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CODES OF CONDUCT AND CERTIFICATION ISSUES FOR SHRIMP FARMING: A REVIEW

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ABSTRACT. The growing demand for fishery products from aquaculture, especially shrimp, led to fierce criticisms about the unsustainable production and socially exploitative management. The product demand is combined with enhanced consumer concern for food safety, and environmental and social issues. Additionally, there is increasing consumer demand for information about the origin and nature of products they consume and the safety of all inputs. From the shrimp pond farmer to the retailer, there is a growing desire to meet or exceed these consumer expectations, and to be seen to be applying responsible management techniques in the development of truly sustainable shrimp production systems. These demands led to the development of codes for better aquaculture practices for the shrimp industry to ensure a sustainable, environmentally friendly and socially equitable way to produce shrimp and for the consumer to be assured healthy food. Shrimp certification was introduced to respond to public perceptions and market requirements and increase public and consumer confidence in the production practices and the product. Currently there are a growing number of standards, "Codes of Practice," and certification schemes. Proliferation of Codes of Practice and certification schemes used by governments and the private-sector industry for sustainable shrimp farming poses a number of challenges. Shrimp producers and exporters in the developing world often struggle to adapt to new and changing rules as they try to bring their farm-raised shrimp to different overseas markets. Additionally, there is the risk that Codes of Practice and certification schemes could affect the competitive position of resource-poor shrimp farmers and prevent benefits from the price premium attained through certification. There is an urgent need for more globally accepted standards and certification guidelines, especially for the small-scale shrimp farmers, to provide guidance, serve as a basis for improved harmonization, and facilitate mutual recognition and equivalence of certification schemes.

Keywords: farmed shrimp, codes of conduct, certification.

Códigos de conducta y certificación para el cultivo de camarón: una revisión

RESUMEN. La creciente demanda de productos pesqueros derivados de la acuacultura, especialmente del camarón, ha traído una fuerte crítica sobre la producción no sostenible y de su manejo socialmente explotador. La demanda del producto se combina con una creciente preocupación del consumidor por salvaguardar su alimentación, así como de aspectos ambientales y sociales. Asimismo, aumenta la demanda del consumidor por información sobre el origen y la naturaleza de los productos que consume y la seguridad de los insumos utilizados en su producción. Desde el camaronicultor al intermediario, existe mayor necesidad de cumplir o exceder las expectativas del consumidor y mostrar la aplicación responsable de técnicas de manejo en el desarrollo de sistemas de producción de camarón verdaderamente sustentables. Estas demandas condujeron a la elaboración de códigos para una mejor práctica de acuacultura en la industria del camarón para asegurar una forma sustentable, amigable con el ambiente y socialmente equitativa de producir camarón y de garantizar al consumidor un alimento saludable. La certificación de camarón se introdujo con el propósito de responder a las percepciones del público y los requerimientos del mercado, así como a la confianza que se tiene en las prácticas de producción del producto. Actualmente van en aumento el número de estándares, de "Códigos de Práctica" y de esquemas de certificación. La proliferación de Códigos de Práctica y de esquemas de certificación utilizados por gobiernos y el sector privado para el cultivo sustentable de camarón, enfrentan numerosos retos.Los productores y exportadores de camarón de los países en desarrollo deben luchar para poder adaptarse a nuevas y cambiantes reglas cuando tratan de introducir su producto cultivado a mercados extranjeros. Aunado a esto, existe el riesgo de que los Códigos de Práctica y esquemas de certificación, basados principalmente en soluciones tecnológicas a nivel de granja, afecten la competitividad de los granjeros con pocos recursos prohibiéndoles los beneficios de los precios privilegiados por la certificación. Son urgentes los estándares y las normas de certificación de aceptación global, especialmente para los camaronicultores

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de pequeña escala que les proporcionen una guía les sirvan de base para lograr una armonía óptima y les facilite el reconocimiento mutuo y la equivalencia de esquemas de certificación.

Palabras clave: Camarón cultivado, códigos de conducta, certificación.

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INTRODUCTION

In many parts of the developing world, marine shrimp farming is one of the fastest growing aquaculture sectors, but it is also one of the most controversial. It has provoked some of the most contentious environmental and social justice debates in Asia, Latin America, and recently, Africa. Rapid expansion of shrimp farming in many tropical countries has proceeded without established and effective regulatory apparatus to monitor and enforce environmental, social and health standards (Barnhizer, 2002).

Among the points of controversy are clearance of mangrove areas for constructing shrimp ponds (Primavera, 1993; de Graaf & Xuan, 1998; Barbier & Cox, 2004; SSNC, 2005; C-Condem, 2007), salinization of groundwater and agricultural land as rice fields are converted to shrimp ponds (Flaherty *et al.*, 1999), abandonment of shrimp ponds after drastic disease-caused collapses, or more gradual, year-to-year reduction in the productivity of the pond bottom (Dierberg & Kiattisimkul, 1996), turning coastal lowlands into shrimp ponds (Páez-Osuna, 2001), disagreements of property rights (Stevenson *et al.*, 2003;de Walt *et al.*, 2002), use of antibiotics and chemicals (Primavera *et al.*, 1993; Holmström *et al.*, 2003), pollution of coastal waters with pond effluents (Páez-Osuna *et al.*, 1999), and negative socio-economic impacts of shrimp cultivation on local populations (Bailey, 1988; Primavera, 1997; Public Citizen, 2004). Additionally, there are heightened concerns after recent detection of illegal and potentially harmful chemicals in cultured shrimp, primarily from Asian sources. However, shrimp farming provides economic opportunities for many people and foreign exchange for poor countries. As industrialized countries have increased demands for sustainable aquaculture products, consumers are insisting on safe and healthy food, willing to pay for it, and seek information about the nature, origin, and safety of inputs and products they consume.

Development of Codes of Practice

The worldwide concerns stimulated a growing desire at several levels within the industry to meet or exceed consumer expectations and be seen as applying responsible production and management techniques. As the shrimp farming industry has come under considerable criticism, discussion of certification proceeded. Researchers, including Bailey (1988), Primavera (1993,1997), Wilks (1995), Stonich & Bailey (2000), Stonich & Vandergeest (2001) and non-government organizations, such as the London-based Environmental Justice Foundation, the U.S. Public Citizen Organization, and the Swedish Society for Nature Conservation (SSNC) portrayed shrimp farming as destructive to coastal ecologies and communities. These critical reports targeted consumers in northern countries. Campaigns range in approach from the Monterey Bay Aquarium (2007) whose Seafood Watch Program and Seafood guide tells consumers how they can help the coasts through appropriate seafood consumption to Greenpeace (1997, 1999), the London based Environmental Justice Foundation (2003, 2004) and the Washington based Solidarity Centre (2008) who are more critical in denouncing not only the environmental impacts of shrimp farming, but also human and labor rights abuses.

Based on changes in mangrove forest cover over two decades, Valiela *et al.* (2001) estimated, in countries where historical data permitted, that of the 35% of mangrove lost, aquaculture development accounted for just over half (18.2%) (13.3% for shrimp culture, and 4.9% for fish culture). In a cost-benefit analysis of a mangrove ecosystem threatened by shrimp farming, Gunawardena and Rowan (2005) showed that shrimp for export is under-priced, since the ecological and social costs were not considered. This under-priced export article is produced at the expense of domestic food security, the environment, and local economies. According to their analysis, if all costs were reflected in the price of shrimp, the market price would be more than five times higher than it is today for the environment to be sustained and local peoples to receive fair

compensation for their inputs. Shrimp farming is a clear example of how the economic colonization of the southern hemisphere is still going on, finding new avenues through modern globalization, transport, and international trade (Uppsala University, 2008). For these reasons, van Mulekom *et al.* (2006) called for a halt to further expansion of shrimp ponds and a temporary halt to export-oriented and liberalization policies. Since most farmed shrimp is produced in southern countries, but consumed in northern ones, production/consumption can easily be framed as a global environmental justice problem, in which northern over-consumption drives environmental and social harm in the south (Vandergeest, 2007). As Béné (2005) described "…although there is agreement between technical experts and scientists in the shrimp farming industry and environmental groups that better management practices in shrimp farming could solve some of the environmental and social problems, there are major differences in opinion about which direction is most useful and valuable, including: (a) Are the main issues the social and environmental disruptions induced by shrimp farming the biological and physical sustainability of the farm? (b) Should the causes of the problems be studied or are technological solutions to be sought first? (c) Is the cause of the problems political (distribution of power) or mainly technical, where the solutions lies esentially in selecting the appropriate farm locations and applying technological innovations? (d) Should extensive and integrated agriculture/aquaculture systems be promoted or intensive and closed systems? (e) Should resource-poor farmers or large-scale entrepreneurs be supported? (f) Should entrepreneurs in shrimp farming be blamed for environmental impacts or small-scale farmers? (g) Are local or international donor organizations, who finance expansion of shrimp ponds to the detriment of poor communities be blamed for the ecological and social problems of shrimp farming or should the blame be placed on resource-poor farmers?".

With increasing concern about environmental sustainability and social impacts of the shrimp farming sector, combined with food safety of consumers, the Food and Agriculture Organization of the United Nations (FAO) prepared a voluntary guide for nations to develop a Code of Conduct for Responsible Fisheries and Aquaculture (CCRF). In 1995, the voluntary code was adopted by the FAO, providing a framework for national and international efforts to ensure sustainable exploitation of aquatic resources in harmony with the environment (FAO, 1995). The CCRF is global in scope, and is directed toward the widest number of members and non-members of FAO, including fishing firms, governmental and nongovernmental regional and global organizations, and all persons concerned with conservation of fishery resources and management and development of fisheries, including shrimp farmers, processors, and marketers of fish products and other users of the aquatic environment in relation to fisheries (FAO, 1995). Article 9 of this guide deals with aquaculture; Article 9.4 explicitly states that States should promote (a) Responsible aquaculture practices in support of rural communities, producer organizations, and fish farmers; (b) Active participation of fish farmers and their communities in developing responsible aquaculture management practices; (c) Efforts that improve selection and use of appropriate feeds, feed additives, and fertilizers, including manures; (d) Effective farm and fish health management that favor hygienic measures and vaccines, safe, effective and minimal use of therapeutics, hormones and drugs, antibiotics, and other disease control chemicals; (e) Governments should regulate the use of aquaculture chemicals that are hazardous to human health and the environment; (f) Governments should require that disposal of wastes (offal, sludge, excess veterinary drugs, and other hazardous chemicals) does not constitute a hazard to human health and environment; and (g) Governments should ensure safety of aquaculture products and promote efforts that maintain product quality. In Article 10, the importance of integrating of aquaculture into coastal area management, taking into account the fragility of coastal ecosystems, the finite nature of their natural resources, and the needs of coastal communities is explained. Additionally, in this article, developing institutional and legal frameworks to determine the possible uses of coastal resources and govern access to them, governments should address the rights of coastal communities and their customary practices to encourage competition with sustainable development.

In 1997, FAO published technical guidelines with annotations on the principles in article 9 about acceptable aquaculture of the Code of Conduct publication of 1995 (FAO, 1997). These annotations were intended for general

guidance, and should have been taken as suggestions or observations to assist those interested in identifying their own criteria and options for actions, as well as for partners helping to support sustainable aquaculture development. As explained in this document: "…given the diversity in aquaculture and the sometimes different perceptions of 'sustainability' more balanced and informed approaches are required to address developmental and environmental issues at any given location. Commitment for collaboration, constructive dialogue among possible partners, and participation of aquafarmers and their communities, are important when assigning responsibilities for sustainable aquaculture development" (FAO, 1997).

Barg *et al.* (1999) reviewed the FAO code for sustainable cultivation of shrimp and reported on the assistance provided by FAO in the development of national codes of practice, technical guidelines, and best management practices for sustainable shrimp cultivation. In the context of a development project supported by FAO's Technical Cooperation Programme, technical assistance was provided to government authorities, as well as the private sector and other stakeholders in the development of a code of practice in Malaysia. Likewise, the development of national codes of practice was discussed during technical workshops in Sri Lanka and Bangladesh (Barg *et al.*, 1999).

The Southeast Asian Fisheries Development Centre focused attention on the original Article 9 of the Code of Conduct with the responsibility of individual States to implement the code and develop guidelines for the implementation of the code at a regional level. "Using these Regional Guidelines as a basis, States may take necessary steps to appropriately manage aquaculture within their jurisdiction by (a) Initiating necessary action identified in the Guidelines, (b) Preparing technical guidelines to further clarify the issues and specific subjects in the Guidelines, (c) Improving the national instruments, and (d) By promoting the required policy and technical research to obtain needed of detailed information" (SEAFDEC, 2001). In December 1997, the FAO convened a technical consultation in Bangkok on policies for sustainable shrimp cultivation, with the goal to collect background information, descriptions and analyze of development of shrimp cultivation and management, including legal and institutional aspects and government policies of several of the main shrimp-producing countries, accounts of activities, the views of several intergovernmental and non-governmental organizations on shrimp cultivation, and a review of development economics and socio-economic issues (FAO, 1998a, 1999).

During this consultation, some participants noted that achieving sustainable shrimp cultivation was dependent on effective government policy and regulatory actions, as well as the cooperation of the shrimp farming sector in utilizing appropriate technology in its planning, development, and operations. Participants recommended that the FAO convene expert meetings to elaborate on good management practices in shrimp cultivation and determine desirable elements of legal and other regulatory instruments for coastal aquaculture (FAO, 1998a).

In 1998 a consultancy workshop took place in Rome, where mainly sustainability indicators (ecosystem and biophysical, economic and social, legal and institutional, and farm-level) for shrimp farming and a draft questionnaire addressed to governments of shrimp-farming countries (FAO, 1998b). This workshop was followed by one in December 2000 in Brisbane, Australia, with 71 experts from 19 countries, most from major shrimp-producing and consuming nations. The participants represented government and non-government organizations, shrimp producers and associations, and intergovernmental agencies, including the World Bank, World Wildlife Fund for Nature, the Global Aquaculture Alliance (GAA), Naturland, and the Industrial Shrimp Action Network (ISANet). The main objectives of the 'Expert Consultation' were to provide a recognized international forum for discussion on major aspects related to the promotion of sustainable shrimp culture practices, as well as related institutional and legal instruments for the development and implementation of good management practices leading to improvements in shrimp cultivation at the farm and institutional level (FAO and Dept. of Agriculture, Fisheries and Forestry, Australia, 2001). During this workshop, topics of discussion included how to identify, develop, and implement specific good management practices and good legal and institutional arrangements for sustainable shrimp culture. Objectives, rather than principles were formulated, so that progress could be measured against them: "(a) Use land and water which is

suitable for sustained shrimp production, (b) Conserve sensitive aquatic habitats and important ecosystem functions, (c) Manage soil resources and earthwork to minimize impacts on surrounding environments, (d) Minimize impacts on local water resources, (e) Avoid release or escape of exotic species and transgenics into the environment, (f) Responsible use of chemicals that may impact adversely on ecosystems and human health, (g) Maximize efficiency of resource use and minimize waste outputs, (h) Reduce dependence on wild stocks for farmed shrimp production, (i) Optimize social and economic benefits to the wider community and country, (j) Conduct shrimp farm operations to minimize impacts on surrounding resource users, and (k) Ensure the rights and welfare of staff in farm operations" (FAO, Dept. of Agriculture, Fisheries and Forestry, Australia, 2001).

Many thought that these objectives would automatically lead to successful operations; however, from a business perspective, good management practices should demonstrate a clear benefit, either in reduced costs and higher profits or in better reputation and reduced potential for conflict.

To provide an analysis of shrimp farming and the environment and to make recommendations the World Bank sponsored a study (Hempel & Winther, 1997). This study confirmed that shrimp farming is a very diverse subsector of aquaculture, in terms of farming systems and geographic location, the environmental, social, and economic importance of cooperation and coordination of efforts to promote better management practices. These results led to a consortium comprising the following agencies: the Network for Aquaculture Centres for Asia and the Pacific, the World Bank, the World Wildlife Fund for Nature and the FAO. In 2004 joined the United Nations Environment Programme (UNEP) the consortium. The objective of the consortium was to analyze and share experiences on better management practices under various environmental, social, and economic conditions and to assess the cost-benefits for farmers to adopt these practices individually and in cooperation with other farmers. Their objectives were to: (a) Generate a better understanding of the key issues involved in sustainable shrimp aquaculture, (b) Encourage a debate and discussion around these key issues to lead to consensus among stakeholders, (c) Identify better management practices for shrimp aquaculture, (d) Evaluate the cost for adoption of such strategies and other potential barriers to their adoption, (e) Create a framework to review and evaluate successes and failures which can inform policy debate on better management for sustainable shrimp aquaculture, and (f) Identify future development activities and assistance required for the implementation of a more sustainable shrimp culture industry (World Bank *et al.*, 2002).

This information was intended to help governments and the private sector develop support strategies and specific assistance measures for farmers to overcome the constraints that currently prevent them from adopting better management practices. The consortium generated improved information on key issues for sustainable development and management of shrimp farming; facilitated consensus building among stakeholders at international, regional, national, and local levels; identified management strategies for sustainable shrimp farming; provided a basis for informing policy makers on management strategies; and provided a platform for identification of future development activities and assistance for implementation of management strategies. The program involved thematic reviews covering the identification of better management practices and reviewed implementation through codes of conduct and practices; reviewed management strategies for preventing and treating shrimp viral diseases; social aspects and alleviation of poverty; and rehabilitation of mangroves and other coastal habitats. Case studies were prepared by more than 100 researchers from more than 20 shrimp-farming countries through consultations throughout Asia, Africa, and the Americas. Some of the reviews and case studies are available on the website: www.enaca.org/shrimp. These reviews and case studies provided the basis for the publication, International Principles for Responsible Shrimp Farming (FAO *et al.*, 2006), which provided the technical basis upon which stakeholders could collaborate for more sustainable development of shrimp farming. For governments, they provided a basis for policy, administration, and legal frameworks that can be renewed, adjusted, funded, and implemented to address the specific characteristics and needs of the this sector to protect and enhance the industry, the environment, other resource users, and consumers. Strengthening of institutional arrangements, capacity, and partnership are also important to ensure cooperation

and coordination of all relevant institutions with jurisdiction over natural resources, and animal and public health. The publication of "International Principles for Responsible Shrimp Farming" deals with: (a) Sitting of shrimp farms, (b) Design and construction of farms, (c) Minimizing the impact of water use, (d) Responsible use of broodstock and postlarvae, (e) Efficient use of feeds and feed management, (f) Health management, (g) Ensuring food safety and the quality of shrimp products, and (h) Social responsibility (FAO *et al.*, 2006). Additionally, this document provided the basis for developing standards and certification systems.

Codes of Conduct

Some countries have developed national level codes of conduct (CoC) for production of farmed shrimp, such as Thailand's Good Aquaculture Practice and Australia's Environmental Code of Practice.

Codes of Conduct at the national level

a) The case of Thailand

The Marine Shrimp Culture Research Institute of Thailand's Department of Fisheries (MSCRI, 2003) designed a flexible framework for a CoC in 2000 through consultation with industry associations, with the idea that farm group would be able to use the framework to design farm-specific codes appropriate to local circumstances, an approach that introduces a degree of mutability into the standards (Vandergeest, 2007). The Department of Fisheries encouraged adoption of voluntary management practices through Good Aquaculture Practices (GAP) to assure product safety and to facilitate shrimp exports by creating traceability and providing laboratory testing for chemical residues. The scheme intended to assure product safety. To obtain GAP certification, shrimp farmers register their farm and provide documentation to the local offices of the Department of Fisheries when they purchase postlarvae from hatcheries, and again when they sell their harvest. Additionally, officials visit these farms prior to harvest to measure water quality and test for antibiotic residues. They take notes on general farm appearance, cleanliness, and water/sediment disposal and make recommendations for improvement (Vandergeest, 2007). In Thailand, processors are no longer accepting shrimp witout GAP valid movement documents, which allow farmers to transport each batch of harvested shrimp to the market. This procedure serves the traceability requirement (Pongthanapanich & Roth, 2006a, b). Field research in Southern Thailand by Vandergeest (2007) showed that a combination of community-based collective action and local governments are currently the most effective regulators of shrimp farming. As local communities need to live with shrimp farming on a day-to-day basis, know best the local social and environmental impacts, and are most motivated to contain these impacts, effective community actions need to be facilitated and supported by central government policies and agencies, including technical agencies like the Department of Fisheries and civil authorities. In a concerted voluntary effort by shrimp farmers, shrimp farming associations, various educational institutions and agencies that are concerned with the importance of biodiversity of the mangrove ecosystem, mangroves could have increased by 46% between 1995 and 2000 (Nissapawanich, 2007). The voluntary collaboration between the shrimp farming industry and the Department of Fisheries was the basis for successful implementation of the GAP certification scheme of Thailand.

b) The case of Australia

Another example is the Australian Prawn Farmers Association (APFA), which prepared a voluntary Code of Practice to maintain the integrity of the environment and enable the shrimp farming industry to become sustainable. This code aims to provide realistic objectives: fall within the legal requirements of environmental protection, be relevant to Australian prawn farmers, provide options for management, be flexible, provide a mechanism for environmental self-regulation, focus on outcomes, and be practical. The Environmental Code of Practice stated the following objective: "To protect Australia's environment while allowing for the development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends." Participants in the Australian shrimp industry are encouraged to: (a) Support industry research into environmental issues, (b) Achieve, and where practical, go beyond compliance with all legislation and license conditions, (c) Ensure that products are produced, packaged, delivered, disposed of, and recycled in an environmentally responsible manner, (d) Minimize use of raw materials and energy, (e) Design production systems to minimize adverse environmental impacts, (f) Take into consideration environ-

mental impacts of new projects at the planning stage, (g) Provide management and employees with appropriate levels of environmental training and education, (h) Require employees to accept environmental responsibilities as a part of their job description, and (i) Conduct environmental reviews at appropriate intervals. Farmers not fulfilling the requirements of the APFA will not receive legal assistance in environmental disputes (Donovan, 2001).

Codes of Conduct at the international level

At the international level, the Global Aquaculture Alliance (GAA) developed codes of conduct for Best Aquaculture Practices and promoted a certification scheme for shrimp production under the Aquaculture Certification Council (ACC).

a) Certification schemes

Increased awareness among consumers over how shrimp are farmed, environmental, social, and food safety concerns, as well as competition in the seafood trade have drivenes interest in certification. Certification gives an opportunity to large retail organizations seeking a competitive edge in product quality and corporate image. For example, US-based Wal-Mart (largest retail chain) and Red Lobster (restaurant chain) and UK-based Lyons Seafood (largest British supplier of shrimp) announced that they require all their suppliers to be certified by the ACC's BAP program.

Certification schemes are best conducted by a recognized and independent third-party organization having a written or equivalent assurance that the product, process, or service conforms to specified requirements. Certification may include a range of inspection activities which could include continuous inspection in the production chain. Typical examples of conformity assessment activities are: sampling, testing and inspection, evaluation, verification and assurance of conformity (suppliers' declaration, certification); registration, accreditation, and approval in any combination.

According to Funge-Smith *et al.* (2007), standards for shrimp certification programs should be developed through transparent involvement of all parties concerned, from the farmer to the consumer and compliance with the agreed standards should be verified and guaranteed by third-party inspection. Clay (2007) considers standards for shrimp certification programs should focus on key impacts. Stakeholders in shrimp farming identified the following issues of high importance for certification: antibiotic and chemical use, disease transfer, land and water use, fishmeal/oil use, water pollution and user conflicts, which should be considered in standards for a shrimp certification program. The ranking of these key impacts, especially the social impacts, is still a special challenge for certification programs.

As examples, goals, principles, and achievements of two international, non-governmental, certification bodies will be described, one promotes "best aquaculture practices" and the other "organic shrimp farming." Following the two descriptions, attempts to certify shrimp production through national organizations will be discussed. Lastly, the work of international organizations to develop more globally accepted norms for aquaculture certification will be described.

Non-governmental certification bodies

a) Global Aquaculture Alliance (GAA), Aquaculture Certification Council (ACC) and "Best Aquaculture Practic"

The GAA, based in the United States, is an international non-governmental organization, supported by aquaculture businesses to counteract prominent critics, especially environmentalist groups, of shrimp farming in developing countries. Based on Article 9: Aquaculture Development in the Code of Conduct for Responsible Fisheries (FAO, 1995) and Technical Guidelines for Responsible Fisheries: Aquaculture Development (FAO, 1997), GAA developed its "Guiding Principles for Aquaculture" in 1997. GAA, in cooperation with The Network of Aquaculture Centres in Asia (NACA) and Auburn University, provided background information on the interactions between shrimp farming and mangroves. In 1998, the first issue of the Global Aquaculture Advocate newsletter was launched to keep subscribers informed about the issues facing the aquaculture industry and the activities of GAA. The Codes of Practice for Responsible Shrimp Farming, drafted by Boyd and reviewed by the GAA Technical Committee, followed in 1999 (Boyd, 1999). It contains nine series of recommended practices (mangroves, site evaluation, design and construction, feeds and feed use, shrimp health management, therapeutic agents and other chemicals, general pond operations, effluents and solid wastes, and community and employee relations)

for the shrimp farming industry. The purpose of the Code was to provide a framework for environmentally and socially responsible shrimp farming that was voluntary, proactive, and standardized and intended as flexible guidelines that would be continuously improved as shrimp farming technology advanced. National codes of conduct and practices based on the GAA's Codes of Practice for Responsible Shrimp Farming were developed by the fisheries departments of the governments of Thailand, Nicaragua, Ecuador, and Honduras. The Bangladesh SSoQ program, Thai Code of Conduct, and the Australian Prawn Farmers Association incorporated the GAA's code of practice into their shrimp certification principles. In 2002, the GAA supported formation of the Aquaculture Certification Council (ACC), an independent and international nongovernmental organization to certify environmental, social, and food safety standards for shrimp hatcheries, farms, and processing plants. In 2004, the GAA developed its "Best Aquaculture Practices" (BAP) guidelines to address social, environmental, and food safety for shrimp aquaculture (GAA, 2004).

For its third party certification system for farmed shrimp the ACC builds on the guidelines for Best Aquaculture Practices developed by the GAA´s Responsible Aquaculture Program and the ACC certifies the shrimp hatchery, farm, and the processor based on these standards. ACC offers a "process" rather then a "product" certification. The ACC published guidelines for certification of aquaculture facilities (hatcheries, farms and processing plants), describing in detail the concerns and possibilities to mitigate negative aspects of shrimp farming related to the community (property rights and regulatory compliance, community relations, especially concerning access to mangrove areas, worker safety, and employee relations), environment (mangrove conservation and ecosystem protection, veterinary health and microbial sanitation, effluent and sediment management, soil/water conservation, source of postlarvae, storage and disposal of farm supplies), and food safety and quality assurance (standard sanitary procedures, hazard analysis and critical control point program, and product testing), and product traceability from the hatchery, farm, and processing plant (ACC, 2004). These guidelines were developed for industrial shrimp farms; resource-poor farmers have difficulties complying with the guidelines, especially with regard to effluent monitoring and sediment management. The ACC specialist in certification receives training in the certification standards and performing environmental and social impact assessments. The first aquaculture facility certification training course was held in Ecuador; courses in Indonesia, Vietnam, Nicaragua, Thailand, and Mexico followed. By the end of 2006, ACC had certified 50 processing plants and nearly 100 other facilities (shrimp hatcheries and grow-out ponds) and the number of ACC auditors reached 112.

b) Naturland, Germany (organic shrimp farming)

Naturland is one of the certification bodies in the International Federation of Organic Agriculture Movements (IFOAM) and developed organic standards for several aquaculture commodities. It issued its standards for organic shrimp farming at the end of 1999 and started its first project with in Ecuador. This pilot project was an opportunity for shrimp farmers to choose responsible, safe, and sustainable production. Naturland's Standards for Organic Aquaculture (Naturland , 2004; 2006) included a specific section for pond culture of the Pacific whiteleg shrimp *Penaeus vannamei*. For conformity assessment of their certification scheme for hatcheries, farms, feed production, and shrimp processing plants, independent, and internationally accredited third party inspection organizations were given responsibility for certification. In collaboration with the Swiss Import Promotion Programme (SIPPO) and the Institute for Marketecology (IMO), Naturland developed the International standards for organic aquaculture, "Production of shrimp" (SIPPO *et al.*, 2002). In 2004 and 2006, Naturland revised this standard, requiring amongst other issues that organic shrimp farms protect mangrove areas and not use antibiotics, inorganic fertilizer, and pesticides, stock ponds with postlarvae in very low densities, and use feed that was low in protein and fishmeal. Certified organic shrimp farms can now be found in Ecuador, Peru, Vietnam, Indonesia, Brazil, and Thailand.

Certification through national organizations

a) Department of Fisheries, Thailand

With assistance from the World Bank and consultations with industrial associations, the Department of Fisheries designed a flexible certification framework, the Marine Shrimp

Culture Industry of Thailand Code of Conduct, with the concept that groups of shrimp farmers would be able to use the framework to design farm-specific codes appropriate to local circumstances, an approach that introduces flexibility into the standards not found in transnational standards. The Thai code covers product safety, as well as environmental and social responsibilities. The overall framework was modeled on the standards of the GAA, with assistance from technical experts to assess environmental impacts. However, during the development of the standards, inputs from local communities on avoiding social conflicts between shrimp farmers and other coastal inhabitants were neglected (Béné, 2005; Vandergeest, 2007). Not surprisingly, participation in the Thai code framework has been low. In 2006, of approximately 35,000 shrimp farms and more than 1,500 hatcheries, only 146 farms and 140 hatcheries were certified. On the other hand, in the GAP scheme, which focuses on product safety, 28,719 farms and 1,679 hatcheries voluntarily joined (Pongthanapanich & Roth, 2006a, b). To increase the number of Thai code adopters, the benefits and costs of participation have to be clear. Resource-poor farmers are willing to miss possible additional income if they can avoid risk and uncertainty of outcome. The implementation of the Thai code must result in positive social and environmental impacts and synergies. Additionally, the constraints to implementation have to be understood and possibilities offered on how these constraints might be overcome, particularly among small-scale shrimp producers. Solutions could be planned, implemented, and enforced at the national and local levels.

b) Shrimp Seal of Quality, Bangladesh

In Bangladesh, the black tiger shrimp *Penaeus monodon* is cultured predominantly under extensive farming systems with low stocking densities, little or no external feed inputs, and tidal water exchange. Bangladesh has large areas of coastal tidal land, of which 143,000 h has been under brackish water shrimp aquaculture and more than 600,000 persons are directly or indirectly engaged in shrimp farming (Alam *et al.*, 2005). In the mid-1990s, the shrimp industry of Bangladesh faced serious difficulties; it was hit by viral shrimp diseases and a ban on frozen shrimp exports for their failure to comply with European Union quality regulations after an inspection team from the European Union condemned shrimp processing plants. Additionally, international buyers and consumers of shrimp were increasingly demanding that shrimp in Bangladesh be produced in compliance with recognized codes of conduct regarding human rights, fair labor practices, and environmental protection. To ensure the shrimp farming industry's survival and growth, the U.S. Agency for International Development provided $10 million in 2003 to the Government of Bangladesh agribusiness project to develop together a voluntary process certification with national and international stakeholders called the "Shrimp Seal of Quality" program (SSoQ) and establish and implement a domestic certification system. The SSoQ program attempted to create sustainable improvement in volume and value of Bangladesh shrimp exports. The program certifies that the operator has met the minimum requirements in food safety and quality assurance, traceability, environmental sustainability, labor practices, and social responsibility. The SSoQ approach, in the short and medium term, was to improve the quality of shrimp larvae to reduce the risk of losses from disease, introduce environmentally friendly farm management practices, and increase production and profit. Additionally, the SSoQ scheme introduced a program to certify shrimp producers, including hatcheries, farmers, transporters, and processors by creating a stable supply of quality shrimp from reliable suppliers for the export market (Kearney Gaillard *et al.*, 2006). The SSoQ program is now a legally registered symbol that certifies that the farmed shrimp was produced and processed in strict compliance with the SSoQ's standards and codes of conduct. The codes of conduct incorporated the standards of the ACC and the ACC conducted a series of workshops, roundtable discussions, and training programs and defined minimal, internationally acceptable operations and management practices pertaining to technical, environmental, and social standards. The SSoQ program now provides training, technical support, laboratory services, and market research and development. An outside third party certifier monitors the certification standards to ensure that there is no cheating or corruption of the program. The SSoQ program ensures that Bangladesh continues to sell its shrimp in international markets (Fleming, 2004). In view of these positive developments in voluntarily adopting codes of conduct and certification schemes, one important point remains to be considered. By using codes of conduct and certification schemes

developed by organizations supported by aquaculture businesses and scientists, there is the danger that the schemes protect industrial shrimp farming and neglects social aspects of resource-poor shrimp farmers and their communities.

By interviewing government officers, shrimp farmers, traders, processors, and workers for non-government organizations, Islam (2008) found that the majority of the stakeholders were skeptical of the role and operation of the SSoQ. The farmers were not familiar with what happens after their shrimp is harvested, including the process of certification, demands of the international market, and the idea of a third-party certifier sidelining the government. Most stakeholders had the opinion that the SSoQ program undermines the capacities and knowledge of the local communities to manage the environment, that the SSoQ program is an agent of the buyers, potentially exclude small-scale farmers and provide privileges to large scale shrimp farmers. The local community believes that the Department of Fisheries is capable of full certification, as required by the buyers. In this respect, a recent, interesting publication about shrimp farming in Bangladesh should be mentioned. Alam *et al.* (2005), from the Asian Institute of Technology and the Network of Aquaculture Centres in Asia Pacific (Bangkok, Thailand) conducted a study in Bangladesh to assess the status and understand the degree of awareness of the FAO Code of Conduct for Responsible Fisheries among different stakeholders and its application in the area of shrimp culture. They found that virtually no significant efforts had been made to comprehend and develop the provisions of the Code, although Bangladesh is a signatory to it. They recommend that general awareness of the existence and significance of the FAO Code of Conduct and its scope and purpose have to be increased among the persons and institutions involved in shrimp aquaculture. It would require training of personnel of the Department of Fisheries to use, conserve, and manage shrimp aquaculture. Likewise, the other stakeholders of the sector need to be made fully aware of the code and to be motivated towards voluntary compliance.

The small-scale shrimp farmer and the Codes of Conduct and Certification Schemes

While recognizing the value of "Codes of Conduct" and certification schemes in shrimp farming for increasing public and consumer confidence in shrimp production practices and products, some non-governmental certification schemes have resulted in higher costs for producers without delivering significant benefits to small-scale shrimp producers. Increasing international environmental and social awareness, coupled with the availability of certified products from well-organized, large scale, industrial shrimp producers may force lowering of prices of non-certified products. It will be more difficult for small-scale producers in developing countries to comply with Codes of Conduct and suffer a reduction of sales price. They usually lack the necessary awareness, organization, and reporting and marketing skills to participate in certification and labeling schemes. Additionally, if Codes of Conduct and certification schemes are over-prescribed, in the sense that they promote specific technical solutions rather than supporting a variety of solutions to achieve a specific outcome, then they will restrict innovation and discriminate unnecessarily against some producers. This is particularly the case for small-scale shrimp farmers where a particular Good Management Practice may have been handed down, based on a highly technological approach. Therefore, it is essential that Codes of Conduct and certification schemes be flexible and adaptable, while strongly promoting the sustainability of the operation (FAO, 2001).

Additionally, there is a need for more globally accepted certification guidelines for shrimp production that could provide more guidance and serve as a basis for improved harmonization and facilitate mutual recognition and equivalence of certification schemes. While certification of shrimp aquaculture products has potential to provide opportunities and incentives for responsible development of shrimp farming, there are a number of issues that need to be considered. Particularly in Asia, the large number of resource-poor shrimp farmers and fragmented market chains will make establishment and operation of shrimp certification programs challenging. The certification and adoption of better aquaculture practices could provide benefits for both producers and consumers, but can also be barriers to participation of small holders in market chains. Because globalization and market trends have significant impacts on the way aquaculture products are produced, small-scale shrimp farmers face various barriers to participation in modern market chains.

This includes the small volume from individual farms and large numbers of farmers with limited access to markets, and complex marketing channels make traceability difficult. Increasingly, integrated production-distribution structures, market risks, and more stringent market standards are all increasing vulnerability and pressure on small-scale shrimp famers; most international market trends in aquaculture are probably working against them. To overcome these barriers, small-scale shrimp farmers need much more focused technical and financial servicing. Support to establishing small-scale local farmer organizations, such as the Thai shrimp farmers associations and "aquaclubs," where shrimp farmers can work together to improve and adopt better aquaculture practices, can eventually be "cluster certified" and develop sufficient economies of scale and knowledge to participate in modern market chains. Additionally, organized shrimp farmers can speak with a stronger voice in negotiating prices for inputs, such as feed and seed and potentially have a better platform for more organized marketing and price negotiation when selling their product (Subasinghe & Phillips, 2007; Phillips *et al.*, 2008).

Since better management practices are the first step to increase productivity and profitability for small-scale farmers and, subsequently to certification, the Australian Centre for International Agricultural Research (ACIAR) funded a collaborative project in Indonesia between four small-scale farmer groups and Australian researchers. During the search for representative farmer groups, the team found localized geographical areas that carried higher risk of shrimp losses than other areas. Two factors appeared to be most important: high bio-security risk from wild shrimp and problematic soil types, particularly high sulfate and sandy soils (Callinan, 2008). This discovery illustrated one of the difficulties in forming "aqua-clubs" with small-scale shrimp farmers.

FAO (2007b) recommended special considerations for small-scale farmers in aquaculture schemes: "a) the certification standard must be practical and accessible for small-scale producers, b) special efforts need to be undertaken to ensure that small-scale producers play a key role in setting of standards, c) small-scale farmers have special needs for education, capacity building, and the transfer of technology and technical information, d) there is a need to develop a model and identify methods that facilitated the ability of small-scale producers to enter the certification scheme and become certified, e.g., a step-wise (i.e., phased) system might be more accessible to small-scale producers, and e) education, training and capacity building programs should be developed to help ensure that small-scale producers have the skill and expertise to apply best management practices up to the state of the art." Additionally, FAO recommended group certification as a means to foster and facilitate participation of small-scale producers, e.g., cooperatives, clusters, or unions of producers. Group members should agree to specific commitments in relation to compliance: a) shared obligations and benefits, b) use similar aquaculture systems, c) geographic proximity and/or used shared resources, such as water, d) certified entity as a group as a whole, e) internal cohesion/organization, so that sampling can be applied, f) organizational structure for the group, e.g., a board of directors, g) financial support structure for the group, e.g., member dues, h) transparency, accountability, and monitoring with group, i) capability to support a viable internal control system, e.g., a contract signed by each member, j) documented audits of all group member for compliance, carried out as a minimum annually by the internal control system, k) consequences for lack of compliance, at the group and individual level, reflecting the severity of the non-compliance, and if mitigation measures are not possible or appropriate, the entire group loses certification for serious non-compliance, and l) operational support for members, including training.

Attempts to compare and harmonize the different standards and certification schemes

The emergence of a wide range of codes of conduct and certification schemes for shrimp production, as well as different accreditation bodies was creating confusion amongst producers and consumers alike. The standards and certification schemes are not harmonized, which means that shrimp farmers and exporters in the developing world often must struggle to adapt to new and changing rules as they try to bring their farm-raised shrimp to different overseas markets. Recently the FAO and the World Wildlife Fund started meetings and dialogues with wide mul-

ti-stakeholder participation to harmonize the standards and certification schemes.

FAO

In September 2006 the FAO Sub-Committee on Aquaculture requested FAO to convene expert workshops and encouraged FAO to play a lead role in facilitating the development of guidelines which could be considered when national and regional aquaculture certification guidelines are developed. To improve harmonization of certification and facilitate mutual recognition and equivalence of aquaculture certification schemes in more globally accepted norms for aquaculture production, an expert workshop convened in March 2007 in Bangkok to start a process for developing guidelines on aquaculture certification (FAO *et al.*, 2007). The workshop was attended by 70 participants representing government authorities, farming and industry associations, NGOs, and the private sector. The objective of the workshop was to define general guidelines around which aquaculture certification schemes can be built, whether they be for systems, practices, or products. FAO compiled the results of the workshop and published a preliminary draft for comments and discussion during an expert workshop held from 31 July to 3 August 2007 in Fortaleza, Brazil (FAO, 2007a). In February 2008 FAO held an additional expert meeting in London as a follow-up to gather views and opinions of European stakeholders from across the seafood supply chain that were involved in aquaculture certification to explore opportunities for building partnerships to support the implementation of aquaculture certification in producing countries, with particular reference to the small-scale aquaculture sector and to continue the process of preparation of the international guidelines for certification of aquaculture products. Expert workshops followed in May in Beijing (China) and Silver Springs (Washington, USA). The draft revised during the workshops of the Guidelines for Aquaculture Certification and subsequently submitted by FAO to its member governments for evaluation and approval in a meeting of the FAO Aquaculture Subcommittee in October 2008 in Chile (FAO, 2007b, 2008). The guidelines should be applicable to aquaculture certification schemes that seek to address: a) social issues, b) environmental impacts, c) food safety, d) animal health and welfare, and e) economic and financial issues. During the workshops, it was stressed that certification schemes should be in compliance with laws and regulations and should ensure that the interests of aquaculture producers, especially of small-scale producers are taken into account. Certification should ensure stakeholder involvement and community issues to minimize conflicts with local communities, including issues of land tenure, access to traditional fishing grounds, land and water use, and sitting and resource use, rights, and needs. Certification should take into account labor issues and work conditions and should ensure that aquaculture addresses the following minimum substantive criteria regarding environmental impacts: a) environmental assessment and monitoring, b) sources and types of environmental impacts, and c) special and cumulative impacts. Certification schemes should ensure that aquaculture addresses the following criteria regarding food safety: a) feed and feed additives, b) residues, and c) traceability. Certification schemes should ensure that aquaculture addresses the following criteria: a) health and welfare maintenance and bio-security and introduction of disease and transfer. Economic and financial issues should be taken into account at all stages of aquaculture to optimize economic benefits and avoid or minimize any negative economic or financial consequences. Corsin *et al.* (2007) assessed qualitatively ten out of more than 30 certification schemes applicable to aquaculture in the Asia-Pacific region. Among these ten were the above described schemes from the Global Aquaculture Alliance (GAA)/Aquaculture Certification Council (ACC), GlobalGAP, Naturland and Thai CoC. The descriptive analysis used a framework of 85 descriptors which included issues like the Code of Good Practice for setting social and environmental standards, developed by the International Social and Environmental Accreditation and Labelling Alliance (ISEAL), addressed the ISO Guides for Standardization and conformity assessment, the Article 9 on aquaculture development of the Code of Conduct for Responsible Fisheries (FAO, 1995), and the Principles for Responsible Shrimp Farming, developed by FAO 3 (2006). The methodology used for the qualitative assessment used a combination of descriptive methods coupled to a simple weighting method to indicate the degree of impact. Each descriptor was further examined for its impact on different stakeholder groups in terms of costs benefits. The stakeholders that were grouped together in the analysis included: certified farmers; workers in certified

farms; neighboring farmers; other resource users; traders; processors; retailers; consumers; governments; the environment and animal welfare. The evaluation of costs and benefits based on the descriptors revealed that certification schemes tended to provide more benefits to consumers and governments, followed by the environment and neighboring certified farms, which benefited from the improved management in the certified farms. Certified farmers and their workers had negative values, mainly a reflection that compliance to standards generally represents a cost for certified businesses and, in consequence, for their employees. The highest value for certified producers was achieved by the Thai CoC, while the lowest value was obtained by GlobalGAP, which on the other hand had the highest consumer value, as a reflection of the number of issues covered by the scheme. When the costs and benefits were expressed as a proportion of the number of descriptors applicable for each scheme, a slightly different picture was observed; the Thai CoC was still the programme that most benefited producers. It was closely followed by most other schemes.

World Wildlife Fund

The World Wildlife Fund (WWF) has a history of developing certification standards. It helped develop and spin off the Forest Stewardship Council standards, and worked with Unilever in the United Kingdom to develop the Marine Stewardship Council and then spun it off as a separated entity. World Wildlife Fund's (WWF) interest in aquaculture began in 1994 with a study comparing the impacts of shrimp aquaculture and shrimp trawling to determine which system of producing shrimp was better. At that time WWF decided to focus its attention on identifying and dissemination on more sustainable shrimp aquaculture practices (WWF, 2007a). To identify and analyze the impacts of shrimp farming and Better Management Practices (BMPs) and to reduce them WWF joined the Consortium on Shrimp Farming and the Environment. Research by the Consortium indicated that shrimp aquaculture had only 8-10 major impacts that accounted for 80-90 percent of all problems and that any individual operation probably had only five or fewer activities that were responsible for the bulk of its impacts. BMPs can effectively address these impacts and a BMP-based certification program will effectively minimize the environmental impacts of shrimp farming (WWF, 2007b). WWF has identified four main areas of concern which must be addressed by any certification program aiming to influence the long-term sustainability of the shrimp farming industry. These areas are: a): Environmental issues (farm design, feed management, water use and pollution, energy consumption, ecosystem and biodiversity, shrimp escapes), b) socioeconomic issues (labor, community impact and livelihoods), c) animal welfare and health (broodstock, disease, prevention and medication), and d) standard development and verification procedures (development, governance and criteria, conformity assessment and verification, standard subject and chain of custody). In a benchmarking study WWF evaluated eight shrimp certification programs. This study revealed most of the analyzed standards have significant shortcomings and lack an effective and credible regulatory framework, and only organic shrimp certification programs performed well. However, none of the standards analyzed was in full compliance with the criteria stated and defined, showing that there is a lot of room for improvement and further adaptation of regulatory frameworks of shrimp certification programs (WWF, 2007a). At the moment WWF is creating on the basis of the International Principles for Shrimp Responsible Shrimp Farming (FAO *et al.* 2006) its own framework for developing criteria, indicators and standards for shrimp farming. The criteria will aim to provide direction on how to reduce each impact and the indicators will address how to measure the extent of each impact. Standards will be quantitative performance levels that evaluate whether a principle is achieved. The global principles, criteria and indicators will be the same for every country, but the performance levels may differ among different countries and regions, among shrimp species having different requirements, and production systems with different performance levels (Rosenberry, 2007). WWF is working together with shrimp farmers in Madagascar and Belize to adapt shrimp standards and to create standards for certifying shrimp aquaculture products, and WWF will meet with shrimp farmers in Vietnam to receive input on the development of global aquaculture standards and how small-scale shrimp farmers can be brought up to the International Principles for Shrimp Responsible Shrimp Farming. Additionally through Shrimp Aquaculture Dialogues, where multi-stakeholders (shrimp producers, NGOs, academics, government officials, retailers) identify and agree on 6-8 key impacts of

shrimp farming and from this baseline data for the key impacts are developed to use as benchmarks and measurable performance-based standards for certifying farmed shrimp products will be established. Dialogue participants are creating standards for shrimp farms in East Africa, Central America/Mexico and Asia. The first Dialogue meeting was held 2007 in Madagascar, and another meeting followed 2008 in Belize. By working in Asia, the Dialogue will ensure that the standards will address the needs of small-scale producers (WWF, 2007c). WWF will hand off the developed standards for shrimp farming to an independent standards-holding body , the compliance of the standards will be audited by a third party accredited entity, and auditing and certification of a single farm or production unit will be performed (Villalon, 2008).

To influence the long-term sustainability of the shrimp farming industry WWF has identified main areas of concern which must be addressed by any certification program. These areas are: a) environmental issues (farm design, feed management, water use and pollution, energy consumption, ecosystem and biodiversity, shrimp escapes), b) socioeconomic issues (labor, community impact and livelihoods), c) animal welfare and health (broodstock, disease, prevention and medication), and d) standard development and verification procedures (development, governance and criteria, conformity assessment and verification, standard subject and chain of custody), e) food safety, and f) economic/financial issues. All these factors influence the sustainability of a given aquaculture system.

Independent Organizations

To facilitate the institutional design of a sustainable aquaculture ecolabel and to judge the credibility and effectiveness of existing or planed aquaculture labels, the Environmental Law Institute (ELI) and The Ocean Foundation (TOF) developed a Gold Standard for sustainable aquaculture ecolabeling (Environmental Law Institute/ The Ocean Foundation, 2008a, b). The Gold Standard provides an institutional design framework that is a necessary first step to the development of an ecolabel that certifies only facilities that achieve environmental, social, and economic sustainability. According ELI/TOF none of the existing initiatives explicitly base their certification requirements on sustainability of production, instead choosing to focus on reducing the harm caused by existing production systems. The success of ecolabels is determined by the degree to which they catalyze environmental and social improvement and convert sustainable production into standard practice. Environmental and socioeconomic improvement is a function of the number of producers who adopt the ecolabel's standards, which is in turn affected by consumer demand for certified products. Thus, the fundamental task of the ecolabel is to connect certified producers with institutional and individual consumers who buy their goods. The effectiveness of this process largely depends on the credibility of the label's institutional structures and substantive standards and the pragmatic benefits of ecolabeling for producers (Environmental Law Institute/ The Ocean Foundation, 2008a, b).

ASEAN Shrimp Alliance

The ASEAN shrimp Alliance (ASA) is working to establish a regional certification body to verify the production standards of shrimp raised in member countries for export. It aims at lessening pressure from shrimp importing countries, which have set different restrictive standards against imported shrimp. While the standards, considered by some as safeguard measures, share some similarities, they eventually add to shrimp farmer´s costs. Some countries have imposed restrictive import standards not only to protect local consumers but also for commercial purposes. Tighter rules could end up pushing the prices of imported products. The organization aims to help improve shrimp farming among member countries and overcome export obstacles (InfoFish International, 2009).

DISCUSSION

Certification schemes are best conducted by a recognized and independent third-party organization having a written or equivalent assurance that the product, process, or service conforms to specified requirements. Certification may include a range of inspection activities which could include continuous inspection in the production chain. Typical examples of conformity assessment activities are: sampling, testing and inspection, evaluation, verification and assurance of conformity (suppliers' declaration, certification); registration, accreditation, and approval in any combination. However, probably the most difficulty in the future will be to avoid the confusion of the consumers being offered a great number of certified far-

med shrimp with no clear information about what make them specifically different from each other.

As guidelines for responsible aquaculture development are becoming commonplace, Ackefors and White (2002) presented a framework for developing best environmental practices concerning the environment, aquatic ecosystem, water management, physical and chemical factors, biotic factors, regulation, monitoring, feed and feeding, feed quality, feed management, reduction in organic wastes, pathogens, product quality, and consumer safety, and trends in consumer preferences. In their recommendations they concluded that a Code of Conduct must be designed around the interests of the farm animals themselves (their life histories, physiology, and behavior, together with culture technology and pre- and post-harvest handling), the environment of the farm site, as well as the interests of local people, considering positive and negative impacts on their social and economic environment.

Today the various standards for shrimp farming and certification schemes include systems that are organized and driven in different ways, including national and international levels, private and public sectors, second and third party certification, and organic and non-organic practices. Some concentrate on environmental issues and sustainability and touch on community and employee relations, others seek accreditation or try to establish recommendations to develop their codes of practice or improve shrimp farming practices. All of this is leading to proliferation of certification standards and systems (Phillips *et al.*, 2005). Ironically, when the various codes, declarations, and guidelines are examined they are more alike in their language and professed goals than they differ. "Words are nice, but effective government-mediated and enforced action that implement the principles of sustainability of shrimp farming is much better" (Barnhizer, 2002). Or as Greenpeace (1999) commented "With regard to laws that are said to be on the books in most countries where shrimp farming has become a problem, experiences have shown that what regulations there may be to enforce on shrimp farm operations will simply not be enforced in the main. There are many reasons why, from lack of resources, difficulties in implementation, to corruption, among others". The creation of an effective legal and regulatory system, and improving monitoring and enforcement and the willingness to impose legitimate sanctions are critical parts of efforts to enhance the sustainability of shrimp aquaculture. A combination of political pressure in the producing countries through economic leverage wielded in the consuming countries could bring a change. Regulations may be put in place, implemented and enforced, but as long as the consumers in rich countries demand cheap shrimp or refuse to pay more for responsibly-produced shrimp, the pressure on tropical coasts and wetlands and the people dependent on their continued quality will remain high. One recourse is to call upon the conscience of the consumers. A stronger option is to ask the buyers not to buy under-priced farmed shrimp as long as the social and environmental costs are not considered (Barnhizer & de la Torre, 2003).

Government departments reacted against this call for shrimp boycott by strengthening educational efforts at the farmer level and stringent quality controls at processing plants. The efforts by Thailand´s Department of Fisheries were described above; the Agriculture, Fisheries and Conservation Department, Hong Kong, published series of Good Aquaculture Practices that registered shrimp farmers need to comply to be certified, and recently the government of Sonora, the most important shrimp farming state in Mexico, requires that shrimp farmers have to take courses in Appropriate Aquaculture Production Practices (BAPP) to be certified and by this to promote sustainable shrimp production methods and for the farmer to obtain a higher market price for their shrimp. Regional, national and international private and non government organizations increased their efforts to develop their own codes of practice and certification schemes for shrimp farming with the aim to make it clear that the certified shrimp not only complies with food quality and safety standards, but also that it is produced on the farm by minimizing detrimental environmental and social impacts, and ensuring a responsible approach to worker health and safety as well as animal welfare win the confidence of the consumer the certification body. The steady increase in the sales of certified shrimp shows that the efforts to develop for farmed shrimp codes of practice and certification schemes were successful.

In areas such as food safety, animal health and environmental sustainability, government authorities have enacted laws and regulations

and developed inspection and certification programs to enforce their application. To guarantee to the consumer a safer product and to reduce for the shrimp producer the costs for inspection the U.S. Food and Drug Administration (FDA) with colleagues in the EU and Australia have started a pilot project to develop common standards and certification, and shared inspections. Additionally FDA initiated on pilot-scale a third-party food safety certification programme for the shrimp industry, and is drafting guidelines for third-party certification schemes to ensure certified products meet FDA requirements. To participate in the programme one or more third-party certification agencies would be chosen (Anon., 2008).

Reacting on long-time complaints from non-government organizations about the illegal construction of shrimp ponds in mangrove areas, especially in Ecuador, in October 2008 the president ordered that all shrimp farms located in bays and beaches have to undergo a census, have to pay taxes and reforest mangrove areas. About 40% of the land occupied by shrimp farms in Ecuador are illegal, since they have no official permission to use the land, are located at beaches and bays and have been accustomed to live in freedom from punishment (Anon. 2008a). Yes, even organic shrimp certifiers were blamed to have certified illegal farms constructed in mangrove areas (C-Condem, 2007). The step of the Ecuadorian government is important to enforce that all (also the wealthy shrimp pond owners) have to respect the law, since the anarchy hurts everybody. To facilitate the institutional design for sustainable shrimp farming and to judge the credibility and effectiveness of existing or planed certification schemes is the first step that only facilities can be certified complying with national/international laws, and that achieve environmental, social, and economic sustainability.

As Ababouch (2008) reports that several recent developments are likely to lead to an expanded use of certification in shrimp farming. These include a) the increasing influence and concerns of civil society related to health, social and environmental issues, b) legal requirements on companies to demonstrate "due diligence in the prevention of food safety risks" c) growing attention to "corporate social responsibility"' and a drive by companies to minimize "reputational risks" d) globalization of supply chains and a trend towards vertical integration through the use of direct contracts between suppliers and retailers, and e) expansion of supermarkets in food retailing both nationally and internationally. The ongoing work in FAO and WTO, organizations that provide an international framework to ensure transparency, will continue to promote the development of science-based standards, harmonization and equivalence, in coherence with WTO trade measures and the standards if international standards setting bodies such as the Codex Alimentarius and the World Animal Health Organization. This may lead to an environment in which private standards and certification schemes complement and add value to the work of governments rather than duplicating it. If supported with appropriate technical assistance, such developments are likely to have positive economic implications, especially for small-scale aquaculture producers in developing countries (Ababouch, 2008). Memoranda of understanding, mutual recognition and equivalence agreements, and unilateral recognition may be developed for recognition of equivalence of aquaculture certification schemes, all of which need to include appropriate controls and verification of the certification systems involved. Tools and technical assistance may be required to ensure fairness, transparency and uniformity in developing equivalence agreements and monitoring that facilitates the development and implementation of aquaculture certification schemes consistent with the accreditation and standards development procedures provided in the FAO Technical Guidelines on Aquaculture Certification, and FAO will facilitate and monitor implementation of them (FAO, 2008).

In view of these positive developments in voluntarily or prescribed by governments adopting codes of conduct and certification schemes, one important point remains to be considered. By using codes of conduct and certification schemes developed by organizations supported by aquaculture businesses and scientists, there is the danger that the schemes protect industrial shrimp farming and neglects social aspects of resource-poor shrimp farmers and their communities. Standards and certification schemes should not only focus on the benefits and requirements of the consumer, but also especially the small-scale the producers, and their farm management practices.

Increasing consumer awareness in developed country markets and new developed/developing countries and the willingness to pay more for certified products led to a proliferation of shrimp farming standards and certification at the national, regional and international level. The lack of equivalence arrangements in certification standards poses the risk that a certification scheme looses credibility by bad schemes or schemes that do not to live up to expectations. There is an urgent need for more globally accepted standards and certification guidelines, especially for small-scale producers, to provide guidance, serve as a basis for improved harmonization, and facilitate mutual recognition and equivalence of certification schemes. Additionally, the increasing number and different approaches for shrimp certification makes it difficult for producers and consumers to choose the right scheme. To solve these problems, the efforts of the FAO and the World Wildlife Fund are the most important for harmonizing the different standards and certification schemes for the benefit of producers and consumers.

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