monitoring to build an integrated national reef monitoring system that profiles and tracks the health of U.S. coral reefs. This monitoring will build on and link existing federal, state and territorial monitoring in addition to implementing new monitoring to, wherever possible, fill in current gaps.*

- *Promoting an All-Islands Coral Reef Initiative to address the highest priorities of U.S. state and territorial islands.*[91]

According to the Task Force, the islands of Hawaii, American Samoa, Guam, Puerto Rico, the U.S. Virgin Islands and the Commonwealth of the Northern Mariana Islands have worked together since 1994 on the issue of coral reef protection. As part of the National Action Plan, NOAA and the Department of the Interior pledged to provide

[90] The Magnuson Fishery Conservation and Management Act of 1976 (renamed the Magnuson-Stevens Fishery Conservation and Management Act in 1996) established eight regional fishery councils to develop and manage fishery management plans within certain geographic regions. Council membership includes commercial/recreational fishermen, scientific experts as well as state and federal fisheries managers. Fishery Management Plans are developed through a consultative process that includes public comments. The eight regional fishery management councils are: 1) The New England Fishery Management Council; 2) South Atlantic Fishery Management Council; 3) Mid-Atlantic Fishery Management Council; 4) North Pacific Fishery Management Council; 5) Gulf of Mexico Fishery Management Council; 6) Pacific Fishery Management Council; 7) Western Pacific Fishery Management Council; 8) Caribbean Fishery Management Council.

[91] "U.S. Coral Reef Task Force Unveils Groundbreaking Plan," Press Release; Noaa 2000-012, March 2, 2000.

$US 1.35 million to help this group "improve coral reef management and protection, including monitoring, education and designation of marine protected areas."[92]

Evidence suggests that LRFF consumers would support wider application of programs which manage reef resources. For instance, when given information regarding destructive fishing practices, nearly 60 percent of Hong Kong consumers polled supported "conservation and regulatory measures to reduce exploitation of vulnerable species which may be targeted with cyanide fishing."[93] Additionally, over 70 percent of respondents also supported the seasonal fishing ban imposed in the South China Sea by China in 1999 as a positive means to protect fish stocks.[94] Such support among consumers for conservation may be viewed as an encouraging nudge for application of management plans on a regional basis.

## V. Industry Practice and Control

As part of the UN Global Compact, Secretary-General Kofi Annan recently extended the responsibility of sustainable development to the private sector and asked businesses to: support a precautionary approach to environmental challenges, undertake initiatives to promote greater environmental responsibility; and encourage the development and diffusion of environmentally friendly technologies.[95] In most industries, greater environmental responsibility on the part of businesses that utilize a natural resource is a matter of self-preservation. Indeed, unlimited exploitation spells the eventual doom of any industry including the live reef food fish trade.

A number of industries have independently initiated methods to standardize or regulate trade because they recognize the benefits they stand to gain from such systems. The following section provides a brief overview of selected industry-initiated programs. These examples illustrate that the private sector can itself be the engine of positive industry change. They also show that what is good for the consumer and good for the environment is, more often than not, good for business.

### *Uniformity: ISO Standards*

Known as ISO, the International Organization for Standardization has developed an organized method of creating agreed-upon standards for business

[92] Ibid.
[93] Noel Chan, "An Integrated Attitude Survey on Live Reef Food Fish Consumption in Hong Kong," (WWF: August 2000), p. 44.
[94] Ibid.
[95] The Global Compact –The Nine Principles, located at: http://www.unglobalcompact.org

practices and products worldwide.[96] ISO standards have been successfully applied to standardize the format of telephone and banking cards, symbols for automobile controls and safety features for wire ropes used in transportation and construction.[97] ISO standards have also been developed to standardize business management (ISO 9000) and environmental practices (ISO 14000). These standards embody the belief that uniformity throughout specific industries worldwide will enhance global trade and/or interactions, facilitate consumer use and bring positive returns to business.

Regardless of the industry or product involved, ISO standards are always developed according to the same principles. Firstly, consensus must be established between all the stakeholders involved. The views and interests of manufacturers, vendors, users, consumer groups, governments, technical experts and research organizations are all considered. ISO members —who represent the national standards bodies from 130 countries— further ensure that the concerns of different regions are heard. Secondly, ISO standards are created with an "industry-wide" perspective. Standards are meant to be globally applicable and are intended to satisfy industries and consumers throughout the world. Finally, participation in standardization is intended to be voluntary.[98]

ISO standards are developed according to a consistent method which is first initiated by the private sector. After the ISO agrees that an international standard is needed, working groups convene to define the scope of the standard. This aspect of standards development is highly decentralized and is carried out by committees composed of technical experts and stakeholders including qualified industry representatives, government authorities and consumer bodies.[99] Countries then discuss the specific details of the proposed standard. Formal agreement on the standard must be obtained from two-thirds of the members that have actively participated in drafting the standards and three-fourths of all members that vote.[100] After implementation, standards are periodically reviewed to ensure they remain accurate and up-to-date.

In addition to working in equal partnership with all stakeholders, ISO also collaborates with regional and international bodies interested in standards-related issues including the World Trade Organization. Furthermore, the International Organization for Standardization also has created an information network (ISONET) to promote access to information regarding standards, technical regulations, as well as

[96] Established in 1947, ISO is a non-governmental organization which seeks to promote the development of standards both for the benefit of consumers and for the development of trade. It is a federation of national standards bodies which works closely with the private sector. ISO standards cover all technical fields except electrical and electronic engineering and information technology. The information in this section is from the ISO website located at: http://www.iso.ch/infoe/aboutiso.htm.
[97] Ibid.
[98] Ibid.
[99] Ibid.
[100] Ibid.

testing and certification activities throughout the world.[101] ISO country members both act as the source of information regarding standards within their own countries and help their own nationals obtain foreign, regional or international-related information.[102] ISO is also engaged in training activities and has a special program to assist developing countries.

ISO standards are an example of industry-initiated efforts to standardize business practices and products on an international basis. The successful application of ISO standards in a number of different industries should be an encouraging example for the LRFFT.

***Quality Control***

Most industries recognize the importance of maintaining a reliable quality product. In order to capture and retain consumer loyalty, businesses have learned to consistently produce products that not only fulfill their stated purpose but also do not harm end users. Many species of live reef food fish are considered luxury delicacies. As such, quality control is an obvious concern for the LRFFT. Two examples below illustrate how businesses, recognizing the importance of quality control, have created mechanisms to standardize, test and monitor product quality.

*-Dutch Flower Bulb Industry*

For centuries, the Dutch have been famous for their flower industry. Today, the Netherlands produces approximately nine billion flower bulbs annually, three billion of which are tulips.[103] Flower bulbs constitute an important part of the Dutch economy and account for about 3.5 percent of the country's total agricultural production.[104] The flower industry is well developed and involves both an export and domestic market. In order to guarantee and protect sales, the Dutch flower bulb industry has recognized the importance of maintaining a high quality product. The industry has developed a program involving established standards and agreed-upon testing methods to regulate product quality.

Standards for the Dutch bulb industry are based on regulations from the Agricultural Quality Act. These standards are used to classify bulbs into one of the three levels of quality. Testing and classification is conducted in the field by the Flower Bulb Inspection Service on an annual basis. Inspectors randomly check bulbs from different batches to ensure that the batches are "true to type and that they are free

[101] Ibid.
[102] Ibid.
[103] The information in this section is based on the International Flower Bulb Center website located at: http://www.bulb.com/industry.asp.
[104] Ibid.

of diseases and viruses."[105] Inspection and approval is required for all flower bulbs regardless of whether they are destined for export or domestic sale.[106]

In addition to protecting the reputation of the Dutch flower industry, bulb testing is also used to conduct research which is intended to benefit the industry as a whole. Research includes "cultivation, plant physiology, plant diseases, plant protection, farm economics, and mechanization used in the culture of flower bulbs and bulb flowers."[107] Two "test farms" have also been established by the Bulb Research Centre to carry out various research projects.[108]

*-Green Food Products in China*

Given the dangers associated with ciguatera toxins and cyanide contaminated fish,[109] health safety is a significant concern for the LRFFT. In a survey of Hong Kong consumers, WWF discovered that 73 percent of respondents were willing to stop eating wild-caught live reef food fish and would instead eat cultured fish or freshwater fish as a means to reduce the risks of ciguatera poisoning.[110] These findings suggest that the LRFFT could benefit from a system which either guarantees consistent quality across the board or which provides consumers with a way to identify healthy, disease-free fish; aquaculture-reared fish; or fish caught according to certain guidelines.

In China, a green foods classification system enables consumers to make informed decisions concerning the quality of a range of products. From soybeans to fruit juices, green food products have become increasingly popular. Created by the Green Food Development Center (a government-sponsored organization), the green foods classification system indicates a product's health safety and environmental impact. The system benefits consumers by providing more product information and rewards businesses who opt into the program with greater sales from concerned consumers.

Green food products in China are divided into two classes: "A" class indicates that the product contains some chemicals while "AA" class suggests that the product contains no chemicals.[111] The determination of a product's status is decided by an evaluation team which conducts on-site inspections. The team conducts an

[105] International Flower Bulb Center, located at: http://www.bulb.com/industry.asp.
[106] Export bulbs are examined by the Plant Inspection Service from the Ministry of Agriculture, Nature Management and Fisheries.
[107] Ibid.
[108] Ibid.
[109] The health effects of consuming LRFF caught with cyanide are still unknown. See, Noel Chan, "An Integrated Attitude Survey on Live Reef Food Fish Consumption in Hong Kong," (WWF: August 2000), p. 44.
[110] Ibid.
[111] Information in this section is based on an interview with Dr. Wang Jianwu, Institute of Tropical and Subtropical Ecology, South China Agricultural University, Guangzhou, China, March 2001.

environmental audit and examines the soil, water and atmospheric quality of the area in which the product is produced. Green food monitoring, which is ultimately certified by the Ministry of Agriculture, focuses on "end-point control" which looks at both the environment in which a product is grown or produced and the presence or amount of chemicals in the end product. In order to obtain "AA" status, a product must not only be entirely free of chemicals. It must also produce no impact on the environment.

The process of green food classification is similar to certification programs. That is, it involves an application by the business seeking classification, examination of the business's procedures, on-site inspection, and a follow-up report. Like organic programs in other countries, China's green food classification system recognizes the mutually beneficial results such a program brings to both consumers and producers alike. The enthusiasm for such programs on the part of both businesses and consumers should be an encouraging example for the LRFFT.

## V. Conclusion

Today, adoption of management programs based upon common principles and standards is a growing global trend. From protected species to non-endangered products, such programs have been put into place to conserve resources, regulate quality and promote trade. This paper has provided a general overview of selected industry standards and management programs currently in practice throughout the world. Such models show that collaborative resource management strategies have been successfully applied to a range of different areas, industries and products. Although the unique aspects of the live reef food fish trade must certainly be considered, it is believed that the LRFFT is not unsuitable to such methods. Given current threats to the world's coral reef ecosystems, collaborative resource management appears to be critically necessary. It is hoped that this paper provides stakeholders with useful models and/or thinking-points which will stimulate discussion and facilitate creative thinking in the process of developing a management scheme suitable for the live reef food fish trade.