Fish and fish products are among the most traded food commodities: close to 40 percent by volume ends up in international markets. Yet around three-quarters of fish exports finish up in just three markets: the European Union, Japan and the United States of America. China is an increasingly important player both as an exporter and an importer. Consumers expect that the fish they have access to will be safe and of acceptable quality, regardless of where they are produced or ultimately consumed. This has given rise to issues regarding fish quality and safety, international trade, risk analysis and harmonization of standards. These and other issues are addressed in this document, which represents the proceedings of the Sixth World Congress on Seafood Safety, Quality and Trade held in Sydney, Australia from 14 to 16 September 2005. The Congress was held under the auspices of the International Association of Fish Inspectors, in collaboration with FAO and the United Nations Industrial Development Organization.
Cover photographs: FAO Mediabase

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Sixth World Congress on Seafood Safety, Quality and Trade

14–16 September 2005
Sydney, Australia

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Preparation of this document

This document represents the proceedings of the Sixth World Congress on Seafood Safety, Quality and Trade, held in Sydney, Australia, from 14 to 16 September 2005. The Congress was the sixth in the now biennial series of conferences held under the auspices of the International Association of Fish Inspectors (IAFI), with support from the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO). This sixth Congress was hosted by Seafood Services Australia (SSA) and the New Zealand Seafood Industry Council (SeaFIC).

These proceedings include selected papers presented at the Congress and draw out some of the overall themes emerging from the discussion. Only those papers submitted by the authors are included and, in some cases, the order has been changed from the Congress programme to reflect the subject matter. Some topical and commercial presentations have been left out. The document was edited by consultant Sally Washington and technically reviewed by David James and Lahsen Ababouch of the FAO Fisheries and Aquaculture Department.
Abstract

Fish and fish products are among the most traded food commodities: close to 40 percent by volume ends up in international markets. About half of those exports by value originate in developing countries. Yet around three-quarters of fish exports finish up in just three markets; the European Union, Japan and the United States of America. China is an increasingly important player both as an exporter and an importer.

Consumers expect that the fish they have access to will be safe and of acceptable quality, regardless of where it is produced or ultimately consumed. Measures to encourage the harmonization of safety and quality standards and to facilitate international trade are part of the regulatory framework generated by the World Trade Organization (WTO). The Codex Alimentarius Commission also plays an important role in setting international standards for food safety. Despite international agreements, fish exporters still face safety and quality regimes that vary from one jurisdiction to another. The current multitude of approaches imposes significant costs on exporters, especially those from developing countries where there is limited capacity to develop comprehensive safety and control infrastructures.

Progress on harmonization has been slow. While there are steady gains in the implementation of Hazard Analysis and Critical Control Point (HACCP) systems, there is still too much reliance worldwide on testing end products. More emphasis needs to be put on developing risk analysis approaches to food safety and encouraging good practices across the food chain. Safety and quality standards, codes of practice, and risk-management strategies need to be based on robust scientific data. This requires investment in research into the epidemiology and prevention of food-borne hazards, including those associated with new products entering international markets.

New players and new relationships are also influencing international trade in fish products. As trade liberalization dismantles tariffs and governments streamline regulation, private sector stakeholders are entering the arena with new health and safety standards, typically linked to their marketing, quality management or corporate social responsibility programmes. These impact on exporters and may impose new compliance costs and influence trade patterns. On the other hand, new forms of collaboration between industry and government regulatory agencies, and in some cases even community groups, are driving innovations and new partnerships in managing fish quality and safety.

These and other issues are addressed in this document, which represents the proceedings of the Sixth World Congress on Seafood Safety, Quality and Trade held in Sydney, Australia from 14 to 16 September 2005. The Congress was held under the auspices of the International Association of Fish Inspectors (IAFI), in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO).

Sixth World Congress on Seafood Safety, Quality and Trade. Sydney, Australia, 14–16 September 2005.
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The Sixth World Congress on Seafood Safety, Quality and Trade was held under the auspices of the International Association of Fish Inspectors (IAFI), with support from the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO). This sixth congress was hosted by Seafood Services Australia (SSA), and the New Zealand Seafood Industry Council (SeaFIC). The congress convener was Jayne Gallagher from SSA, who is also the President of IAFI.

Key sponsors of the Congress were: the Department of Agriculture, Fisheries and Forestry, Australia; the New Zealand Food Safety Authority; Sud-Chemie; the Canadian Food Inspection Agency; Workplace Learning Initiatives; the National Food Industry Strategy; the Australian Maritime College; Food Standards Australia New Zealand; JAS-ANZ; Australian Food Safety Centre of Excellence; Standards Australia; and Safe Food Queensland.

Thanks are extended to all those who made presentations, chaired sessions and moderated workshops.
Executive summary

INTRODUCTION
This document represents the proceedings of the Sixth World Congress on Seafood Safety, Quality and Trade, held in Sydney, Australia, from 14 to 16 September 2005. The Congress was the sixth in the now biennial series of conferences held under the auspices of the International Association of Fish Inspectors (IAFI), with support from the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Industrial Development Organization (UNIDO).

The proceedings include an overview of the Congress and selected papers presented there.

A BRIEF HISTORY OF CONGRESSES ON SEAFOOD SAFETY AND QUALITY
The first International Conference on Fish Inspection and Quality Control was held in Halifax, Canada in 1969 on the initiative of the Food and Agriculture Organization of the United Nations (FAO). The second was held some 27 years later in Washington DC, in the United States of America. It was decided that more frequent meetings would be useful to enable fish regulators to share experiences and best practices. During the third conference, in Halifax, Canada in 1999, the International Association of Fish Inspectors (IAFI) was formally constituted. IAFI now has a mandate to organize, in collaboration with FAO and UNIDO, biennial meetings on fish safety and quality.

The fourth IAFI Congress was held in Vancouver, Canada in 2001, and the fifth was held in The Hague, the Netherlands in 2003. Reflecting the evolution of IAFI to involve not only government regulators but also other stakeholders in fish safety and quality, this sixth Congress was for the first time organized by industry associations: Seafood Services Australia (SSA) and the New Zealand Seafood Industry Council (SeaFIC).

The shared objective of FAO, IAFI and UNIDO is to encourage production of “fish, seafood and associated products that are safe, of acceptable quality, and readily available for sale in the world’s marketplaces”. Their seafood safety and quality congresses bring together: fish inspectors; government officials involved in fisheries, trade, and food safety; representatives from the fish and seafood harvesting, processing and marketing industries; researchers and academics; and interested international organizations. They provide a forum for the exchange of information and experience on fish inspection, quality management, technological developments, regulatory regimes, and industry infrastructures, with the overall aim of facilitating international trade in safe and high quality fish and seafood.

FAO contributes to the development of IAFI Congress programmes and the selection of speakers and, along with UNIDO, facilitates and financially supports the involvement of participants and experts from developing countries. FAO also assumes the main responsibility for Congress proceedings.

Interest in the congresses continues to grow — 327 delegates from 50 countries attended the sixth Congress compared with 165 at the previous event.

The full Congress programme is presented in this document.
OVERVIEW OF THE CONGRESS

International trade in fish: a snapshot
Fish and fish products are among the most traded food commodities. Close to 40 percent by volume of fish production ultimately ends up in international markets. Around three-quarters of fish exports finish up in just three of those markets: the European Union, the United States of America and Japan. Those markets therefore dominate international fish trade in terms of prices and market access requirements.

About half of total fisheries exports by value stem from developing countries; in those countries fish now accounts for a larger share of net foreign exchange earnings than traditional food commodities such as rice, coffee, meat, bananas and tea, even when combined.

International fish trade is being influenced by other developments. China is becoming an increasingly important player in international markets, both as an importer and an exporter. Aquaculture production continues to grow, helping to meet increasing global demand for fish and offering a partial response to pressure on capture stocks. New fish products are also appearing in international markets as the industry develops new value-added and processed forms of fish in response to changing lifestyles and increased demand for more convenience products.

International agreements
The World Trade Organization (WTO) has generated a regulatory framework to facilitate this international trade. The basic underlying assumption is that WTO members treat imported products no less favourably than their own products. Part of this equation is encouraging harmonization of safety and quality standards. The Sanitary and Phytosanitary (SPS) Agreement and the Technical Barriers to Trade (TBT) Agreement of the WTO are particularly relevant to trade in seafood products. The work of the Codex Alimentarius Commission is also important in setting international standards and norms for food safety. Consumers expect that the fish they have access to will be safe and of acceptable quality, regardless of where it comes from.

Poor progress towards harmonization
Despite these agreements fish exporters still face safety and quality control regimes that vary from one jurisdiction to the next. This multitude of approaches imposes significant costs on exporters, particularly those in developing countries where there is limited capacity to develop comprehensive safety and control infrastructures, let alone several different systems to meet diverse import market requirements.

Although some progress has been made in terms of harmonization, it has been slow. This Congress concluded that the main fish importers have failed to put in place processes for harmonization. There were even some suggestions that harmonization might not be achievable and that equivalence, or better still mutual recognition of equivalence, was a more realistic goal, at least in the interim. One presentation argued that Free Trade Agreements (FTAs), rather than being a distraction from international harmonization, might actually speed up the pace of integration between key markets and even help to set benchmarks for agreements elsewhere, including in the WTO.

Focus on outcomes
Equivalence means recognizing an equivalent outcome from different practices or regulatory systems. This ‘outcomes-based’ approach to achieving safety and quality was considered from both international and national perspectives. Congress participants heard several calls for a move towards more ‘bottom-up’ outcomes-based regulatory frameworks as opposed to ‘top-down’ prescriptive rules. It was argued that food regulations should reflect minimum safety standards but they should not be
Executive summary

overly prescriptive which might stifle innovation. This in turn is consistent with a ‘risk-analysis’ approach to food safety – emphasizing good practices across the food chain and relying less on testing end products.

The Congress heard that despite progress on the implementation of Hazard Analysis and Critical Control Point (HAACP) systems there is still too much emphasis worldwide on end-product sampling. Some reasons for this were identified. In some areas there was a lack of scientific data to support risk assessments. In others, science has advanced to the point that food-borne hazards are identified but their actual risk to human health has not been established. Sometimes these potential risks are communicated to the public, leading to more pressure for unrealistic ‘zero-tolerance’ policies and detracting resources from more preventative whole-of-food chain approaches to safety. In other countries, particularly developing countries, there is inadequate infrastructure, including skilled staff, to manage a risk-based system. While the underlying issues might be the same, the solutions vary: from training and building capacity in developing exporting countries to more effective public communication in developed importing countries.

New players, new relationships
Other developments are influencing the health and safety debate and consequently international trade in fish products. As tariffs and quotas are progressively dismantled, consumer protection and food safety have become the most important market access requirements. On average, tariffs applied to fish and seafood now sit at around 4.5 percent.

As governments, either individually or collectively in international fora, attempt to streamline regulation, private sector stakeholders are developing their own health and safety standards. In OECD (Organisation for Economic Co-operation and Development) countries, 70 percent of fish is now sold in supermarkets. Large international supermarket chains therefore have significant market clout. Some of them are introducing or signing up to prescriptive requirements as part of their marketing or quality management programmes, typically related to quality, packaging, labelling and environmental issues, which will impact on exporters and may impose new compliance costs. How this will affect trade patterns, particularly the access of developing countries to international markets, needs to be monitored.

The Congress also heard about new forms of collaboration between industry and government regulatory agencies, and in some cases even community groups, in developing and managing fish quality and safety systems. This ranged from a health campaign to promote the benefits of fish (Australia) to the use of observers collecting information on sanitary processes on fishing vessels at sea (Canada) to community groups monitoring producer compliance with fisheries management requirements (East African countries). It was agreed that a collaborative approach to developing safety and quality standards, between regulators, industry and even the community, was the best way to ensure ‘ownership’ of those standards and to achieve the overall desired outcomes.

The importance of research and science
Safety standards and risk-management strategies need to be based on robust scientific analysis. Investment in research into food-borne hazards, particularly new hazards associated with new products entering international markets, is crucial. The results of that research must be shared among the international community – not just the scientific community but among government regulators, industry and consumers. The Congress concluded that FAO, IAFI and UNIDO, through these seafood safety congresses, should continue to provide a unique forum for the international dissemination of information related to seafood research.
These, and other issues, are addressed in the papers appearing in following sections. The papers represent a selection of the presentations made at the Congress. They are briefly summarized below.

SUMMARIES OF CONGRESS PAPERS

Section 1 - World trade in seafood: key trends and issues
- Grimur Valdimarsson outlines the key trends in world trade in seafood and the challenges these pose for the seafood industry. He revisits some of the issues raised at the last IAFI congress.
- Alastair Macfarlane examines how the rules that underpin the conduct of international trade in seafood are interpreted in practice, and argues that certain practices, often masquerading as rules, could be undermining the spirit of free trade.
- Mahfuzzuddin Ahmed provides a prospective analysis of future supply and demand for fish and analyzes critical market access and trade liberalization issues. He focuses on the particular constraints faced by developing countries.
- Nicolas Brown considers the proliferation of Free Trade Agreements and their implications for the seafood industry both in Australia and globally.
- Steve McCutcheon describes the work of the Codex Alimentarius Commission (CAC) in relation to seafood and its importance for ensuring fair practices in food trade.

Section 2 - Major importers: requirements and opportunities
- Richard Bates outlines the European Union (EU) regulatory system for fishery products.
- Kazuhiro Kondo describes Japanese importing requirements and opportunities.
- Susan Schenkeveld outlines the reform of the Canadian Import Inspection Agency (CFIA), in the process of developing an overall risk based border and import control system. The new system includes a vision for the future, a new policy framework and adjusted roles for regulators and the Canadian fish industry.
- Wang Hongbing, Zheng Yuhong and Li Qiang examine the management systems for ensuring the safety and quality of seafood imported to and exported from China.
- Lahsen Ababouch summarizes a FAO study on the causes of rejections and detentions in international fish trade by comparing fish safety and quality import regulations in the European Union, North America and Japan. He argues that the current multitude of approaches to border controls imposes significant costs on exporters, and calls for more harmonization and equivalence among fish trading partners.

Section 3 - Building capacity for safety and quality
- Ahmadou Ouauich reviews the challenges faced by the African food industry in attempting to meet international market requirements for food safety and quality. He outlines the capacity-building work of UNIDO in 25 African countries.
- Nancy Gitonga details the development of comprehensive fish quality and safety management regimes in the East African Community (EAC), in particular relating to Nile perch, and referring to the impetus provided by the EU bans on fish from that region in the 1990s.
- N. Anandavally describes the uptake of Hazard Analysis and Critical Control Point (HACCP) in developing seafood industries in Asia and the South Pacific.
- Lahsen Ababouch outlines the work of FAO in rebuilding capacity in the fishing industry in the countries affected by the tsunami that originated off the coast of Japan.
Executive summary

Sumatra in December 2004. The aim of the FAO post-tsunami assistance is to optimize sustainable outcomes by ‘building back better’ the livelihoods of the affected communities, and by restoring coastal ecosystems.

• Graham Peachey describes how Australia has adjusted its governance and organizational structures to adopt a whole-of-government approach to the regulation of food. He links this process to regulatory convergence in the global marketplace.

• Alfred Bungay describes how CFIA tested the efficacy of some innovative options for monitoring regulatory compliance of Canadian shrimp vessels fishing for long periods at sea.

• Johanna Oehling looks at capacity from the perspective of human resources. In the Canadian context she argues that a well-trained labour force is a key component for ensuring the overall competitiveness of the seafood industry.

Section 4 - New partnerships for achieving fish safety and quality

• Philippa Seagrave outlines the development of ISO 22000, a process that allowed a variety of stakeholders to participate in designing a food safety standard to ensure the control of potential hazards regardless of where products are produced or ultimately consumed.

• Paul McShane et al describe the Clean Green programme for Australian Rock Lobster as the “world’s first fully integrated product management system for commercial fisheries”. The programme is industry driven and includes an auditable system of standards, from the point of capture to the point of consumption.

• Samara Kitchener et al analyses a public health campaign to inform women about the risks and benefits of eating fish during pregnancy. The campaign was a response to negative messages about mercury in fish and involved participation from a range of stakeholders including a successful partnership with the seafood industry.

• Alan Fagerland introduces the Global Food Safety Initiative (GFSI), launched by a group of international retailers, to implement and maintain an industry-based scheme to recognize food safety management standards worldwide.

Section 5 - Research, science and risk-assessment

• Allan Bremner outlines the work of SEAFOODplus, an international seafood research project promoting the benefits of seafood consumption. The project is multifaceted including epidemiological studies and risk-benefit analyses of fish and seafood products.

• Marc Berntssen and Anne-Katrine Lundebye describe research on tailoring farmed Atlantic salmon to have low levels of dioxins while maintaining the health promoting nutrients.

• Iddya Karundasagar and John Sumner present the results of a FAO/World Health Organization sponsored risk assessment for *Vibrio cholerae* in export shrimp. They conclude that the risks to human health are generally minimal.

• Hector Lupin gives an overview of cost-benefit analysis as it can be applied to public health regulations to examine their impacts from both the perspective of industry and for society as a whole.
List of contributors

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               (She is the former Director of Fisheries)

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Iddya Karunasagar  Senior Fishery Officer (Quality and Safety), Fish Utilization and Marketing Service FAO Fisheries and Aquaculture Department, Rome
(At the time of the conference he was Professor of Microbiology at the College of Fisheries, University of Agricultural Sciences, Mangalore, India. His paper was co-written with John Summer)

Samara Kitchener  Executive Director, Consumer and Corporate Services New South Wales Food Authority, Australia
(Her paper was co-written with Adrian Bradley and George Davey)

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Philippa Seagrave  General Manager, Strategy and Planning Standards Australia, Australia

Grimur Valdimarsson  Director, Fish Products and Industry Division FAO Fisheries and Aquaculture Department, Rome
Programme

6th WORLD CONGRESS ON SEAFOOD SAFETY, QUALITY AND TRADE

14–16 SEPTEMBER 2005, STAR CITY, SYDNEY

Wednesday, 14 September 2005

8.30am Congress Opening Ceremony
Chair: Sirilak Suwanrangsi, President, IAFI (Thailand)
Speakers: Russell Reichelt (Australia); Dave Sharpe (New Zealand); Bob Pennington (Australia); Grimur Valdimarsson (FAO); Ahmidou Ouaouich (UNIDO); Australian Minister for Aquaculture, Fisheries and Forestry

9.15am “Consumers and commercial drivers shaping global seafood trade – threats and opportunities” – Patrick Wall, Professor of Food Safety, Centre for Food Safety, University College, Dublin and Board Member of the European Food Safety Authority (Ireland)

10.40am What does the future hold for world trade in seafood?
Chair: Ken Palmer, Chairman, MG Kailis (Australia)

10.45 am The buyers and the sellers of the future – challenges for the world’s seafood industry – Grimur Valdimarsson, FAO (Italy)

11.25am Fish to 2020 – the role of developing countries, Mahfuz Ahmed, WorldFish Centre (Malaysia)

12.05am International seafood trade – the rules and the rorts – Alastair McFarlane, New Zealand Seafood Industry Council (New Zealand)

1.25pm Capacity Building for the Modern Seafood Industry – Part 1
Chair: Ahmidou Ouaouich, UNIDO (Austria)

1.30pm Capacity building through regulatory support and cooperation – the past, the present and the future Spencer Garrett, NMFS (United States of America)

1.50pm The role of the Marine Stewardship Council in building capacity in the seafood industry – Duncan Leadbitter, Marine Stewardship Council (Australia)

2.10pm Rebuilding capacity after the tsunami – lessons learned – Lahsen Ababouch FAO (Italy)
2.30pm  Developing the food safety and quality management capacity of aquaculture and inland fisheries in East and South Africa – Gerard McCollum, Lake Harvest Aquaculture (Zimbabwe)

3.25pm  Capacity Building for the Modern Seafood Industry – Part 2

3.30pm  The role of 3rd party certification and testing bodies in building seafood industry capacity to meet international food safety regulations – Sergio Sachez, BSI Inspectorate America Corp (United States of America)

3.50pm  Internationally-agreed training competencies and modern training techniques – Barbara Johnson, SITO (New Zealand)

4.10pm  Clean Green – The Southern Rock Lobster Experience – Paul McShane, Australian Maritime College (Australia)

4.30pm  Establishing a regulatory framework and laboratory infrastructure to support the emerging seafood industries – Steve Roberts, Gillett Preston (Noumea)

Thursday, 15 September 2005

What in the World is going on! – Major Importing Country Trends and Opportunities  Chair: Jayne Gallagher (IAFI)

8.30am  EU – Paolo Caricato, SANCO

8.50am  USA – Phil Spiller, USFDA (United States of America)

9.10am  China - Wang Hongbing

9.20am  Japan – Kazuhiro Kondo

9.50am  Detentions and rejection in international fish trade – Lahsen Ababouch, FAO (Italy)

10.45am  Here’s how we do it – practical approaches to achieving food safety!  Chair: Chris Pyne, Parliamentary Secretarty for Health and Aging (Australia)

10.50am  Canadian Import Inspection Program – New Directions – Susan Schenkeveld, Fish Program Network Chief, CFIA (Canada)

11.10am  East Afric/Kenya – Nancy Gitonga, Director of Fisheries, Kenya

11.30am  Brazil/Uruguay – Gillherme Da Costa Jr. (Brazil) and Enrique Bertuello (Uruguay)

11.50am  New Zealand – Andrew McKenzie, New Zealand Food Safety Authority (New Zealand)

12.10pm  Australia – Integrating domestic and export standards – Ted Loveday, Managing Director, Seafood Services (Australia)
## Concurrent Sessions

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<tr>
<td>1.25pm</td>
<td><strong>International Standards and Harmonization – Myth or Reality</strong>&lt;br&gt;Chair: Cameron Prince (Canada)</td>
<td><strong>Emerging Food Safety Issues (Toxins, Contaminants, etc.)</strong>&lt;br&gt;Chair: Carlos dos Santos, IAFI (Brazil)</td>
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<tr>
<td>1.30pm</td>
<td><strong>Codex – what’s on the agenda?</strong>&lt;br&gt;Codex Australia</td>
<td><strong>Ciguatera – A risk manager’s nightmare</strong>&lt;br&gt;Barbara Wilson, CEO Safefood (Australia)</td>
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<td>1.50pm</td>
<td><strong>The International Accreditation Forum – its role in international harmonization</strong>&lt;br&gt;Tony Craven, Managing Director, JASANZ (Australia)</td>
<td><strong>Dioxins in farmed salmon</strong>&lt;br&gt;Marc Berntssen (Norway)</td>
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<td>2.10pm</td>
<td><strong>Global Food Safety Initiative</strong>&lt;br&gt;Alan Fagerland, Woolworths Ltd (Australia)&lt;br&gt;(on behalf of CIES France)</td>
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<td>2.30pm</td>
<td><strong>Harmonisation from a Certification Body Perspective</strong>&lt;br&gt;Peter Marshall, Director, IFQC Ltd (Ireland)</td>
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<td>3.25pm</td>
<td><strong>Around the World in 90mins – Industry driven initiatives and partnerships</strong>&lt;br&gt;Chair: Dave Rideout, IAFI</td>
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<td>3.30pm</td>
<td><strong>Development of the Irish Quality Seafood Program</strong>&lt;br&gt;Catherine Barratt, BIM (Ireland)</td>
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<td>3.50pm</td>
<td><strong>HR in Seafood Processing – the Canadian Experience</strong>&lt;br&gt;Johanna Oehling, President National Seafood Sector Council (Canada)</td>
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<td>4.10pm</td>
<td><strong>International collaboration in technology development and transfer – regional solutions</strong>&lt;br&gt;Steve Otwell, University of Florida (United States of America)</td>
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<td>4.30pm</td>
<td><strong>Uptake of HACCP in developing seafood industries in Asia and the South Pacific</strong>&lt;br&gt;N. Anandavally (India)</td>
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<td>6.00pm</td>
<td><strong>Australian Seafood on Display incorporating the IAFI Awards in the Exhibition &amp; Poster Areas</strong></td>
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### Friday, 16 September 2005

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<th>Time</th>
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<tr>
<td>7.00am</td>
<td><strong>The Great Breakfast Debate – Who has the Power? Regulators or Supermarkets?</strong>&lt;br&gt;<em>Sponsored by Department of Agriculture, Fisheries and Forestry</em></td>
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<td>8.50am</td>
<td><strong>Free Trade and Seafood – What’s the story</strong>&lt;br&gt;Chair: Joanna Hewitt, Secretary, Department of Agriculture, Fisheries and Forestry (Australia)</td>
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9.00am  Free trade agreements – implications for global seafood supply and demand – Mark Vaile, Minister for Trade (Australia)

9.45am  Globalisation, branding and reputation – what should we expect of food regulation?
Rob McLeod, Chairman Aotearoa Fisheries Management Ltd (New Zealand)

Innovations and new approaches to food safety management
Sponsored by Sud Chemie
Chair: Patrick Hone, Executive Director Fisheries Research and Development Corporation (Australia)

11.00am  Emerging research challenging traditional approaches to food safety management options – Chris Hudson, Chair Australian Food Safety Centre of Excellence (Australia)

11.20am  Carbon Monoxide – uses and abuses – Blane Olson, Managing Director, Clear Smoke Technologies (The Netherlands)

11.40am  Regulatory Options for Processing Vessel Inspection – Alf Bungay, National Manager, Inspections Systems and HACCP, Fish Seafood and Production Directorate (Canada)

12.00pm  Fish behaviour, aquaculture capture and harvest methods – impacts on food safety and quality management – Kjell Midling (Norway)

Concurrent Sessions

Food Security and Food Safety – two sides of the same coin?
Chair: Luisa Arthur (Mozambique)

Food Security and Food Safety – two sides of the same coin?
Chair: Luisa Arthur (Mozambique)

1.30pm  Global Governance, Quality Control of Shrimp and its impact on the shrimp export sector in Bangladesh – S.M. Nazmul Alam, Curtin University (Australia)

International Risk Assessments – the importance of relevant data – Tom Ross, Australian Food Safety Centre of Excellence (Australia)

1.50pm  Bioterrorism and seafood security – practical concerns and possible approaches – Doug Archer, University of Florida (United States of America)
A Through Chain Assessment of Prawns – Connor Thomas and Tom Madigan, SARDI (Australia)

2.10pm  Biotraceability (BIOETT) – Steve Wilson, Director Sud-chemie (Australia)

The FAO/WHO global risk assessment in seafood – I. Karunasagar (India)
2.30pm Bar Code of Life – Bob Ward, CSIRO (Australia)
Cost-benefit Analysis and risk management – Hector Lupin, FAO (Italy)

3.00pm Facilitating World Seafood Trade – The Report Card
Chair: John Emberley, IAFI (Canada)

3.30pm Summarizing the conference discussions and setting the agenda – Panel of three

4.00pm Discussion – International action plan – Alaistair McFarlane, Seafood Industry Council (New Zealand)

4.45pm Closing Ceremony

5.00pm Congress concludes
SECTION 1

World trade in seafood: key trends and issues
Challenges for the global seafood industry

Grimur Valdimarsson
Food and Agriculture Organization of the United Nations, Rome

ABSTRACT
Fisheries are one of the fastest growing food sectors in the world. This development has not occurred without problems: over-fishing, IUU fishing (illegal, unregulated and unreported), overcapacity, discards and coastal degradation are widely reported in the world’s media. A recent FAO study on the effect of fish trade on food security in developing countries concluded that fish exports generally had a positive effect in terms of food security and in generating income, employment and foreign exchange. However, the study also pointed out that to increase or maintain fish trade, effective management is required to ensure the sustainability of the resource.

The growing strength of large retailers is also affecting the fisheries sector. In Organisation for Economic Co-operation and Development (OECD) countries large supermarkets now account for 70 percent of food sales. Supermarkets are fast gaining market share in developing countries. The rise of the corporate social responsibility movement makes it very important for large food retailers to maintain a good reputation. They have to meet consumers’ expectations with regard to a number of issues besides food safety and quality, such as environmental impacts and animal welfare, which where previously seen as the responsibility of public and international authorities. There is now a push for private food safety standards that are more demanding than current national standards.

There is a need to promote a wider understanding of the new risk approach to food safety. This is particularly important when communicating food safety risks to the public. Balanced information about the positive and negative aspects of fish consumption, emphasizing a science-based approach, must be readily available.

The Codex Alimentarius Commission (CAC) has been actively strengthening its work based on the Strategic Framework 2003-2007. The framework has identified six major objectives that serve to strengthen the scientific basis of Codex decision making, to improve capacity building and to enhance its ability to deal effectively with new issues. It specifically mentions promoting the collection of data from developing countries.

This paper provides an overview of the current challenges facing the seafood industry worldwide. It calls for a greater emphasis on risk-analysis to ensure the health and safety of products, and for greater harmonization of the rules underpinning global trade in fish and fish products.

INTRODUCTION
Global fishery production amounted to a total of 132 million metric tonnes in 2003. The most significant increase in fishery production in recent years has been through increasing aquaculture production, which reached almost 41 million tonnes in 2003 (FAO 2004). Fishery products are the most internationally traded food in the world.
More than half of the world’s fish imports by weight (and 77 percent of the total world imports by value) are concentrated in three areas: the European Union (EU), Japan and United States of America. Those areas dominate world markets both in terms of prices and quality requirements. Yet over half of international fish trade now originates in developing countries, generating for them a net fishery trade surplus of almost US$18 billion annually. For many of these countries fish exports are a major source of foreign currency. For developing countries to have been able to comply with the complicated requirements of the most demanding importing countries is indeed impressive. It has taken a clear and sustained focus as well as investment and training.

Fish enjoys a good reputation as a nutritious and healthy food. However, there are growing concerns about environmental contaminants in fish as well as about the poor management of fisheries in many parts of the world. The fifth IAFI Congress in 2003 identified a number of issues regarding safety and quality that needed to be addressed. These included more harmonization of sanitary requirements and a more holistic approach to communicating to consumers the risks associated with seafoods as well as its positive nutritional aspects. This involves a shift from zero tolerance policies and less reliance on end product sampling to a more risk-based approach to quality and safety. This paper describes some of the current challenges facing the global seafood industry.

AN OVERVIEW OF GLOBAL FISH TRADE
In 2003, total world trade of fish and fish products increased to US$63.3 billion (export value), representing a 14 percent increase relative to 2000 and a 43 percent increase since 1993. In terms of quantity, exports were reported to be 48.6 million tonnes (live weight equivalent), having grown by 16 percent since 1993, but showing a slight decline compared with 2000 levels.

A large share of fish production enters international marketing channels, with about 37 percent (live weight equivalent) exported as various food and feed products. Developed countries exported more than 21 million tonnes of fish (in live weight equivalent) in 2003. Although a part of this trade may be re-exports, this amount corresponds to nearly 70 percent of their production. Exports from developing countries (28 million tonnes) were around one-quarter of their combined production. The share of developing countries in total fishery exports was 49 percent by value and 56 percent by quantity (FAO 2005).

The net receipts of foreign exchange derived from fish in developing countries (i.e. the total value of their exports less the total value of their imports) increased from US$13.2 billion in 1993 to US$18.3 billion in 2003. These figures were significantly higher than those for other agricultural commodities such as rice, coffee and tea, even if combined. Low-income food-deficit countries (LIFDCs) play an active part in the trade of fish and fish products; in 2003, they accounted for more than 20 percent of the total value of fishery exports, with net export revenues estimated at US$8.8 billion (FAO 2005).

In 2003, about 75% of the import value of fish was concentrated in three main areas: the European Union (EU), Japan and the United States of America. In terms of quantity, developed countries imported over 31 million tonnes (live weight equivalent), of which 70 percent was fish for human consumption, while developing countries imported 19 million tonnes (live weight equivalent), of which 48 percent consisted of fish for food.

With the entry of China into the World Trade Organization (WTO) in 2001, all major fishery countries other than the Russian Federation and Viet Nam (which have started negotiations to become members) are now members of the organization. Parallel to the increase in the WTO’s membership, a number of bilateral trade agreements with strong relevance to fish trade have been signed. The full impact and long-term effects of
Challenges for the global seafood industry

An FAO study was conducted in 2002-2004 to examine the impact of fish exports on food security in 11 selected developing countries (Kurien et al, 2005). The study showed that this fish trade generally had a positive effect on food security through increased export earnings. For the countries involved, the export trade did not have a detrimental effect on fish consumption. However, the study emphasized that sustainable resource management is a necessary condition for maintaining fish trade.

SCIENCE BASED APPROACHES TO FOOD SAFETY

The approach to ensuring food safety has moved away from relying on end product inspections with accompanying laboratory analyses, towards the preventive Hazard Analysis and Critical Control Point (HACCP) approach. Assigning responsibilities to operators throughout the food chain establishes shared responsibilities among primary producers, processors, as well as the consumers themselves, with regard to the safety of food products. This risk-based approach, formally adopted in the Sanitary and Phytosanitary Agreement (SPS Agreement) of the WTO, mandates a transparent science based approach which acknowledges that food can never be made risk free for all people at all times. Extensive surveys of food show a continuing prevalence of pathogens in the products as well as in food processing establishments even where stringent HACCP programmes have been applied (GudbjornsDottir et al, 2004).

New approaches are being implemented along the lines of ‘Performance Standards’, where pathogen prevalence in different products is monitored and consequently realistic standards set for performance. For example the Performance Standard for broiler chicken in the United States of America is presently set at maximum 25 percent contamination for salmonella (The National Academy of Sciences 2003). That means that the ‘failure rate’ of a particular food production system is being monitored to keep it within the set limits deemed achievable by the whole production system. This sets a new stage for food control. The problem facing the food industry seems to be that, while these new approaches appear sensible and are beginning to show tangible results, they have become additional layers of control rather than replacements for more traditional control methods. Despite the fact that the preventative HACCP approach has been implemented by industry for over a decade, end product analysis does not appear to be diminishing. This, however, may be the inevitable cost of transition; to maintain old approaches until there is sufficient confidence in new ones.

The 1995 SPS Agreement of the WTO prescribes further development of HACCP by stating that all SPS measures must be risk based. The “appropriate level of risk” or more descriptively the “tolerable risk” must be scientifically established. There must be a clear distinction between the scientific evaluation of the risk associated with the food and the political risk management part. The latter refers to the process of deciding on options for dealing with risk. It is important that the inevitable risks are communicated to all parties (risk communication). Options on how to achieve maximum practical achievable food safety levels are actively debated between the risk assessors and risk managers. The different options can have significant and diverse economic consequences.

The high level of rejection of fish and fishery products in international trade due to ‘filth’ indicates that there is room for improvement in production and distribution systems. FAO has emphasized the need for more human capacity building and more harmonization of the control measures in place. Fish trade is still increasing, particularly from aquaculture in developing countries, and the entry onto the market of a more diverse range of value-added convenience products. This definitely poses new challenges.
The practicalities behind the necessary controls in seafood trade are noteworthy. The United States of America imports seafood from 160 countries representing 13,000 individual processors. Less than half (48 percent) of importers in that country could document that foreign suppliers complied with United States HACCP requirements in the fiscal year 2002 (albeit up from 27 percent in 1999). Moreover, the United States Food and Drug Administration (FDA) have as yet no fish inspection equivalence agreement in place with other countries. Indeed, the FDA has expressed the view that “the time and resources required to develop equivalence agreements for seafood may outweigh the benefits” (GAO 2004).

For international markets in fish and fishery products, one of the most serious difficulties faced by exporters is the different standards and regimes being imposed by importing countries on producing countries to ensure that products meet the requirements of their domestic markets. Huss and others (2004) noted that for selected microbiological criteria in the EU, standards are both complex and diverse, are not based on current Codex principles, “and do not appear to be meaningful in terms of consumer health protection”. They pointed out that France for example, has more than 80 microbiological criteria for foods, whereas Germany has none, except for those applying through European Commission (EC) Directives. The industry has repeatedly complained about the difficulties this creates for trade, and points to the need for more harmonization.

A TRANSPARENT WORLD TRADING SYSTEM

The WTO is the only global international organization dealing with the rules of trade between nations. WTO verifies that trade has been growing on an average of 6 percent annually over the last 50 years. Trade rules are embodied in the various WTO agreements signed by its 148 member countries (September 2005) and ratified by their respective parliaments. Therefore, these agreements are legally binding for all WTO members. They form the legal ground rules for international commerce, by guaranteeing members important rights but at the same time obliging them to keep their trade policies within agreed limits. The objective is to assist producers of goods and services, both exporters and importers, to conduct trade so that it flows smoothly, freely, fairly and predictably, with the overall goal of improving the welfare of people in member countries. It is also important to note that trade liberalization is placed at the heart of the development agenda, as spelled out in Chapter 2 of Agenda 21 (Rio 1992) stating that the international economy should “promote sustainable development through trade liberalization”. This commitment is very important, especially for developing countries.

The SPS Agreement confirms the right of WTO members to apply measures they deem necessary to protect human, animal and plant life and health. It is important to note that the provisions of these agreements have developed over time. This right was included in the original 1947 General Agreement on Tariffs and Trade (GATT) Agreement provided that “such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade”. The SPS Agreement requires that, with regard to food safety measures, WTO members base their national measures on international standards, guidelines and other recommendations adopted by the CAC, where they exist. This, however, does not prevent a member country from adopting stricter measures if there is a scientific justification for doing so. Members are encouraged to accept the SPS measures of other countries as equivalent, even if different, where they can provide the same level of protection as their own regulations.

The spirit of the new global arrangements is clear. It is to ensure a level playing field for all parties by applying scientific principles, taking a science-based risk approach,
Challenges for the global seafood industry

promoting transparency of the process, and emphasizing the preventive approach rather than end product inspection. It is acknowledged that there must be a distinction between legitimate food safety measures and protectionism. However, there is a long way to go before a level playing field is achieved. There is no agreement yet on what constitutes an “Appropriate Level of Protection” (AOLP), each WTO member decides for itself. A very important part of the WTO trading system is the procedure for resolving trade disputes, the Dispute Settlement Understanding, which is crucial for enforcing the rules. Countries bring disputes to the WTO if they think their rights under the agreements are being infringed. Since October 2004, 315 cases have been brought to the attention of the WTO. The most famous case involving food safety is probably the ruling in favor of Canada and the United States of America against the EU relating to the use of growth hormones in beef.

A clear framework that gives primacy to scientific methods when evaluating food safety is crucial for fending off politically motivated rejections, as well as for responding to calls by NGOs and reports in the media for people to avoid eating fish (claiming high levels of contaminants). This sensationalism in reporting calls for food safety authorities to have readily available material with correct and balanced information. A good example is a report by the European Food Safety Authority, on the safety assessment of wild and farmed fish in Europe, where both the negative and positive aspects of different fish species was presented in an unbiased way (EFSA 2005).

MAJOR DEVELOPMENTS IN FISH SAFETY AND QUALITY

After numerous food scares in the 1990s, the public is now far more sensitized towards food safety issues. This is having a big impact on the food industry, retailers and food safety authorities. It is tempting to conclude that consumers are now better informed and able to make educated decisions about the quality and safety of the food products they purchase. Current work on risk perceptions indicates that this is not necessarily the case. Consumers may be driven more by perceptions than hard data relating to food risks.

Fish products are subjected to close scrutiny regarding safety for consumption, not least because of how widely they are traded internationally. For years FAO has been studying the reasons for rejections and detentions of fish and fishery products at the borders of the main importing countries. The results show considerable divergence in reasons for detentions and suggest the need for harmonization of the procedures and methods that govern imports (Ababouch et al 2005). Seafood may be beginning to acquire a reputation for being less safe than other animal protein foods. A recent report from the United States stated: “Seafood products represented about 15% or 26 of the 169 food borne illness outbreaks from a confirmed source - a level greater than that associated with meat or poultry products, which are consumed at 8 and 6 times the rate of seafood, respectively” (GAO 2004). Similarly, the EU alert system for food and feed indicated that fish and fishery products were responsible in 2002 for the largest category (over 25 percent) of food safety and quality alerts (EU 2003). Drawing conclusions by comparing outbreaks can be very misleading. For example, the number of cases per outbreak related to meat and milk products, is usually much larger than for fish. There needs to be more analysis of the epidemiological data to determine the relative safety of meat compared with fish.

Efforts are now underway to integrate fish safety and quality policies at national, regional (e.g. EU) and international (e.g. CAC) levels. In the EU, the established health rules affecting the production and placing on the market of food products have been contained in a large number of Directives. These contain common principles such as those related to: the responsibilities of manufacturers, the obligations of Competent Authorities, the technical requirements for establishments handling food products, the minimum hygiene requirements to be complied with, the procedures for the approval
of establishments, the conditions for storage and transportation, and the health labelling of products. These hygiene rules have now been subjected to a complete recasting to simplify them and to eliminate the inconsistencies that have arisen during their implementation, while at the same time securing a high level of consumer protection. The new legislation gives food producers primary responsibility for the safety of food through self-checking and modern hazard control techniques. It integrates 16 existing product specific Directives and Directive 93/43 (on the hygiene of foodstuffs) into a package of five hygiene regulations and directives (Ababouch et al 2005). They also take into account the international obligations laid down in WTO Agreements on SPS and TBT and by the CAC.

In addition, the EU has instituted the European Food Safety Authority (in 2002) to ensure that scientific advice strengthens the new food hygiene rules. The implementation of these hygiene rules will be guided by objectives such as pathogen reductions targets or performance standards. Likewise, the EU Alert System for Food and Feed, initiated in 1999, is now fully operational and their reports are regularly posted on the internet. Considering that traceability of food and food ingredients along the food chain is an essential element in ensuring food safety, the new EU traceability rules for fishery products, (EC 1999, EC 2001) require that at the point of consumer purchase, the following aspects should be documented:

- species (trade name and/or Latin name);
- production method (‘caught at sea’ or ‘in inland waters’ or ‘farmed’); and,
- catch area for fish caught at sea the area must be stated. For fish from inland waters the country of origin must be given and for farmed fish the country of the final development of the product must be given.

The United States of America has continued implementing the Federally Mandated Seafood Rule (FDA 1995), along with the Good Manufacturing Practices (GMP) (21 CFR part 110) and Sanitation Control Procedures (21 CFR part 123). Likewise, application of the updated Fish and Fishery Products Hazards and Controls Guide issued by the FDA to assist the fish industry has been broadened. The Seafood HACCP Alliance has been strengthened but this is a national education programme designed to complement the Guide. This programme involves academic and regulatory expertise in every state plus numerous international training efforts (Seafood HACCP Alliance 2001). Risk assessment work for specific pathogens related to seafood was also carried out.

Of particular interest is the 2003 FDA Interim Final Regulation (21 CFR Parts 1 and 20) promulgated under the Public Health Security and Bio-terrorism Preparedness and Response Act. This regulation requires that domestic and foreign facilities that manufacture or process, pack, or hold food for human or animal consumption in the United States register with the FDA and submit prior notice electronically to FDA before the shipment arrives in the United States of America. Several fish exporting countries fear that the implementation of these requirements may disrupt fish trade flows from exporting countries into the United States of America.

A recent review (the National Academy of Sciences 2003) of the use of scientific criteria and performance standards for safe foods in the United States of America recommended that, for seafood, the FDA:

- includes a process validation protocol in the fish and fisheries products hazards and controls Guide and appoints an appropriate advisory committee to periodically update this guide; and,
- develops strategies to ensure the safety of imported seafood by focusing on pathogen intervention strategies prior to shipment and international harmonization of standards.

In Japan, the application of HACCP-based food control regulations is being pursued, including those applying to sanitary and hygienic requirements for fish
handling and processing establishments, and conditions for storage and transport. Risk
analysis principles are being incorporated, along with spot checks at the entry border,
with the quality control schemes of the Japanese fish industry, which often controls
imports at the source.

At the international level, the Codex Alimentarius Commission (CAC) has been
actively strengthening its work based on its Strategic Framework 2003-2007. The
framework identified six major objectives that serve to strengthen the scientific basis
of the Codex decision making, improve capacity building and enhance its capacity to
deal effectively with new issues. It specifically mentions “promoting the collection of
data from developing countries”.

The general principles of GHP/HACCP have been adopted by the CAC in 1997 and
1999 (FAO/WHO 2001). They include requirements for the design of facilities, control
of operations (including temperature, raw materials, and water supply, documentation
and recall procedures), maintenance and sanitation, personal hygiene and training of
personnel. Similarly, the Codex Committee on Fish and Fishery products is working
on a draft Code of Practice for fish and fishery products, including aquaculture
products, which integrates these general principles and adapts them to the fish industry.
Sections of the Code have been adopted by the CAC (CAC 2005). Unfortunately, this
Code is not intended to cover extensive fish farming systems or integrated livestock
and fish culture systems that dominate production in many developing countries. The
Code also describes the requirements for surveys and monitoring of mollusc bivalve
growing areas.

In addition, significant changes are taking place within the CAC to strengthen its
role as the internationally recognized body for deliberations regarding food safety,
consumer health and fair trade. The CAC has initiated a plan of action encompassing
six major elements:

- improved efficiency and speed of the Codex process and consensus building;
- further strengthened scientific support and science-based decision making;
- increasing the participation of developing countries in CAC deliberations;
- establishment of a Trust Fund by FAO and WHO to help the participation of
developing countries;
- greater transparency and participation of non governmental organizations; and,
- increased support from FAO and WHO.

THE RISE OF SUPERMARKETS

The supermarket sector has risen to have an important and often dominant share of
food retailing, commonly 70 percent in developed countries (OECD 2004). This share
is also rising sharply in many developing countries. The rapid spread of supermarkets
has resulted in a restructuring of the food markets in many countries of the world.
As supermarkets increasingly influence the distribution from primary producer to
retailer, there is a power shift from suppliers and wholesalers to retailers. This may
have an important impact on how benefits are shared along the distribution chain.
This is particularly relevant in the case of small-scale fisheries in developing countries.
The fragmented nature of the industry and their lack of access to information often
puts small-scale fishers at a competitive disadvantage in relation to the retail sector.
Supermarkets, which are increasingly incorporating social, environmental and ethical
benchmarks in their operating procedures, should recognize the organizational
constraints facing small-scale fisheries in developing countries and try to ensure a fair
distribution of benefits.

Supermarkets are also increasingly adopting private safety and quality standards,
either to replace missing or incoherent public standards, or to impose standards that are
higher than the public standards. Examples are the British Retail Consortium Global
Standards or the Global Food Safety Initiative. Leading supermarket chains are shifting
towards higher quality and increasingly safe products through private standards imposed on suppliers. There are several reasons for this:

- Higher product quality and safety are being used to further entice consumers away from small shops and markets.
- Standardization reduces costs and allows more efficiency of product flow in the procurement system.
- Bringing the attributes of local supply into conformity with private standards of European or United States retailers reduces costs in regional or global procurement systems of a given chain.
- Centralized purchases (with better monitoring ability), qualified specialized wholesalers, and preferred supplier programs of selected producers, raises the capacity of retailers to apply higher standards than is possible prior to purchasing from general-line wholesalers who purchase from and sell to a wide variety of firms.
- Public food regulations for the domestic market, where they exist, are not easily enforced by governments. Private standards and private enforcement are a way to ensure food safety in retail outlets.

The adoption of private safety and quality standards makes economic sense for supermarkets. However, supermarkets must also recognize that the adoption of these standards will require adjustments throughout the distribution chain. For many developing countries, meeting minimum SPS (Sanitary and Phytosanitary Standards) is already a major challenge. In many instances the imposition of even higher safety and quality standards may be impossible. Supermarkets that require higher safety and quality standards should provide assistance to suppliers from developing countries to ensure they can continue to provide products which meet requirements. A recent survey in OECD countries showed that 70 percent of consumers felt that food safety was primarily the responsibility of governments and only 10 percent felt it was the responsibility of the private sector.

CONCLUSIONS
Given how globalized fish trade has become, it is imperative to continue harmonizing the rules by which it is governed, including relevant inspection procedures. Countries should make data on detentions and rejections available so that producers can adjust their safety and quality regimes accordingly. The risk analysis approach needs to be further implemented throughout the production chain. All food safety standards should be risk based.

The fish industry faces new realities that stem from the ease with which information is now exchanged. Consumers are more demanding than ever. Companies need to do more than pay lip service to these demands. However, it is important that they do not overstep the mark by imposing standards that are unrealistic and that create barriers to producers selling their products. This is crucial for developing countries that might already be struggling to develop quality and safety control systems to meet agreed international standards. An open, transparent, and harmonized system is imperative for the smooth and fair functioning of global trade in fish.

REFERENCES:


GAO. 2004. Food safety. FDA's imported seafood safety program shows some progress, but further improvements are needed. United States General Accounting Office. GAO-04-246, 56 p.


International seafood trade: the rules and the rorts

Alastair Macfarlane
New Zealand Seafood Industry Council

ABSTRACT
This paper examines how the rules that underpin the conduct of international seafood trade are interpreted into practice, and how certain practices, often masquerading as rules, could be undermining them.

INTRODUCTION
The term ‘rort’ is quintessential Australian English. Colloquially, a rort is a shady practice rather than an outright act of dishonesty; for example, when a food seller weighs your purchase, with accurate scales, but leans on the scale slightly to add some weight. The relevance of this concept to international seafood trade will be revealed below, following a brief description of the fundamental features of international trade in seafood products, and an overview of the rules applying to that trade.

INTERNATIONAL SEAFOOD TRADE: A SNAPSHOT
More than 40 percent of global fish production, whether from capture fisheries or from aquaculture, is traded internationally. About 50 percent of the international export trade by value stems from developing countries. Most developing country fisheries are therefore significantly export oriented. Most of that trade is directed to developed country markets. Indeed, international markets are dominated by four import markets. More than 80 percent of global imports of fish and fish products is by Japan, the European Union (EU), the United States of America and lately China. Of these countries, Japan, the EU and the United States of America have significant net supply deficits from domestic sources. China is different, as much of the seafood that is imported there is being further processed and then re-exported to the three main developed country markets. Within this global set of trading relationships, the expectation of developed country consumers is that all the seafood they have access to will meet first world standards of safety and quality.

The key message to be taken from this description of international seafood trade, is that while the international import markets for seafood products are highly directed towards a small number of developed countries, these markets are uncompromising in their expectations that the product will be safe to eat and will meet expectations of quality. Therefore, regardless of domestic capacity and infrastructure in developing countries, the seafood products that they export must meet developed importing country expectations or they will be excluded from trade.

Developed country markets have only recently, within the last one to two generations, become heavily import dependent. There is a lingering misconception among consumers that their markets can be self-sufficient. Imported seafood products, especially where they are direct replacements for previously abundant domestic
products, are often vulnerable to a xenophobic backlash. This is especially the case when imported products are linked to instances of food-borne illness.

The once dominant domestic fishing sectors in developed countries can be seen to exploit these resentments from time to time. One of the latest examples, in this case in aquaculture, has been the reaction of the United States catfish producers to cheaper product being imported from overseas. The case involved claims of ‘dumping’ resulting in anti-dumping action on the part of the United States of America, and included a dispute about whether the imported product could even be called ‘catfish’, which it clearly was.

**TRADE RULES**

The General Agreement on Tariffs and Trade (GATT) was one of the post-World War II Bretton Woods institutions. It was conceived as an institution to assist the world to avoid a return to pre-war protectionism. The fundamental basis of the original and subsequent agreements is that members treat imported products no less favourably than they treat their own domestic products (‘national treatment’) and that they accord that treatment to all other member states (‘most favoured nations’).

Until it eventually morphed into the World Trade Organization (WTO), the GATT was instrumental in facilitating global tariff reductions and trade liberalization in the non-agriculture goods sectors. Until the Uruguay Round of negotiations, agriculture remained firmly off limits to the application of trade liberalization agreed for other goods.

Seafood trade was initially perceived to be part of agriculture. In 1995, the Uruguay Round detached seafood trade from agriculture, thereby extending the general rules of trade liberalisation applying to non-agriculture goods to trade in fish and fish products.

The GATT and now the WTO, safeguard the rights of member states to protect public health and safety (Article 20). But the Uruguay Round established a number of new agreements to clarify the extent to which protection can be extended. Most significantly, the Uruguay Round produced a robust and binding dispute settlement system. Seafood trade has been in the forefront of testing its effectiveness. Two cases stand out: the Canadian and United States of America’s case against Australia’s restrictions on imports of fresh and frozen salmon, and the Peruvian case against the EU to clarify the definition of sardines.

The Sanitary and Phytosanitary (SPS) Agreement determines that members must base their protection of public health on science-based risk assessment, referenced wherever possible to internationally agreed norms. The salmon case tested this element and Australia was required to carry out a proper risk assessment that led to the opening of its market under prescribed terms. The most significant element of the agreement, apart from science based risk assessment, is that members are encouraged to harmonise their protection measures with each other. If this is not achievable, the SPS Agreement encourages members to recognise equivalency of the outcomes of differing regulatory regimes. Wherever possible, members are encouraged to extend recognition of equivalency to mutual recognition.

The Technical Barriers to Trade (TBT) Agreement applies to all goods trade, including trade in food products. It specifies that the SPS Agreement has precedence for food safety issues. For seafood, the TBT Agreement is primarily relevant to issues of technical conformance and measures to protect consumers from fraud arising from dishonest product presentation, especially issues like labelling and the naming of products. As with the SPS Agreement, the TBT Agreement encourages the adoption of regulatory systems that have the least impact on trade but are sufficient to produce the intended outcomes. Again, the preferred approach is for countries to reference their regulatory systems to internationally agreed standards and norms.
Both WTO agreements require that members notify each other of new regulatory developments and provide enough time for them to adjust to those changes. They also provide a frame for negotiation and early settlement of potential disputes before recourse is had to formal dispute settlement.

**TRADE RULES IN PRACTICE**

So much for the internationally agreed machinery; how is life in the real world of seafood trading developing? What follows is a brief description of two key recommendations of the SPS Agreement, harmonization and equivalency, and four problem areas associated with them.

**HARMONIZATION**

Harmonisation of national measures between WTO member states is rare. The outstanding example is the EU. However, harmonisation in the EU is a result of another political process altogether, not the WTO. It arises from the EU’s basis as a customs union, and is more akin to the harmonisation that takes place within federal states to ensure that inter-state trade is conducted on a consistent basis and is compatible with measures taken by federal authorities at the national frontier.

New Zealand and Australia have attempted elements of harmonisation in food standards governed by a Treaty. However, the two countries have found that harmonisation in food safety standards is too problematic, so they have opted for mutual recognition.

**EQUIVALENCY**

Equivalency may be making better headway. However, in seafood trade the outcome of seeking equivalency is heavily affected by the inequalities of trading strength between the negotiating parties. Equivalency continues to stray towards the imposition of ‘equivalent’ practices by importing countries on exporting countries. In practice, importing states impose their practices on exporting states, rather than the process being a recognition of an equivalent outcome from the practices adopted independently by the exporting countries. Even where there is relative equality in negotiating strength, as between the EU and the United States of America, true mutual recognition of equivalency remains some way off.

**SECURITY ISSUES**

The relatively new concern about how to protect nations from terrorist threats that might arrive in the food chain through international trade, is not well addressed at present through transparent and internationally agreed norms and standards. In the United States of America in particular, attempts to address security concerns has lead to conflicting oversight from different agencies, who are still struggling internally with inter-agency communication. It has enabled some agencies to require traders to supply more detailed and time bound information than was previously deemed necessary to safeguard public health and food safety.

Considerable capacity for ad-hoc and costly interventions and subsequent interruptions to trade appears to be inherent. Intervention measures have been put into place, but their impacts have yet to be seen in the event of a security alert or incident.

**PRIVATE SECTOR RISK AVERSION**

Regardless of internationally agreed norms and standards of food safety, the international food marketing brand owners, processors and retailers, are heading rapidly towards imposing even stricter measures on their suppliers as part of their intense competition to attract retail customers. Corporate responsibility is a new marketing tool to differentiate the market.
The approach can be inconsistent. There have been examples of zero tolerance for ‘fashionable’ pathogens, the imposition of shorter shelf lives than required by regulators, and concerns about heavy metals and contaminants in some products, but not necessarily all.

At present there is no ready recourse to WTO dispute settlement when these strict measures are imposed. Concerns are being expressed by mainly developing country WTO members of the SPS Agreement, who see a need to find a solution to this creeping return to zero-tolerance.

At a local or state government level, there is also capacity for local government to go beyond norms agreed at the national level. A current example is legal precedent in California clashing with Federal norms in relation to requiring labelling to warn consumers of mercury in tuna and swordfish.

**DECEPTION**

Passing off a less desirable fish species as other more desirable species is a long standing rort in the seafood business. There are well over 1000 species of fish in international trade. Many are related to each other, while others can be genetically very different but appear to closely resemble familiar and favoured species.

The trade in seafood has not only grown enormously in the last 30 years, the number of species in trade has positively exploded. A common and legal practice in some jurisdictions is to group species into common local language generic names, as in the case of some hake and squid species in Europe.

The desire to protect consumers from this abuse, of traders passing off one species as another, is a legitimate one. However, it is a daunting task, as Australia appears to be finding. It is constantly updating its prescriptive fish naming regulation to cope with the continuing influx of new and exotic species.

A literally hidden issue is the woefully out of date harmonised system of customs classification as it is applied to fish and fish products. More than half of the fish being traded is unidentified and therefore runs the gauntlet of higher tariffs applying to unspecified tariff lines, while identified species can often enter markets at low or zero duties.

**COUNTRY OF ORIGIN LABELLING**

A debate on country of origin labelling is occuring currently in Australia. Consumers have a legitimate right to know where their food originates from, especially if that is a real concern for them. Problems occur when country of origin labelling is turned into a protectionist tool and becomes the basis for favouring domestic products over imports. Certain aspects of the debate in Australia are straying towards undermining the fundamental basis of the WTO system of ‘national treatment’ mentioned above.

There is a capacity to obfuscate and imply a domestic origin to an imported product through application of ‘Product of’, ‘Made in’, ‘Manufactured in’ description. There are new proposals being developed to require country of origin labelling for unpackaged fish, and also to competing meat products, leaving an impression in the minds of consumers that meat is of domestic origin, whether it is or not.

In the fish trade, as more fish are caught in one ocean, processed in another country and consumed in a third, determining origin is becoming a real challenge. Country of origin labelling requirements differ from country to country and there is a need to standardise.

The use of origin documentation and labelling is also a growing practice in regionally managed fisheries to positively identify legally caught fish and to exclude non-conforming and presumably illegal fish from markets. This is leading to a proliferation of conflicting, cumbersome and expensive paper based systems. For example, a Pacific Bluefin tuna caught in the Pacific and exported to Japan must now be accompanied by
verification documents from three other regional agreements that do not apply in the Pacific, essentially to verify that it did not originate from those fisheries.

CONCLUSIONS
The WTO has provided a set of rules that are a legally binding basis for managing safety and the risk of fraud in a transparent and least trade impacting way. Yet national authorities can become torn between their obligations under international agreements and local private sector and consumer demands for levels of protection that exceed agreed international norms. Marketing demands in the private sector to differentiate products to make them stand out are creating private sector demands that can restrict market opportunities or access, especially for products originating from developing countries that already struggle to meet internationally agreed risk management norms. At present there are no adequate means for redress in the case of private sector requirements being more risk averse and trade impacting than the requirements of WTO agreements. Moreover, new demands for safeguarding other risks, including national security, natural resources and biosecurity are bringing new agencies into the game that have little experience in working with international rules based on science and norm-based risk assessment. Finally, xenophobia continues to exist around the world and impacts on international fish trade. It presents itself disguised as concerns about transparency, country of origin labelling, or in the naming and identification of fish species. These are all issues that will need to be addressed if the rules, and the intentions underlying those rules, are to triumph over the potential rorts.
Fish to 2020 in changing global markets: trade liberalization and market access constraints for developing countries

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ABSTRACT
The global outlook for fish suggests a growing dependence on aquaculture. According to a study by the International Food Policy Research Institute (IFPRI) and the WorldFish Center (Delgado et al 2003), by 2020 more than 40 percent of fish consumed will come from fish farms, as aquaculture production nearly doubles and the supply of wild caught fish from oceans and rivers stagnates. Overall consumption of fish is projected to dramatically increase to 128 million metric tons in 2020 from 91 million metric tonnes in 1997.

Increased trade has integrated many local and domestic fisheries in developing countries with foreign markets all over the world. Continued access to foreign markets is a major factor for developing countries to increase and maintain their high performance in fish trade. Removal or easing of many traditional barriers to trade such as tariffs and quantitative restrictions through the General Agreement on Tariffs and Trade (GATT) and more recently the World Trade Organization (WTO) have played a significant role in increasing fish trade. Despite significant tariff reductions in both developing and developed countries, the selective use of tariffs, and several different types of non-tariff barriers related to food and environmental safety standards, continue to limit access to international markets.

This paper provides a prospective analysis of future supply and demand for fish, and analyses critical market access and trade liberalization issues in fisheries. It also focuses on constraints faced by developing countries from both demand and supply perspectives. Demand side constraints include those related to international trade such as tariff and non-tariff barriers, while the supply side constraints reflect domestic challenges in developing countries, including issues related to the sustainability of natural resources.

INTRODUCTION
Currently, the value of global fish trade is close to US$60 billion compared to about US$15 billion in the early 1980s. Developing countries account for over 50 percent of the global export value of fish. Net fish exports from developing countries are worth an estimated US$18 billion and have surpassed all traditional agricultural exports, such as beverage products, cocoa, coffee, sugar and rice (FAO Globefish, 2004; Figure 1). For many of the developing countries, especially the food deficit or net food importing ones, fish trade represents a major source of foreign currency earnings paying for the bulk of food import bills (other than fish). It also benefits millions of fishers, farmers,
processors and others involved in micro level production, input and commodity supply chains (Ahmed et al., 2002; Kurien, 2004).

Continued access to foreign markets and improved terms of trade are recognized as an important factor for poorer countries to meet the Millennium Development Goals (UN Millennium Project, 2005). Increased emphasis is also given to fairer rules for international trade, investment, finance and migration, which take account of all interests, rights and responsibilities to enable all to participate in the opportunities offered by globalization (ILO, 2004).

This paper provides a prospective analysis of future supply and demand for fish, and analyses critical market access and trade liberalization issues in fisheries.

GLOBAL FISH PRODUCTION AND TRADE: OUTLOOK TO 2020
The creation of exclusive economic zones (EEZs) in 1977 and UN Convention on the Law of the Seas (UNCLOS) significantly influenced the shift of production in favour of developing countries. The EEZs also stimulated international trade since countries that had fished widely in unclaimed coastal waters around the world became importers, while countries with large national fishery resources and low domestic demand became exporters. Fish production in the developed world has also declined or become stagnant since 1989 due to stringent fishing quotas applied in the North Atlantic and the disappearance of the Eastern block that contributed significantly to fish catch in the developed region. Declines in wild caught fish in the developed region can also be attributed to over-fishing. On the other hand, most of the recent expansion in fishery production came from the faster growing aquaculture sector that grew at an average rate of 9 percent between 1970 and 2002. Today, aquaculture contributes 32 percent of total fishery production, accounts for an increasing share of global trade, and provides approximately 40 percent of the world’s total food fish supply (FAO, 2002; FAO, 2004). Technical innovations, private

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1 EEZs currently cover 40% of the world’s oceans and 90% of living marine resources (Deere, 2000).
sector growth and increased market demand are the main drivers in the expansion of aquaculture in developing countries, particularly in Asia (Ahmed and Lorica, 2002).

Recent studies forecast that aquaculture from developing countries will continue to increase its share in global fish production and trade (Delgado et al., 2003). At the same time, demand for fish in Asia and other developing nations, will certainly expand as wealth, population, and urbanization continue to increase. These factors imply a rapid expansion of trade in fish commodities among developing countries, otherwise called ‘south-south trade. Developed countries, on the other hand, will exhibit a lesser increase in total demand for fish due to stagnant or declining population. As a consequence, it is likely that producers in developed countries will gradually leave the sector and policies in these countries will probably come to favor import-friendly regimes for fish (Delgado et al., 2003). Aquaculture will continue to expand especially since its predictable supply patterns and high quality products are ideally suited for supermarket chains, which are expected to supply an increasingly larger proportion of food demanded worldwide.

Fish and fishmeal prices are predicted to rise unless aquaculture growth declines or efficiency in feed conversion increases significantly. The prices of low value fish are also expected to increase, affecting the food security of lower income households. On the other hand, economic growth in developing economies will create opportunities for artisan and small-scale fishers to specialize in entrepreneurial modes of operation. Fish will become an increasingly high-value commodity and the shift in traded products from frozen low-grade whole fish to value-added products processed in developing countries will continue (Delgado et al., 2003).

Delgado et al. (2003) also predicts that sustainability concerns will increase and motivate environmental regulations and institutions, first in developed countries and then in developing countries. Over-fishing will remain a major concern, and the use of pelagic stocks for fishmeal and fish oil will become an important policy issue. The link between pollution and food safety in the fish sector, including pollution sources from outside the sector, will receive more attention worldwide. In this regard, institutional developments in the sector will be necessary to reduce poverty and to ameliorate the social impacts of increased global trade, such as the elimination of marginal and small-scale enterprises resulting from fisheries and aquaculture development.

**FISH AND THE WORLD TRADE ORGANIZATION (WTO)**

On a global level, WTO and the UN organizations are the main actors that shape the regulatory framework on fish trade. The WTO provides the institutional structure for the opening of world markets while UN organizations address the issues of sustainable development, trade and its impacts on the environment, environmental conservation and food security. The Food and Agriculture Organization of the United Nations (FAO) programme areas cover every aspect of fisheries management including global fisheries assessment and analysis, policy development, treaty monitoring, coordination, and technical assistance.

To date, WTO discussions regarding trade issues in the fisheries sector have focused on market access for developing countries, the distributional impacts of international trade (e.g. impacts on food security), the effects of subsidies, and concerns that trade-related environmental measures may constitute disguised protectionism. Concerns such as how the mismanagement of fishery resources can lead to trade distortions, and fears that trade rules may interfere with or impose constraints on environmental management or conservation efforts relating to fisheries, have also been discussed from time to time.

Negotiations facilitated by the WTO have succeeded in reducing average tariffs for fish by 25 percent. After the Uruguay Round, the average tariff on fish produce is 4.5
percent for developed countries and below 20 percent for developing countries. However, this success masks the tariff peaks and tariff escalation that remain, applied predominately to processed or value-added fish products in key import markets. Such import duties, as well as countervailing duties and the proliferation of non-tariff barriers (often in the form of technical, safety or hygiene standards), continue to hinder processing and the economic development of fishery industries in many developing countries (FAO-Globefish, 2000). Many of these constitute demand side constraints, which limit market access. On the other hand, supply side constraints act similarly and involve institutional constraints.

The removal or easing of many traditional trade barriers such as tariffs and quantitative restrictions through the General Agreement on Tariffs and Trade (GATT) and more recently WTO have significantly increased fish trade in the past decade. Despite significant tariff reductions by both developing and developed countries, the selective use of tariffs, including tariff peaks, tariff escalations, countervailing duties, and several different types of non-tariff barriers related to food and environmental safety standards, continue to limit access to international markets. Despite the ’Doha Mandate’ (the Ministerial Declaration of November 2001) to negotiate on Non-Agricultural Market Access (NAMA), disagreements on approaches and modalities toward liberalization, unpredictable adjustment costs due to changes in revenue structures in developing countries, and concerns about the negative impacts of tariff elimination on the sustainable use of fish resources, are all seen as major obstacles to the speedy liberalization of fish trade (Ahmed, 2005). Overall, market access and liberalization in both developed and developing countries have a significant bearing on the future patterns of fish trade, both among developing countries and between developed and developing countries (Delgado et al., 2003).

**MARKET CONSTRAINTS RELATED TO INTERNATIONAL FISH TRADE**

Although traditional barriers to trade such as tariffs and quantitative restrictions have been partially removed through GATT and more recently WTO, the issues of market access and trade liberalization for fish commodities are seen as somewhat different than for most types of agricultural or industrial products. Fish came under the stricter trade rules that govern industrial products under the NAMA negotiations, resulting in about a 25 percent cut in import tariffs by developed countries against an overall reduction of 40 percent on industrial products. Major importing countries or regions (e.g. Japan, European Union (EU) and the United States of America) have adopted various approaches including preferential rates, duty-free access and near-total removal of tariffs for certain fishery products from developing countries. Major sources of conflict between exporting developing countries and importing developed countries are high tariffs on most processed products and tariff escalation that often discourages local processing in developing countries (Bulte and Barbier, 2005). On the other hand, developing countries (e.g. China, Thailand and the Philippines), wary of structural rigidities and decreased market shares due to trade liberalization, have also taken steps to reduce tariffs, quotas and subsidies in fish production and processing. However, a variety of conventions and special agreements of bilateral and multilateral cooperation (i.e. free trade agreements or reciprocal preferential agreements), which govern the negotiations on tariffs and access of fish products to developed country markets, are seen as clear obstacles to market access by many fish exporting countries.

Several new and emergent regulatory measures such as sanitary and phytosanitary (SPS), quality and composition standards, and labelling of source and origin, could have negative impacts on market access similar to previous tariff and quantitative restrictions. Many developing countries continue to face frequent rejections of exported fish, despite taking measures to conform to the food safety standards of importing

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2 Further details of this section can be found in Ahmed (2005).
countries, with serious economic implications. For example, the EU’s five-month ban in 1997 on shrimp imports from Bangladesh cost at least US$14.7 million in short-term losses. While the ban may have been justified in terms of sanitary standards not being met, it could be argued that lack of capacity to address the concerns of the EU and to meet required standards construes a barrier to trade (Rahman, 2001). Many developing countries argue that they did not have input into the SPS and technical barriers to trade (TBT) agreements established during the Uruguay Round of multilateral trade negotiations, and consider many of the resulting regulations and requirements as unfair and a significant obstacle to their market access.

**DOMESTIC CONSTRAINTS RELATED TO INTERNATIONAL FISH TRADE**

The inability to respond to changing safety and quality standards is a major concern for developing countries. The high cost of compliance is a major economic obstacle to suppliers. Countries also face different economies of scale in meeting safety standards. This is true even at the level of individual processors and exporters within each country (Table 1). There is typically a higher unit cost of compliance for small-scale producers. Further analysis of these issues will need to focus on the following (Ahmed, 2005):

- assessing the existing pattern of post-harvest fish handling and processing and the technical capacity to comply with the health and sanitary standards;
- evaluation of the costs and benefits of food safety standards and other regulatory measures as they apply to exporters, processors, and poor fishers and fish farmers in developing countries;
- determining the characteristics of production, supply chain, trade policy processes and policy environments in developing countries, and identifying principal interest groups and institutional frameworks to vertically integrate the supply chain to meet the challenges of globalization;
- assessing the capacity of developing country institutions to link fisheries trade policies to fish supply chains (institutions, stakeholders, and processing industries) so that a comprehensive institutional network can be established to manage the quality of fish and seafood cost-effectively.

**TABLE 1**

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Investment of a Plant (000 US$)</th>
<th>Yearly Operating Cost of a Plant (000 US$)</th>
<th>Cost per Kg of Fish Processed (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>277.2</td>
<td>34.9</td>
<td>0.03 – 0.09</td>
</tr>
<tr>
<td>India</td>
<td>309.3</td>
<td>41.2</td>
<td>0.21 – 0.28</td>
</tr>
<tr>
<td>Malaysia</td>
<td>795.8</td>
<td>113.7</td>
<td>---</td>
</tr>
<tr>
<td>Thailand</td>
<td>380.9 – 404.8</td>
<td>47.6 – 71.4</td>
<td>0.01 – 0.014</td>
</tr>
</tbody>
</table>

Source: Dey et al. (2005)

Other constraints faced by developing countries are the adjustment costs and longer gestation gaps in restructuring government revenue sources. For many developing countries customs tariffs contribute significantly to government revenues, which are subsequently used as development expenditure targeting the poor. There is also evidence of a significant imbalance in the participation level between developed and developing countries in international negotiations. Many developing countries lack the capacity (technical and financial) to enable them to analyse the issues, to participate effectively in, and thereby to influence negotiations (Ahmed, 2005).

Developing countries also need to review their own trade policies in order to remove structural and institutional rigidities for trade within developing regions. The role of regional free trade agreements such as the Association of South East Asian Nations (ASEAN) Free Trade Agreement (AFTA) or East Asian Free Trade Agreement (EAFTA) will be significant in removing barriers to south-south trade.
Export restrictions and export taxes are common forms of regulation in developing countries. These create gross imbalances in trade between importing and exporting developing countries. (Ahmed, 2005).

**IMPACTS OF TRADE LIBERALIZATION ON DEVELOPING COUNTRIES**

Increased liberalization of trade through the removal of tariff and non-tariff barriers will have multi-dimensional effects: on foreign exchange earnings, employment, profitability, as well as on societies and the environment. These effects will differ depending on: methods of fish production (i.e., capture or aquaculture), domestic fisheries management policies, and country-specific social, cultural, economic, and political factors. Fishers and fish workers are a highly heterogeneous group; changes in trade will impact on their livelihoods differently. However, some generalized costs and benefits of trade liberalization can be identified. These are discussed below, as are the impacts on three areas of key importance: vulnerable groups, producers and consumers, and the resource base.

**The benefits of trade liberalization**

There is general consensus that trade is good for economic development and can bring benefits to many people (Leadbitter, 2004). Deere (2000) suggests that the positive effects include specialization in areas where a producer nation has a comparative advantage, and the potential to generate higher economic growth, which can be used to alleviate poverty, reduce prices, and provide greater choice for consumers. A World Bank study demonstrated that during the 1990s per capita income in developing countries that were open to globalization, such as China and India, grew three times faster than other developing countries (Dollar and Kraay, 2001). The economic impacts of trade liberalization in fisheries are considered to be relatively high for fish exporting developing countries, where it can serve as a significant contributor to employment, income, and economic growth, thereby supporting poverty reduction strategies.

Other benefits of sustainable trade include (Kent, 2003):

- increased food security[^3];
- stabilized or reduced fish prices for consumers;
- improved quality fish products in local markets;
- employment generation where other income sources are scarce, including for women[^4];
- increased fishers’ well-being, provided that increased wealth is equitably distributed;
- access to and diversification of overseas markets with a resulting increase in incomes in the fisheries sector, including the artisan sector;
- increased intra-regional trade;
- improved foreign exchange earnings from the export of high-value food products, which can be used to import much larger volumes of low-cost foods with large net nutritional gain;
- access to technological improvements;
- efficient resource use;
- increased competitiveness in international markets of some local fishing companies through better organization of production and management; and
- spill-over effects: such as when undersized or off-grade fish might be provided to the local community at very low cost, and pressure for improved working conditions and labour-based entitlements for workers, etc.

[^3]: Current food fish imports to LIFDCs are consciously utilized to enhance both direct food and indirect food security through imports for value-added re-export (Kurien, 2004).

[^4]: There is relatively easy labour absorption into the fishery sector, mainly because access is fairly open in nearly all of these countries.
It should be noted that the positive effects of trade in developing countries, such as increased employment as well as income and economic growth, do not immediately translate to or trickle down to the poorer segments of the population unless supported by proactive measures. Effective governance is central to managing the effects of trade.

**Negative effects of trade liberalization**

Trade may increase food security and promote economic prosperity in general, but the negative impacts on welfare may be serious in particular locations and groups of people (Kurien, 1993). Local deleterious effects can include reduced fish supply for consumption, because of the reduction in fishing stocks or the diversion of staple food to fishmeal for aquaculture production, which can affect food security in areas with few natural food sources. Higher domestic prices of fish due to excess demand can particularly affect those who spend a relatively large proportion of their incomes on food.

Indirect effects can include, competition from artificially low-priced fish due to remaining subsidies in other exporting countries, and environmental degradation from aquaculture or harmful technologies, such as trawling, which seriously impacts on sustainability and long-term food security and incomes. Fish production for export can also divert government and foreign investment and other resources (e.g. land) away from fish for domestic markets, which in turn can displace fish workers from their traditional livelihoods. This can compound the already poor conditions in fishing communities where malnutrition problems, low standards of living, and high dependence on fish (a traditionally cheap and highly nutritious food) are known to proliferate (Kent, 2003). Governments do not always use the profits from fish trade to improve domestic production, increase food security, or to minimize conflicts between local and foreign fishers over access to fisheries, all of which might help to offset some of these negative effects.

Other costs of trade liberalization include:

- incentives for commercial fishing operations, including overseas’ fleets, to enter the market, which may displace traditional fishers and threaten the livelihoods of fishing-dependent poor segments of society;
- increases in illegal, unregulated, and unreported fishing in response to increases in fish prices;
- degradation of the environment and promotion of transport-related pollution;
- technological impacts on natural resource sustainability in fish exporting developing countries, which may have severe long-term impacts, including negative ecosystem impacts resulting from excessive removal of target species or through by-catch;
- pressure to lower production costs including by weakening protection for workers and the environment, such as inadequate laws on pollution control, resource management, and child labour;
- potential non-transparent, unpredictable, and inappropriate use of non-tariff barriers to protect domestic industries, resulting in large economic losses;
- erosion of decision-making at various levels in the absence of adequate reforms in governance. Governments may not have the capacity to adjust institutions and policies to realize the benefits of trade, or to compensate for the negative impacts;
• inadequate capacity for involvement in trade negotiations may result in lower terms of trade; 5 and
• difficulties faced by small countries, especially small island developing states, in achieving the scales of production needed to compete in a global marketplace.

IMPACTS ON THE SUSTAINABILITY OF NATURAL RESOURCES IN FISH EXPORTING DEVELOPING COUNTRIES

Unlike other highly traded agricultural commodities, almost 70 percent of tradable fish is still obtained from wild harvest, putting severe pressure on the sustainability of that resource. Trade-induced demand is viewed as one of the main reasons for increased fishing pressure in developing countries. Excessive removal of target and non-target species has led to overexploitation of specific fish species, and to a wider ecosystem impact on predator-prey relationships. In most fisheries, there are now less long-lived species and more short-lived opportunistic species (Brown and Ahmed, 2004). Rising trade is also a major reason behind the expansion of live reef food fish (LRFF) fisheries in the Indo-Pacific region, resulting in some of the more vulnerable species like groupers (the most desired fish species in the LRFF trade) to be heavily fished (Sadovy et al., 2003).

Higher potential export earnings from fish may make domestic fish resources, especially high-value species in developing countries, more vulnerable to overexploitation. Efforts to recover stocks that have already deteriorated may be sacrificed or traded for short-term economic gains. The open-access nature of fisheries in some parts of the oceans, provide perverse incentives to over-fish. Subsidies aggravate this pattern by artificially lowering production costs.

Questions are increasingly being raised as to whether developing countries are mining their resource stocks and the environment in pursuit of immediate economic gains. This is especially the case where access agreements involve fees, which comprise a small percentage of the value of the landed catch. The biomass of most fish populations is at a low point. The biomass of most commercial species reached 20 percent of pre-fishing levels within 15 years of introducing industrial fishing, while that of large predatory species is now at 10 percent of pre-industrial levels (World Bank, 2004). Many believe that the failure to understand the dynamics of fishing and a lack of good governance are the main causes of this fisheries crisis (Pew Oceans Commission, 2003).

Forecasts of the impact of trade liberalization on resource sustainability are hampered by the lack of information. There is a lack of empirical evidence on the effects of trade flows and the potential application of trade rules and measures on fish, fish products, and services, as well as on the sustainability of fisheries and marine ecosystems. Knowledge about the structure of fisheries markets and of the links between market structures, prices, trade liberalization, and sustainability issues is also limited. The Organisation for Economic Co-operation and Development (OECD) predicts that liberalizing trade through further removal of trade barriers will increase prices in exporting countries and lower prices in importing countries until a new equilibrium is reached (OECD, 2003). The magnitude of these changes will depend largely on the management system in place. If an open access system exists, fishing efforts by exporting countries will increase, resulting in the decline of fish stocks in the short term and possibly a loss from trade in the longer term. In contrast, importing countries will reduce fishing efforts in the short term, which is expected to lead to a ‘double dividend’ as gains from decreased prices are realized, resources are transferred to higher yielding uses, and fish stocks recover in the longer term. The predictions are fairly similar for

5 The conventional terms of trade in fishery products for the LIFDCs deteriorated in the WTO phase with considerable losses on potential earnings and food security implications (Kurien, 2004).
countries where the catch is controlled, although exporting countries may receive small gains from trade because there are no constraints imposed on individual fishers, leading to high levels of capitalization and effort. If both exporting and importing countries have efficient management systems in place, then both countries can gain from trade, similar to when trading in agricultural products.

Similarly, tariff reductions on value added processed products will result in increased supply and trade in processed fish. If there is effective management, then supply and demand will reach a new equilibrium level at a higher quantity of processed products. However, if there is open access, exporting countries will suffer stock overexploitation and importing countries will reap a double dividend as mentioned earlier. Since the majority of exporting countries are developing countries characterized by open access to fisheries resources or with poorly managed systems, and since the larger share of imports are bound for developed countries, this has serious implications on the long term sustainability of natural fish stocks. Under this scenario, an effective fisheries management regime is the most important determining factor for the outcome of trade liberalization: if trade increases without management improvements, fisheries may collapse.

To maximize welfare gains, policies should concurrently target market liberalization and improvements in fisheries management. The full benefits of market liberalization can only be achieved without compromising sustainability if proper fisheries management schemes are in place and if concurrent national policy reform is carried out to protect vulnerable groups and enable larger investments in capacity and infrastructure (OECD, 2003). Increased trade can bring increased financial resources that would enable the implementation of sustainable management programmes.

**ADDRESSING DIFFERENT BARRIERS BY DIFFERENT POLICIES: FISHERIES IN THE WTO PROCESS**

Currently, fisheries are subject to the disciplines of the Agreement on Subsidies and Countervailing Measures (ASCM), which deals with two types of subsidies relevant to the fisheries sector: prohibited and actionable subsidies. There is disagreement within the WTO negotiating group as to whether the provisions of the ASCM could be utilized to address sustainability concerns. The ‘Friends of the Fish’ countries argue that there is a need to adopt special disciplines on fisheries subsidies that aim to preserve fish resources. Others argue that any new policies promoting sustainability would need to be safeguarded with an appropriate means to minimize the institutional systemic risk, which the current proposals by Friends of Fish do not include (Seung, 2003). Some commentators question whether the WTO is the appropriate forum, suggesting that the FAO or UN more broadly is a more appropriate arena for negotiating the protection of global fisheries (Grynberg, 2003). Indeed, FAO, the UN Environment Programme (UNEP) and OECD are currently conducting research on these issues (Seung, 2003). The Doha Round launched negotiations to clarify the relationship between existing WTO rules and obligations set out in multilateral environmental agreements, and the trade measures taken under each type.

There is great concern that the WTO NAMA negotiations will hasten the negative impacts of trade such as the overexploitation of fisheries, by removing trade restrictions designed to protect the environment (e.g., tracing and labelling of fish products, certification and eco-labelling, and general tariffs). It is argued that even partial liberalization could increase trade and consumption if it affects the actual tariff levels applied (FOEI, 2004). Certain sectors, including fish and fish products, are being proposed for complete liberalization by countries such as the United States of America, Canada and Singapore. Perceived threats to fishery resources posed by such measures are major sources of concern for other WTO members including Japan, Korea and Taiwan (WTO, 2003). Another view held by countries such as India is the ‘less than full reciprocity’ approach.
Although the positions of individual WTO members vary on approaches and formulae for the reduction and elimination of tariff barriers, it is clear that further accelerated trade liberalization on fisheries products has the potential to benefit developing countries significantly, provided that they are able to comply with food safety and quality standards, and that fisheries governance is improved globally. The implementation of health and safety processes requires legal and institutional reform as well as investment to improve management systems. Although initial investment costs as well as ongoing operating costs to achieve compliance with SPS and other health and safety standards are considerable, data shows that compliance delivers value in the longer term by way of higher prices and easier access to world markets. (Dey et al., 2005). For example, Thailand receives higher product prices in the international market because of its consistently higher performance in terms of standards compared to many other countries (Dey et al., 2005). Consumers are willing to pay a premium price for safe and high quality food. Technical assistance or investing in safety standards in developing countries is one way to ensure the quality and safety of products on the international market.

CONCLUSIONS

The view that trade will induce overexploitation and cause long-term harm to fishery resources needs critical and careful investigation. As mentioned above, the root causes of fisheries overexploitation are failures of resource management and governance, and weaknesses in the current property rights system. If developing countries are able to put in place proper management systems, trade will bring larger benefits. Poor governance and lack of accountability and transparency can cause misallocation and inequities in the flow and distribution of the benefits from trade to poorer segments of the population, and hence hinder progress toward poverty reduction in developing countries. Therefore, policies should focus on creating institutions, infrastructures, and capacity building to enable small-scale fisheries and farmers to participate in and take advantage of globalization, thereby preventing their exclusion and marginalisation. Agreements and actions must also be directed towards liberalizing imports in developing countries, to take advantage of growing south-south trade.

The primary focus of policy actions at WTO should therefore be to:

- harmonize trade policies, both tariff and non-tariff barriers;
- ensure social and environmental sustainability; and
- create a level playing field in negotiations on trade and market access issues including increasing the capacity of developing countries to participate in technical, institutional and legal areas.

A three-pronged strategy involving simultaneous progress in WTO agreements, national policy reforms, and multilateral and non-governmental organization outreach and assistance will be necessary to achieve a full and fast liberalization of fish trade. This would involve the complete abolition of all forms of tariffs. It would require a commitment to and action on investments in food safety standards, especially in developing countries with poor institutional capacities. A global agreement within the orbit of the WTO on fisheries governance and management, under which all open waters including trans-boundary fishery resources would be covered, is also needed. For the latter however, a separate body should negotiate the global agreements and their implementation in alliance with FAO, UNEP, and similar agencies of the UN.

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Free trade agreements: implications for global seafood supply and demand

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ABSTRACT
Free trade agreements (FTAs) have spread very rapidly since the mid-1990s. There is increasing acceptance that comprehensive FTAs can expand trade and act as a building block for World Trade Organization (WTO) liberalization. They have come to be seen as vehicles for deeper, faster and broader liberalization. The Australian Government, for instance, is open to considering FTAs which are comprehensive and in line with our WTO obligations, and which can deliver market access gains not achievable in a similar timeframe elsewhere. The paper considers the proliferation of FTAs in the context of their implications for the seafood industry in Australia and the global seafood industry more broadly.

INTRODUCTION
Free trade agreements (FTAs) have become an important focus of international trade initiatives in the last decade or so, including for Australia. This paper ranges quite broadly over aspects of FTAs, including their characteristics and the reasons they are spreading so rapidly. Their implications, in particular for the global seafood industry, are considered against the backdrop of recent trends in the industry, although the main focus of the paper is on Australia’s interests.

What are FTAs and why are they spreading?
In essence, FTAs liberalize trade in goods and services between two or more countries. Unlike customs unions, they do not involve common tariffs and other barriers for countries which are not part of the agreement, but they can, and increasingly do, cover a variety of other measures designed to facilitate trade between the parties, ranging from provisions on electronic commerce to intellectual property and competition policy.

FTAs are sanctioned under the World Trade Organization (WTO) under certain conditions. To comply with the WTO, agreements on goods must cover substantially all trade, and eliminate barriers between the parties within a reasonable timeframe (usually 10 years). Agreements on services must have “substantial sectoral coverage” and eliminate “substantially all discrimination” within a reasonable timeframe.

There is increasing acceptance that comprehensive FTAs can expand trade and act as a building block for WTO liberalization by achieving deeper, broader, and more

1 Views expressed are those of the author and should not be considered as representing the views of the Department of Foreign Affairs and Trade, portfolio Ministers, or the Australian Government.
2 According to the Understanding on the Interpretation of Article XXIV of the General Agreement on Tariffs and Trade 1994, the time taken to eliminate barriers should exceed 10 years only in exceptional cases.
innovative outcomes between FTA partners, than might reasonably be expected to be achieved through the WTO, which requires consensus among its 148 members. However, there are also potential risks. These may arise from trade diverted away from other countries to FTA partners because of the preferences agreed to, lessened benefits due to the exclusion from FTAs of sensitive sectors such as agriculture, the cost of applying different rules among agreements, and the development of trade blocs. In general, the more liberal and forward looking an FTA, the greater is the likelihood that benefits will outweigh any costs.

FTAs have spread rapidly since the mid-1990s. A recent report to the WTO noted that a total of about 300 preferential agreements had been notified between 1948 and October 2004, although many of them were no longer in force. The striking statistic, however, is that more than half of these agreements, nearly 180, were notified after January 1995. The report forecast that some 300 agreements might be in force by the end of 2007, although the pace at which they are spreading in our region suggests that this might be a conservative estimate.

There are a number of reasons for rapid growth in FTAs and other preferential agreements. The examples of European and North American integration (through the European Union’s Single Market and the North American Free Trade Agreement (NAFTA)) were a spur in the early 1990s. In recent years, a variety of factors have been driving growth. FTAs have come to be seen as vehicles for deeper, faster and broader liberalization than the multilateral system can deliver. Countries have also moved to negotiate FTAs because they fear the costs of exclusion from key markets as their rivals negotiate better access. Doubts about progress in multilateral rounds have also encouraged countries to look to alternative options.

The costs associated with FTAs, for example, trade diversion costs, or adjustment costs, have declined as general trade barriers have declined. Some countries, for instance the United States of America in the Middle East, have sought to use FTAs to promote broader political or strategic objectives.

In East Asia, FTAs were slow to take hold, but are now spreading quite rapidly, with a large number of negotiations under way. There is a complex set of dynamics here.

- The Association of Southeast Asian Nations (ASEAN) has been actively seeking new agreements to underpin stronger economic growth and attract further investment. Within ASEAN, Singapore and Thailand have been particularly active in seeking bilateral FTAs. This has encouraged other ASEAN economies, such as Malaysia, to seek their own FTAs.
- There has been an historic shift of policy by Japan and Korea, both of which had long ruled out participation in FTAs. Japan, for example, which was one of the last countries to negotiate an FTA, has now concluded FTAs with Singapore and Mexico, and is at varying stages in considering or negotiating others.
- China and Japan are looking to increase their influence in East Asia, including by developing agreements with ASEAN economies.
- The United States of America has showed interest in FTA options in the region. To date, it has concluded only one FTA (with Singapore) in East Asia, and is negotiating with one other (Thailand).
- Other countries from outside East Asia (for example, India) are looking to FTAs with East Asian economies to further develop trading and investment links with them.

The number of agreements could well increase rapidly in the next few years. For instance, China has around nine FTA negotiations in process, and is pursuing a number

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AustraliA's approach to FTAs

Historically, Australia’s FTA agenda focused on New Zealand, first through the 1966 NZ Australia FTA and then through the 1983 Australia-New Zealand Closer Economic Relations Trade Agreement (known as CER). CER has developed into one of the world’s most open and successful trade agreements, resulting in an impressive expansion of two-way trade between Australia and New Zealand. Australia also participated in some non-reciprocal arrangements with others, in particular in the South Pacific and Papua New Guinea. For some time after 1985, however, Australia did not enter negotiations for new FTAs.

In recent years, Australia has become open to considering FTAs with other economies which are comprehensive and in line with its WTO obligations, and which can deliver market access gains which could not be achieved in a similar timeframe elsewhere.

Agreements have now been concluded with Singapore, the United States of America and Thailand under this new approach. The agreement with Singapore entered into force in July 2003 and those with the United States of America and Thailand in January 2005. New FTAs are currently being negotiated bilaterally with China, Malaysia, and the United Arab Emirates, and along with New Zealand, with ASEAN as a group. An FTA feasibility study with Japan is also under way.

Australia’s active approach on FTAs does not, of course, mean that it has abandoned the multilateral trading system. A substantial outcome from the Doha Round remains Australia’s top trade priority and the primary focus of its trade diplomacy. For instance, Australian trade negotiators are working closely with other like-minded nations to secure an ambitious outcome for the seafood industry in the Doha Round. Disciplining fisheries subsidies that are production and trade distorting is a key objective.

In particular, the different levels of trade diplomacy can be pursued simultaneously and are mutually reinforcing. By delivering access gains faster in priority markets, bilateral and regional agreements can help set a high benchmark for the multilateral system and stimulate further liberalization under it. At the same time, WTO rules and commitments provide a basis for further bilateral or regional liberalization.

All this, as the Deputy Prime Minister and Trade Minister, Mark Vaile, has pointed out, makes for the most active trade agenda in Australia’s history.

The global seafood industry

International trade in fish and fishery products has roughly quadrupled over the last twenty years. The value of world fish exports has risen from US$16 billion in 1980 to US$58 billion in 2003, with developing countries accounting for around half of that trade. Developed countries account for around 80 percent of total world imports, most of which is imported by the European Union (EU), Japan and the United States of America.

For many developing countries, trade in fish is a significant source of foreign currency earnings, in addition to the sector’s important role of income generation, employment and food security (Figure 1).

Because fish is highly perishable, over 90 percent of seafood products are traded internationally in frozen or in processed form. In 2003, 62.6 percent of the world fish supply came from capture fisheries production. The remainder came from aquaculture (Figure 2). As natural fisheries approach their optimal level of utilisation, growth in fisheries production to meet demand can be expected to come from aquaculture. This can already be seen in recent trends in the relative contribution of aquaculture and capture fisheries to food fish consumption, especially in China.
More generally, trade in developing countries is gradually evolving from the export of raw materials for the processing industry in developed countries to high-value live fish or value-added products. Some countries are also importing raw material for further processing and re-export.

There are clear efficiency gains to be realised by avoiding imposition of trade barriers and reducing tariffs on seafood products. In particular, freer trade will encourage the efficient, cost-effective, development of aquaculture and the processing of fish from capture fisheries.

**IMPLICATIONS OF FTAs FOR GLOBAL SEAFOOD TRADE**

The challenges faced by the global seafood industry exist regardless of FTAs. This applies especially to the challenges to developed country producers from developing countries, with their access to lower labour costs as well as emerging aquaculture technologies. FTAs can, however, help to harness many of the potential gains from more efficient and effective use of resources and market access opportunities available to the industry, including through the use of new technologies. This can benefit not just FTA partners. It can also help to pave the way for broader agreements elsewhere, including in the WTO.

After the Uruguay Round, completed in 1993, average weighted tariffs on fish were reduced to 4.5 percent in developed countries. However, this low rate hides some high tariff peaks for selected species and products, and cases of tariff escalation, where tariffs escalate as fish products are processed and subject to value adding. Seafood tariffs are generally higher in developing countries. This not only inhibits trade with the developed world, but also trade between developing countries.

Seafood trade is also hampered by non-tariff barriers. For instance, local regulations often complicate and disrupt the efficient management of supply chains. These can stall the implementation of arrangements to capitalise on new technologies for cost effective ways to ensure freshness and greater safety.

It is hoped that the Doha Round will deliver substantial further liberalization. In the meantime, for seafood as for other industries, FTAs can generate access gains faster in priority markets, both bilateral and regional, and set new benchmarks for further liberalization.
Free Trade Agreements: implications for global seafood supply and demand

FTAs not only improve access for seafood exporters in key markets by eliminating or reducing tariff and non-tariff barriers, they can also:

- boost market security for producers by diversifying the range of markets open to them if one or other major markets are disrupted, such as during the Severe Acute Respiratory Syndrome (SARS) crisis;
- boost investment, output and employment in the seafood industry, particularly in fishing communities, including through investment in new technologies, and in joint ventures, boosting development of the local industry all along the supply chain, including in the fast emerging aquaculture sector;
- benefit other sectors participating in or affected by seafood supply chains (including, for example, the construction industry and transport and related logistics sectors);
- reduce the cost of imported raw materials and capital equipment provided from partner economies; and
- spur industry efficiency and productivity by sharpening competition between local producers and producers in FTA partner countries.

IMPLICATIONS FOR AUSTRALIA

A more tangible sense of the benefits available to Australia from its FTAs, including for the seafood industry, can be gleaned by looking at its two most recently agreed FTAs: with the United States of America, and with Thailand.

The Australia-United States FTA (AUSFTA) provides open access to the world’s largest economy, and the most dynamic and technologically advanced of the major developed economies. Seafood trade became duty free from day one. United States’ tariffs on all Australian fish and fish products were removed, including the 35 percent tariff on canned tuna, the 15 percent tariff on canned sardines and the 7.5 percent tariff on crabmeat. In all, 48 separate rates of duty on various seafood products were removed, providing Australian producers with an opportunity to access the lucrative United States market. Australia’s tariffs, such as the 5 percent tariff on canned tuna, which were somewhat lower, were also all removed.

The Thailand-Australia FTA (TAFTA) similarly offers important benefits. Thailand is already an important market for Australia (its ninth largest for manufactures), but many Australian companies had been locked out of the market by high tariffs, for instance on motor vehicles. Under TAFTA, more than half of Thailand’s tariffs on Australian goods were eliminated on 1 January 2005; 98 percent will be reduced to zero by 2010.

Under TAFTA, seafood trade will be tariff free. Australia reduced its tariff of 5 percent on canned tuna to 2.5 percent on entry into force of TAFTA and will eliminate this tariff in 2007. Thailand will eliminate all tariffs on fish products. These were predominantly at 5 percent, with some as high as 30 percent. Some 20 percent tariffs were eliminated on 1 January 2005. The rest will phase to zero by 2010.

In both AUSFTA and TAFTA, Australia retains its right to anti-dumping or countervailing action in the event of unfair trade causing material injury to specific industries.

THE FORWARD AGENDA AND ITS IMPLICATIONS FOR SEAFOOD

The FTAs Australia is negotiating with China, Malaysia, the United Arab Emirates, and with the 10 ASEAN economies also have the potential to boost Australia’s trade in seafood and deliver mutual benefits to the seafood industries in partner economies. The FTA being negotiated with China is potentially the most significant of these agreements.

With or without an FTA, China’s economic emergence poses great challenges and opportunities for Australian businesses. That said, a comprehensive FTA would
offer Australian seafood producers substantial opportunities, especially in higher unit value products such as lobster and abalone, in what is now Australia’s second largest market overall for merchandise exports. For seafood, China’s average tariff is currently 10.4 percent, after being as high as 15.3 percent in 2001 prior to accession to the WTO, although Most Favoured Nation (MFN) seafood tariffs are still as high as 17 percent.

Australia wants to work with China to address not just tariff barriers, but also to address customs and a range of ‘behind the border’ issues, including intellectual property rights, to ensure that standards are transparent and applied consistently. Australia also wants to progress issues of shared interest such as the sustainability of fisheries, promoting aquaculture, and encouraging joint ventures.

Different industries will be affected in different ways by a FTA with China. The Australian Government is continuing to consult extensively with industry, including the seafood industry, building on the consultations already undertaken during the joint feasibility study completed earlier in 2005. The Government welcomes submissions on industries’ interests and concerns relevant to the negotiations. As with all Australia’s other FTAs, the Government is committed to maintaining effective trade remedies against imports causing material injury to domestic industry under any agreement with China.

Agreements with ASEAN, Malaysia and the United Arab Emirates similarly offer prospects of improved access, and will build on Australia’s already strong links with those economies. Australia’s annual seafood exports to ASEAN countries are currently around AU$130 million, or 9.5 percent of those to all destinations. In most ASEAN economies, seafood exporters face a range of tariff and non-tariff barriers. In Malaysia, for example, average tariffs on fish and fish products are low at 2.9 percent but there are peaks that affect key exporters, with several lines as high as 20 percent. Eliminating such barriers under an FTA could open up new opportunities for both the Australian and Malaysian industries, with flow-on effects for other industries supplying inputs or

![Figure 3: China Fisheries production](source: FAO)

![Figure 4: China’s Trade in Fish Products](source: FAO)
benefiting more broadly from higher incomes. In other ASEAN countries, examples of average tariffs on seafood include 5.3 percent in Indonesia and 8.4 percent in the Philippines.

Seafood exports to the United Arab Emirates amount to just AU$1.2 million. The UAE is tariff free but there are concerns about shelf life and labelling requirements, and about legalisation of documents, which need to be addressed.

CONCLUSIONS

The picture outlined above is one of a number of economies simultaneously negotiating free trade agreements in the region, or positioning to negotiate them. It is also part of an emerging larger picture involving the future regional order in the Asia Pacific area and, from Australia’s perspective, its place in it.

Australia’s approach has been to seek to deepen its economic engagement with its trading partners. This is delivering important benefits in a number of areas and across a broad range of industries, not least the seafood industry, as they adjust to take advantage of the opportunities that closer engagement presents.

In the case of the seafood industry, the key challenges are to harness the major changes under way to deliver the greatest benefits possible to both producers and consumers. In particular, the increasing role of aquaculture and the development of more advanced supply chain technologies, along with the emergence of China as a major exporter and importer of seafood, are together fundamentally changing trading patterns worldwide.

Comprehensive FTAs help to quicken the pace of integration between key markets and to set benchmarks for agreements elsewhere, including in the WTO. In doing so, they can play an important role in putting in place trade rules that encourage production to meet demand as effectively as possible, and can contribute to the continuing development of trade in seafood worldwide.

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International food standards: trends and significance to the seafood sector

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ABSTRACT
The FAO/WHO Codex Alimentarius Commission (CAC) or Codex is an intergovernmental body whose purpose is to develop international food standards with the dual objective of protecting the health of consumers and ensuring fair practices in food trade. Australia, as a member of Codex, and in the interest of ensuring that the international standards are based on science, participates in standards development within Codex.

Issues relevant to the seafood industry span a number of Codex Committees. These include the Codex Committee on Fish and Fishery Products, as well as a number of horizontal committees relating to all commodities, including seafood. Some standards under discussion are particularly pertinent to seafood, including the development of Principles for the Application of Traceability/Product Tracing in the Context of Food Import and Export Inspection and Certification Systems. The Codex Committee on Food Hygiene (CCFH) has also stepped up its work in the field of biological risk management, including developing risk profiles for a number of seafood. This paper covers current developments in Codex and their relevance to the seafood sector.

INTRODUCTION
The Codex Alimentarius, or the ‘food code’, has been under development by the FAO/WHO Codex Alimentarius Commission (CAC) for over 40 years and has grown to become the global reference point for national food control agencies and international food trade. Codex has an enormous impact not only on national food regulatory bodies, but also on the thinking of food producers and processors, as well as on the awareness of the end users, consumers. Its influence extends to every continent, and its contribution to the protection of public health and fair practices in the food trade is immeasurable.

The Codex Alimentarius system presents a unique opportunity for all countries to join the international community in formulating and harmonizing food standards. It also allows them a role in the development of guidelines for hygienic food processing practices and recommendations relating to compliance with Codex standards. Like other governments, the Australian Government recognises the significant impact Codex standards can have and places significant resources into Codex development.

negotiation processes, especially to uphold Australian food safety and industry competitiveness and export trade interests.

Codex has relevance to international food trade and the ever-increasing global food market. The advantages of having universally uniform food standards for the protection of consumers are self-evident. It is not surprising, therefore, that the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT) both encourage the international harmonization of food standards. Products of the Uruguay Round of multinational trade negotiations, these Agreements cite international standards, guidelines and recommendations as the preferred measures for facilitating international trade in food. As such, Codex standards have become the benchmarks against which national food measures and regulations are evaluated within the legal parameters of WTO Agreements.

The World Organisation for Animal Health (OIE) standards are also recognised by the WTO as international sanitary rules. The OIE is an observer organization of CAC. This is useful for encouraging the flow of information and the exchange of data, and avoids gaps and duplication between the two standards setting bodies. The relationship between Codex and OIE is particularly important for addressing human pathogens carried by food-producing animals that may transfer to humans via food. The relationship between Codex and OIE also facilitates the development of ‘whole of supply chain’ requirements to address food hazards in a more comprehensive manner.

CAC operates under a committee system, consisting of the Commission and its Executive Committee plus commodity, horizontal, specific issue task forces and regional committees.

The Commission chooses proposals for new international standards using a set of established criteria. Work is allocated to the most suitable Committee and all proposals must then undergo an eight-step standards development process before a new standard can be adopted by a full meeting of the Commission. Throughout the development process, expert technical bodies are often engaged and more than 170 countries are consulted.

ISSUES FOR CONSIDERATION BY THE SEAFOOD INDUSTRY

Issues relevant to the seafood industry span a number of Codex committees. Apart from the work programme being undertaken by the Codex Committee on Fish and Fishery Products, a large amount of work is undertaken within horizontal committees that cover issues relevant to all commodities, including seafood.

Some standards under discussion within Codex may have a particular impact on the seafood industry.

**Codex Committee on Food Imports and Exports Inspection and Certification Systems**

The Codex Committee on Food Import and Export Certification and Inspection Systems has developed ‘Proposed Draft Principles for Application of Traceability/Product Tracing in the Context of Food Inspection and Certification Systems’. A definition of Traceability/Product Tracing was adopted by CAC in 2004: “Traceability/Product Tracing: the ability to follow the movement of a food through specified stage(s) of production, processing and distribution”. Product tracing is an important tool at the regulatory level to ensure that food safety incidents can be quickly identified and managed. Product traceability is also becoming an important commercial tool for quality assurance.

This CAC document relates to the application of traceability/product tracing within food inspection and certification systems and takes into consideration other work
within Codex Committees and within other international organizations such as the International Organization for Standardization (ISO).

A working group, chaired by Australia, with the assistance of two vice chairs (Argentina and Norway), prepared a revised set of Principles for the Application of Traceability/Product Tracing for discussion at a meeting of members of the working group in Brussels in September 2005. The outcomes of this working group meeting, that is, the revised set of principles, will be discussed further at the 14th Session of CCFICS in Melbourne in late 2005.

Food Hygiene
Diseases caused by food borne microbial hazards constitute a worldwide public health concern. The incidence of food-borne diseases has increased in many parts of the world. The globalization of food markets has made managing the associated risks more challenging.

The Codex Committee on Food Hygiene covers issues relevant to seafood in particular, the Proposed Guidelines on the Application of General Principles of Food Hygiene to the [Control] of Listeria Monocytogenes in Ready to Eat Foods, (Adopted at Step 5 at 28th Session of Codex Alimentarius Commission)

The scope of these proposed Guidelines will be applicable throughout the food chain, from primary production through to consumption. Based on available risk assessments and epidemiological evaluation, the guidelines focus on control measures to prevent the contamination and growth of *Listeria Monocytogenes* in ready-to-eat foods. The Guidelines highlight key control measures affecting factors that influence the frequency and extent of contamination in these foods. Control measures are expressed in general terms within the Recommended International Code of Practice – General Principle of Food Hygiene (CAC/RCP 1-1969, Rev. 3-1997, Amd. (1999), as part of a general strategy for the control of food-borne pathogens. It is assumed that these guidelines will facilitate the implementation of the General Principles of Food Hygiene. The principles reiterate the need for special attention for the control of *Listeria monocytogenes*.

The Codex Committee on Food Hygiene has increased its commitment to and the extent of its work in the field of microbiological risk analysis, particularly with respect to microbiological risk assessment and microbiological risk management. As part of this effort, CCFH has identified several pathogen/commodity combinations that present a potential significant public health threat for food subject to international trade and for which risk management strategies are appropriate.

A Codex discussion paper Risk Management Strategies for *Vibrio* spp in Seafood presents a risk profile for the occurrence of *V parahaemolyticus* in fish and shellfish. Based on these findings the authors provide recommendations to the Food Hygiene Committee on the need to review existing Codex texts depending on whether they provide sufficient information for the hygienic control of *Vibrio* in these products and, if not, to recommend the development of specific risk management guidance.

The paper recommends that the Committee request the independent FAO/WHO Joint Expert Group on Microbiological Risk Assessment to assess the impact of *V parahaemolyticus* on human health. This assessment would cover a range of areas including: the temperature of seafood throughout distribution and storage; the effects of washing with disinfected seawater or potable water after harvest; the impact on the number of food-borne outbreaks that would occur with guidelines that allow no more than certain levels of the pathogen in seafood; and the effects of different post harvest treatments.
Viruses in Food

Food-borne outbreaks have occurred in which people are exposed simultaneously to mixtures of pathogenic viruses. Progress in the field of virus detection in food is slow and fraught with technical complexities.

A discussion paper, outlining progress in understanding viruses that may be transmitted through the food chain, will be considered by the Food Hygiene Committee at its next session in 2006. This document provides a sample of different food sectors and describes the potential public health problems. One area highlighted is the role of food-borne transmission of noro-viruses.

Biotechnology

Codex has re-convened the Ad Hoc Intergovernmental Task Force on Food Derived from Biotechnology. This Task Force will meet in Chiba, Japan in September 2005. The main agenda item for the meeting is a discussion on the future work programme for the Task Force. In determining its priorities the Task Force will take into consideration its four-year timeline for finalising any work undertaken.

Proposals for new activities put forward by member countries include work on foods derived from transgenic animals and foods derived from cloned animals. Japan has specifically put forward a proposal for new work on foods derived from recombinant-DNA fish.

STAKEHOLDER ENGAGEMENT

By having knowledge of the standards being discussed in Codex, industry members gain the advantage of being able to contribute to the development of these standards, and the opportunity to strategically plan for the future impacts the standards may have on their industry. All food producers and processors who may be affected by Codex standards should be encouraged to review and comment on standards under development. Indeed, as Codex negotiations work on a government-to-government basis, industry technical input is vital to ensure that producer and processor interests are taken into consideration.

In Australia, Codex Australia is the liaison point with the food industry, consumers, traders and other stakeholders. This liaison ensures that the government is provided with an appropriate balance of policy and technical advice on which to base Australia’s input into the work of Codex. Similar ‘Codex Contact Points’ are in operation in other countries.

Codex Australia, together with the National Food Industry Strategy, has put significant resources into improving stakeholder access to Codex standards under development, and to facilitate their input into Australian positions in advance of Codex committee meetings. Apart from providing information regarding the structure, functions and activities of the Codex Alimentarius Commission, the Codex Australia website allows stakeholders to register to receive Codex documents and summaries pertinent to their industry sector. Stakeholders can also register to receive the e-bulletin ‘Setting the Standard’ that regularly reports on Codex happenings. The website also provides a map of Codex activities which summarises the issues being dealt with across all Codex committees. In addition, Codex Australia has established an annual Codex Industry Stakeholder Forum. The forum offers stakeholders an update of Codex activities, and the Australian Government an opportunity to listen to industry priorities.

Australian positions on Codex matters are managed in the following way. Stakeholder comments are collated by Codex Australia and forwarded to the appropriate Australian delegation leader. Australian positions then undergo a consultation process via inter-agency meetings and through an Advisory Panel for each committee, which includes
interested government, industry and other stakeholders. Similar Codex consultation processes have been established in other countries.

CONCLUSIONS
All industry stakeholders, in all countries, should engage in the Codex process to ensure that their interests are taken into consideration in the development of these important international standards. In this way, standards will be informed by the fullest information possible and are more likely to achieve the dual objective of protecting the health of consumers, and ensuring fair practices in food trade.
SECTION 2

Major importers: requirements and opportunities
European Union importing requirements and opportunities

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ABSTRACT
Consumers in the 25 Member States of the European Union (EU) want seafood that is safe and wholesome. The concern of the EU is to make sure that the food its citizens eat is of the same high standard, whether it comes from inside or outside the EU. Since the bovine spongiform encephalopathy (BSE) crisis the EU has made a political choice not to compromise over food safety rules. The average EU fish consumption stands at 22.7 kilograms per capita per year, which is above the world average and is continuing to grow.

The increasing depletion of EU fishery resources has resulted in a drop in catches of about 10 percent over the past decade. As consumer demand has increased by nearly 10 percent in the same period, the shortfall has been made up by growth in imports, now accounting for 64 percent of supply needs.

This provides an obvious opportunity for exporters from around the world. This paper outlines the EU regulatory system for fisheries products, principally with regard to revised health legislation. The role of different actors involved in the legislative process and in ensuring food safety is also presented. Harmonised health rules were introduced at the beginning of the 1990s and these have been updated and will apply from 1 January 2006. The same rules apply to the EU internal market as to imports. Information is given on initiatives to facilitate trade in safe food and to help third counties, particularly developing countries, to better understand the EU regulatory system.

INTRODUCING THE EUROPEAN UNION OF 2005
The European Union (EU) is a family of 25 democratic European countries, called Member States, which work together for peace and prosperity based on the rule of law. The historical roots of the EU date back to the years after the Second World War when there was a strong will to bring to an end the killing and destruction of war which had been all too common in Europe in earlier years. The Treaty of Rome signed in 1957 established the European Economic Community which was renamed the European Community (EC) in 2002. In 2002 the Treaty on European Union was signed.

The EU is not a state, yet it is more than an international organisation. Its population grew to 450 million when ten new Member States joined on 1 May 2004. At this stage the number of official languages increased to 20. The EU is characterised by ‘four freedoms’, in that people, goods, services and money can move freely within its borders. Under the European Economic Area Treaty of 1995, three additional states, Norway, Iceland and Lichtenstein became part of the single market, although not part of the EU itself. The Member States have set up common institutions to which they delegate some of their sovereignty so that decisions on specific matters of joint interest can be made.
Among the EU Institutions is the European Parliament, which is elected by the people of Europe. It approves the EU budget and has a say in decision making. It is co-legislator with the Council for health legislation having the power of co-decision. For fisheries and trade legislation, for the moment, it has a less powerful role. In these fields it is consulted for its opinion. There are more than 700 Members of the European Parliament coming from all corners of Europe. The Council of the EU, also known as the Council of Ministers, represents the governments of the Member States and decides on legislation. It enacts legislation in the form of regulations, directives and decisions. A regulation is the strongest form of legislation. Regulations have direct effect and are binding in their entirety. Directives on the other hand set out what is to be achieved via implementing rules in the Member States. The Council is governed by a rotating Presidency with one Member State in the chair for a period of six months.

The European Commission (EC) is the driving force and executive body of the EU with more than 20,000 staff. It has the sole right of initiative to propose legislation and has some decision-making powers delegated from the Council. It is the guardian of the Treaties. The Court of Justice ensures that EU legislation is complied with and the Court of Auditors controls budget spending. The Parliament has its seat in Strasbourg but its Committees meet in Brussels. The Council has its headquarters in Brussels. The Commission also has its headquarters in Brussels, but some of its departments are based in Luxembourg and the Food and Veterinary Office (FVO) is based at Grange near Dublin, Ireland.

The Commission is a collegiate body with 25 Commissioners. The current Commission President is Mr José Manuel Barroso from Portugal, under him 24 fellow Commissioners are responsible for Commission departments, known as Directorates-General (DG). Commissioners with portfolios of strong relevance to the seafood sector are, Mr Joe Borg, Fisheries and Maritime Affairs DG, Mr Markos Kyprianou, Health and Consumer Protection DG, Mr Peter Mandelson, Trade DG and Mr Günter Verheugen, Enterprise and Industry DG.

Within the Health and Consumer Protection DG, three Directorates dealing with health issues are particularly relevant for the purpose of this paper; these are concerned with safety of the food chain, international questions, animal health and welfare, and food and veterinary inspection (FVO). Two Community Agencies are also relevant: the European Food Safety Authority based in Parma, Italy is responsible for the provision of scientific advice to underpin legislation; and the European Medicines Agency, based in London, is responsible for ensuring that medicines for human and veterinary use are safe, effective and of high quality.

**OPPORTUNITIES IN THE EU MARKET**

The EU is increasingly dependent on imports of fish and fishery products to meet its needs. The only sector with a higher reliance on imports is fruit and vegetables. In 2005, the EU25 imported in excess of €14 billion worth of fish and fishery products, while exports amounting to €2.5 billion. The EU trade deficit in fish and fishery products continues to widen and has reached a new record of €11.7 billion.

Most imports go to Spain (20 percent), followed by the United Kingdom (13 percent) and Denmark (11 percent). Some 55 percent of imports came from ten countries with Norway accounting for the largest share (17 percent), followed by Iceland (8 percent) and China (6 percent). Other important exporting countries are Morocco, Argentina, the United States of America, Faroe Islands, Chile and India. In 2005 the most significant imported products in value terms were fish fillets (€3.3 billion), crustaceans (€2.4 billion) and fresh or chilled fish excluding fillets (€2 billion). There is a high demand for semi-processed fish, which can be imported at low tariff rates, to undergo secondary processing in the EU.
The main export items were frozen fish (€879 million), prepared and preserved fish (€307 million) and fresh or chilled fish excluding fillets (€305 million). The trends in EU trade with countries outside the EU for fish and fishery products from 1988 onwards can be viewed in graphical form at the following address: http://ec.europa.eu/trade/issues/sectoral/agri_fish/fish/index_en.htm.

Specific details for three of the more important imported products, shrimps, tuna and salmon can be viewed at the related site: http://ec.europa.eu/trade/issues/sectoral/agri_fish/fish/pq_en.htm.

The growth in aquaculture production has led to a greater role for farmed aquatic products in international trade but the exact share cannot be established with any accuracy because of the lack of a reliable breakdown of trade statistics (i.e. customs nomenclatures do not necessarily distinguish between wild and farmed fish).

Trade has proved to be one of the most effective tools to foster development. Increased trade with developing countries will enhance their export earnings, promote their industrialisation and encourage the diversification of their economies. The classical instrument for achieving these objectives is tariff preferences, where the goods that the EU imports from developing countries are not submitted to the normal customs duties. Tariff preferences provide an incentive to traders to import products from developing countries, thereby helping them to compete on international markets.

In 1968, the United Nations Conference on Trade and Development (UNCTAD) recommended the creation of a ‘Generalised System of Tariff Preferences’ (GSP) under which industrialised countries would grant trade preferences to all developing countries. This authorises developed countries to establish individual GSP schemes. The European Community was the first to implement a GSP scheme in 1971. The EU GSP grants products imported from GSP beneficiary countries either duty-free access or a tariff reduction, depending on which of the GSP arrangements a country enjoys. The EU GSP is implemented following cycles of ten years, for which general guidelines are drawn up. Guidelines for the period from 2006 to 2015 were adopted in 2004. In practice, the GSP is implemented by means of Council regulations, during the ten-year cycle. Based on the guidelines of 2004, a new GSP scheme was adopted in June 2005.

The EU is one of the key players in the World Trade Organization (WTO). This is because the EU has a common trade policy, where the European Commission negotiates on behalf of the Member States. As such, the EU is one of the driving forces behind the current round of multilateral trade negotiations in the WTO, the Doha Development Agenda. This round comprises both further market opening and additional rule making, underpinned by commitments to take measures necessary to integrate developing countries into the world trading system, notably by strengthening assistance to build capacity. The main objective of the new round is to put development at the heart of the world trade system in a way that will help combat poverty.

Fishery products play an important role in the European diet as a valuable source of protein and as a healthy food. Consumption within the EU varies, from a high of 56.5 kilograms per person per year in Portugal to a low of 4.4 kilograms per person in Hungary. With the enlargement of the EU to 25 Member States in 2004, average EU consumption stood at 22.7 kilograms per person per year, slightly higher than the world average of 20 kilograms. With Bulgaria and Romania scheduled to join the EU in 2007 the total EU population will increase from just over 450 million to nearly half a billion people.

Strengthening Fishery Products Health Conditions is a five-year programme financed by European Development Fund on behalf of the Group of African, Caribbean and Pacific States (ACP). It offers assistance to institutions and others in the ACP states and in the Overseas Countries and Territories (OCT) with a strong focus on the strengthening of Competent Authorities (CAs). The aim of the programme, which commenced activity in November 2002, is to improve the sanitary conditions...
for fishery products as food for human consumption, so as to increase the income of those countries by developing trade and the optimal use of available resources (for details see: http://www.sfp-acp.eu/).

MODERNIZATION OF EU FOOD LEGISLATION
Following the problems connected with bovine spongiform encephalopathy (BSE) the EU carried out a number of reforms to protect the health of consumers. In 1997 the Commission undertook a radical reorganisation of the departments concerned with consumer health and food safety, with particular emphasis on the separation of responsibilities for legislation, inspection, and scientific consultation, and on ensuring the excellence of scientific advice.

In this context a major overhaul was carried out on the EU Hygiene Directives which were gradually developed between 1964 and 1991. Two Directives, one on placing on the market of fishery products and a second on placing on the market of live bivalve molluscs, were agreed in 1991, to facilitate the completion of the European single market in 1993. This overhaul followed a specific recommendation in the EU White Paper on Food Safety to recast horizontal and vertical directives on the hygiene of food of plant and animal origin into a Regulation on hygiene. Among the objectives was to clarify the responsibility of food operators, to introduce the systematic implementation of the system of Hazard Analysis and Critical Control Points (HACCP) in establishments, and to apply hygiene rules at all levels of the food chain, including primary production. It was decided to improve, simplify and modernise this legislation and to separate aspects of food hygiene from animal health and food control issues.

Two years on from the White Paper, agreement was reached on a new general food law, Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and setting out procedures in matters of food safety. This framework regulation establishes risk analysis, with its three component parts of risk assessment, risk management, and risk communication, as a general basis of food law. It takes account of the ‘precautionary principle’ and sets out general provisions for imposing traceability of food and feed and establishes the Rapid Alert System for Food and Feed. This is a system, first set up in 1979, for the exchange of information on measures to ensure food safety. Weekly overviews are published on the Internet (see:http://ec.europa.eu/food/food/rapidalert/archive_en.htm).

A new set of legislation, known as the hygiene package, was finalised in 2004 to replace the former EU Hygiene Directives, with the date of application set as 1 January 2006. This includes:

- a regulation on hygiene of certain food of animal origin, Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin; and

Also part of this package are Council Directive 2002/99/EC of 16 December 2002,

**GENERAL FOOD HYGIENE**

Under Regulation 852/2004 all food business operators are to ensure that all stages for which they are responsible, from primary production (including fishing and aquaculture) up to and including the sale to the final consumer, are carried out in a hygienic way. Food business operators carrying out primary production and certain associated activities are to comply with the general hygiene provisions of part A of Annex I of the Regulation, including to:

- prevent contamination arising from water, soil, feed, veterinary products, waste etc.;
- take account of results from tests relevant to animal and human health;
- use medicines appropriately.

This Annex also contains provisions regarding record keeping and recommendations for guides to good hygiene practice.

Food business operators carrying out activities other than primary production are to comply with the general hygiene provisions of Annex II. This sets out the hygiene requirements for: food premises, including outside areas; transport conditions; equipment; food waste; water supply; personal hygiene of persons in contact with food; wrapping and packaging; heat treatment which may be used to process certain foodstuffs; and the training of food workers. Such food business operators are to apply the seven principles of HACCP introduced by Codex Alimentarius (code of international food standards drawn up by FAO/WHO. However, HACCP-based procedures are not required at the level of primary production. The Regulation introduces a system of registration or approval of food businesses. As regards trade, foodstuffs imported into the Community are to comply with the Community hygiene standards or with equivalent standards. Foodstuffs of animal origin exported out of the Community are to at least comply with the requirements that would apply if they were marketed within the Community, as well as to any requirements that may be imposed by the importing country.

The Community microbiological criteria for foodstuffs have subsequently been revised by Commission Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs. This lays down food safety criteria for certain important food-borne bacteria, their toxins and metabolites, such as listeria, and histamine in seafood. These criteria are applicable to products placed on the market during their entire shelf-life. The microbiological criteria have been developed in accordance with internationally recognised principles, such as those of Codex Alimentarius.

**FOOD OF ANIMAL ORIGIN**

The provisions of Regulation 853/2004 apply to unprocessed and processed products of animal origin, but not to foods consisting partly of products of plant origin. Establishments handling products of animal origin must be approved by the competent authority in their Member State. This does not apply to establishments engaged only in primary production, transport, or storage of products not requiring temperature-controlled storage conditions. Member States must keep up-to-date lists of approved

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6 OJ L 18, 23.1.2003, p.11  
7 OJ 157, 30.4.2004, p 33  
establishments, which are given an approval number with additional codes indicating the type of products of animal origin manufactured.

For live bivalve molluscs the Regulation specifies requirements in the following areas:

- production of live bivalve molluscs: three types of production area (Class A, B or C);
- harvesting of molluscs and their transportation to a dispatch or purification centre, relaying area or processing plant;
- relaying of molluscs in approved areas under optimal conditions of traceability and purification;
- essential equipment and hygiene conditions in dispatch and purification centres;
- health standards applicable to live bivalve molluscs: freshness and viability; microbiological criteria, evaluation of the presence of marine biotoxins and harmful substances in relation to the permissible daily intake;
- health marking, wrapping, labelling, storage and transport of live bivalve molluscs;
- rules applicable to scallops harvested outside classified areas.

There are requirements for fishery products with regard to:

- equipment and facilities on fishing vessels, factory vessels and freezer vessels: areas for receiving products taken on board, work and storage areas, refrigeration and freezing installations, pumping of waste and disinfection;
- hygiene on board fishing vessels, factory vessels and freezer vessels: cleanliness, protection from any form of contamination, washing with water and cold treatment;
- conditions of hygiene during and after the landing of fishery products: protection against any form of contamination, equipment used, auction and wholesale markets;
- fresh and frozen products, mechanically separated fish flesh, endo-parasites harmful to human health (visual examination), and cooked crustaceans and molluscs;
- health standards applicable to fishery products: evaluation of the presence of substances and toxins harmful to human health; and
- wrapping, packaging, storage and transport of fishery products.

OFFICIAL CONTROLS
Regulation 854/2004 lays down requirements as regards the approval of establishments by the competent authority. If during a control the competent authority identifies serious deficiencies on the part of a food business operator, it may withdraw this approval. Food business operators must provide the competent authority with all assistance needed to carry out the control, notably as regards access to premises and the presentation of documentation or records.

The official controls include audits of good hygiene practices and HACCP principles. Article 13 deals with listing of production sites for bivalve molluscs in third countries and Article 15 deals with landings of fresh fishery products in the Community by vessels flying the flag of a third country. Specific controls for various sectors are set out in the Annexes to the Regulation.

For live bivalve mollusc production the competent authority must fix the location and the boundaries of production areas. The production areas are divided into three classes:

- Class A areas: areas from which molluscs may be collected for direct human consumption;
- Class B areas: areas from which molluscs may be collected but may be placed on the market for human consumption only after treatment in a purification centre or after relaying;
• Class C areas: areas from which molluscs may be collected but may be placed on
the market only after relaying over a long period (at least two months), whether
or not combined with purification.

In order to enable production areas to be classified the competent authority must
make an inventory of the sources of pollution from human or animal origin and
examine the quantities of organic pollutants released during the different periods of
the year and their circulation characteristics. It must establish a sampling programme
to verify the microbiological quality of the bivalve molluscs and check for the presence
of toxin-producing plankton and chemical contaminants. This programme is based on
sampling plans that determine the frequency of these controls.

Where the results of sampling reveal non-compliance with the essential health
standards, the harvesting of molluscs is to be prohibited within the production area
concerned. The production area may not be re-opened until two consecutive analyses
separated by at least 48 hours produce satisfactory results. In addition to the monitoring
of relaying and production zones, a control system including laboratory tests must be
set up in order to verify that the requirements applicable to the end products are being
complied with.

In addition to the common control requirements, specific official controls on fishery
products are to be carried out at the time of landing or before first sale at an auction or
wholesale market. The official controls are to include:
• organoleptic surveillance testing;
• total volatile basic nitrogen tests;
• histamine testing;
• surveillance testing for contaminants;
• microbiological checks;
• parasite screening tests; and
• checks for the possible presence of poisonous fish species or fish containing
  biotoxins.

Fishery products are to be declared unfit for human consumption if organoleptic,
chemical or microbiological checks on such products reveal the presence, in excessive
quantities, of substances dangerous to human health.

IMPORTS: LISTS OF THIRD COUNTRIES AND LISTS OF ESTABLISHMENTS

The Commission draws up lists of third countries from which the importation of
products of animal origin is authorised. When drawing up these lists, it takes account
of: the existing legislation of the third country; the organisation and powers of the CA
and inspection services; the country’s health situation; the procedures for notifying
the Commission and international organisations; and compliance or equivalence with
Community requirements and Community controls.

Establishments, factory vessels or freezer vessels, as well as live bivalve mollusc
production and harvesting areas, must feature on a list drawn up by the Commission.
For inclusion in this list, the competent authority of the third country must guarantee
in particular that:
• the establishment, factory vessel or freezer vessel complies with the appropriate
  Community requirements or their equivalents;
• an official inspection service exists in the country concerned; and
• the inspection service must be able to prevent exportation in the event of failure
to comply with Community requirements or equivalent standards.

In the event of a favourable outcome of the EU controls, the Commission will list
an establishment, factory vessel, freezer vessel, or production/harvesting area for live
bivalve molluscs, approved by the CA of the third country and complying with the
existing EU provisions in the sectors of activity concerned. A specified procedure must
be followed for updating an already approved list.
CONTROLS: OPERATIONAL CRITERIA
A related piece of legislation, Regulation (EC) No 882/2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules⁹, lays down rules and general operational criteria for the performance of official controls. It specifies inter alia that official controls must be effective, that there should be adequate laboratory capacity including facilities and equipment, that contingency plans should be drawn up for implementation in case of a food crisis, that procedures should be documented, and that there should be appropriate training with regular updates for control staff. Article 46 contains provisions regarding Community controls in third countries. Under Article 50 there are provisions for support for developing countries, while Article 51 concerns training courses organised by the Commission to ensure a harmonised approach to official controls. The latter article has given rise to the initiative 'Better training for safer food', (see: http://ec.europa.eu/food/training/index_en.htm).

ANIMAL HEALTH RULES AND FOOD
Council Directive 2002/99/EC laying down the animal health rules¹⁰ harmonizes and strengthens veterinary public health requirements scattered throughout the EU legislation. It makes for the stricter application of animal health rules and a broader scope. The Directive thus covers all production stages of a product of animal origin: primary production, processing, transport, storage and sale. It also applies to live animals intended for human consumption. It lays down animal health conditions applicable to all these stages.

CONTAMINANTS AND RESIDUES
Contaminants are substances that have not been intentionally added to food. These substances may be present in food as a result of the various stages of its production, packaging, transport or holding. They also might result from environmental contamination as is more often the case for seafood. Contamination generally has a negative impact on the quality of food and may imply a risk to human health. The EU has taken measures to minimise contaminants in foodstuffs.

Community measures have been taken for the following contaminants of relevance to fish and seafood: metals (cadmium, lead, mercury, inorganic tin), dioxins and PCBs and polycyclic aromatic hydrocarbons (PAH).

For heavy metals: cadmium, lead and mercury, maximum levels have been established by Commission Regulation 466/2001/EC of 8 March 2001 setting maximum levels for certain contaminants in foodstuffs¹¹. For dioxins and PCB there is separate legislation for food and feed; in the case of food maximum limit values were set in Council Regulation (EC) No 2375/2001 of 29 November 2001¹². In the case of feed, maximum limit values were set in Council Directive 2001/102/EC¹³.

The European Food Safety Authority has published an opinion on the health risks related to the consumption of wild and farmed fish on 22 June 2005 with reference to these contaminants. This provides advice on the safety and nutritional contribution of wild and farmed fish. (See: http://www.efsa.europa.eu/en/science/contam/contam_opinions/1007.html).

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⁹ OJ L 191, 28.5.2005, p.1
¹⁰ See footnote 6
The issue of monitoring aquaculture products for the presence of residues of veterinary medicines and the illegal use of medicines is very important for trade purposes. The EU legislation relating to veterinary medicinal products is available at http://ec.europa.eu/enterprise/pharmaceuticals/index_en.htm. The section on ‘maximum residue limits’ lists products which are approved or which are banned for use in food producing animals. All other substances are not approved for use in food producing animals.

ASSISTANCE TO EXPORTERS TO THE EU
The EU launched an improved and multilingual version of its on-line Expanding Exports Helpdesk in February 2005, intended to help developing country producers seeking to export to EU markets. The new Expanding Exports Helpdesk service includes new on-line features and key services are now available in English, French, Spanish and Portuguese.

It comprises a ‘Market Place’ service to facilitate deals between traders and an enlarged database of trade statistics. Work on the second phase of the system, which will widen the range of information to cover product specific import requirements and internal taxation in the Member States is well advanced. This has been established as a platform for dialogue between exporters in the developing world and EU importers, see: ‘http://ec.europa.eu/trade/issues/global/development/pr040205_en.htm’ for further details.

The European law site ‘EUR-Lex’ on the Europa server provides direct free access to European Union law in the EU official languages, including the references cited in this paper. The system makes it possible to consult the Official Journal of the European Union and it includes inter alia, treaties, legislation, case-law and legislative proposals. It offers extensive search facilities and can be accessed at: ‘http://eur-lex.europa.eu/en/index.htm’.

CONCLUSIONS
The EU is now dependent on fish imports; 64 percent of fish and fish products consumed by EU citizens are now imported. This consumer demand is likely to grow. It provides enormous opportunities for fish exporting countries, including developing countries, to sell their products in EU markets.

The EU is determined to ensure the safety of products sold to its citizens. Food must meet high safety and quality standards regardless of where it is produced. A comprehensive regulatory system has been designed to ensure these standards are met. The relevant regulations and directives, and the role of the various EU decision-making bodies responsible for them, were outlined above.

The EU has also taken steps to provide information to third countries, in particular developing countries, to assist them in understanding the regulatory framework, so as to improve their compliance with safety standards and to enable them to take advantage of the trade opportunities the EU market offers.
In Japan a new era in food safety emerged following the outbreak of Bovine Spongiform Encephalopathy (BSE) in 2001. It led to the re-organization of parts of the Japanese government administration and the establishment of new regulations. The Food Safety Basic Law (FSBL) was enacted in 2003, while the Food Safety Commission (FSC) was given the responsibility for risk assessment. The Ministry of Agriculture, Forestry, and Fisheries and the Ministry of Health, Labour, and Welfare, both adjusted their roles accordingly. The Food Sanitation Law was also revised.

Sixty percent of the Japanese diet is imported foods. In recent years the number of import notifications submitted has increased significantly. This is due to a number of factors. Food industries have developed in exporting countries to produce more processed foods, so there are more types of food products available for importation. Some manufacturers in exporting countries have also started producing processed foods that better suit the tastes of Japanese consumers. Moreover, Japanese food businesses have shifted some of their manufacturing operations abroad, producing products that are then re-imported.

The FSBL states that, “Food safety may be affected by every element in a series of internal and external food supply process, from the production of agricultural, forestry, and fishery products to food sales.” The monitoring of imported foods includes measures to ensure sanitation at three stages: in countries of origin, at entry point, and in domestic distribution. Under this scenario, the Japanese government needs to cooperate more with exporting countries.

Various kinds of actions are taken to ensure food safety in Japan including; ensuring a quick response to import notifications submitted, developing the concept of risk assessment at FSC, and facilitating other approaches such as, HACCP, ISO22000, a traceability system, and a food labelling system in the private sector. This paper outlines the main import requirements in the Japanese system and the opportunities they present for exporting countries.

In Japan, a new era in food safety emerged following the first outbreak of Bovine Spongiform Encephalopathy (BSE) in September 2001. This shock, coupled with other food safety scandals led to the reorganization of relevant parts of the Japanese government administration and the establishment of new legislation. The Food Safety Basic Law was enacted and a new ministry, the Food Safety Commission was set up. A risk analysis approach to food safety was applied for the first time.
THE IMPORTANCE OF IMPORTED FOOD

According to “the Food Supply and Demand Table”, Japan’s domestic production supplies only 40 percent of the foods consumed (based on calories supplied). Therefore, Japan relies on imported foods for 60 percent of its food supply. In fishery products, 49 percent is produced domestically, while 51 percent is imported. Japan’s reliance on imported food means that stable imports are required. This presents opportunities for exporting countries.

The Food Safety Basic Law states that: “Food safety may be affected by every element in a series of internal and external food supply process, and shall be ensured by taking the necessary measures appropriately at each stage of the food supply process.” Measures are required at three stages: in exporting countries, at the point of entry, and in domestic distribution. It is therefore necessary for the Japanese government to cooperate with exporting countries.

IMPORT PROCEDURES

The procedures for importing products into Japan include:

- Submission of import notification: Those who wish to import food for direct sale or for further processing must first notify the relevant Minister. The notification form must be submitted along with other documents outlining the materials involved, the ingredients used and the manufacturing methods employed.
- Examination of documents at the quarantine station.
- Inspection: Most cargoes, relating to about 90 percent of import notifications, go directly into domestic distribution following document examination. The remaining 10 percent are required to be tested at laboratories. “Inspection” here includes laboratory testing.

There are three types of inspections.

Monitoring inspection system

Each year the monitoring inspection plan designates the items to be subjected to monitoring, based on annual import records and the record of non-compliance. The purpose of this monitoring is to collect data on the sanitation status of a range of food items so as to promote the smooth distribution of these items. While food sanitation supervisors carry out sample inspections, the import procedures can be continued without waiting for the inspection results. The cost of inspection is borne by the Japanese government.

If any violation is discovered in the process of the monitoring inspection, the inspection frequency is increased to 50 percent of notifications for the same product. If the same product exported from the same country or by the same manufacturer is found to violate the Law more than twice, any other foods exported from the same country or by the same manufacturer are considered to have a high probability of also violating the Law. These products are subsequently subjected to an inspection order.

Inspection order system

If, on examination of the relevant documentation, information about the country of origin, or the nature of the food, indicates a potential violation of the Food Sanitation Law or if the ‘record of non-compliance’ of similar items indicates potential violations, an ‘Inspection order’ will be issued by the Minister. When this occurs the import procedure will be suspended until it is proved that the food in question is in compliance. This system is mandatory and called the ‘Inspection Order System’. The importer is responsible for the cost of the inspection. The Minister orders the importer
Japanese importing requirements and opportunities

to take the inspection at a designated inspection laboratory. The Japan Frozen Foods Inspection Corporation\(^1\) is a major designated inspection laboratory.

Other inspection systems

There are two other inspection systems; “Guidance” inspection and “Administrative” inspection.

During guidance inspection, a food sanitation supervisor instructs an importer to conduct testing to check for agricultural chemicals, veterinary drugs and additives, where these have been found in the ‘violation information’ of similar foods. The importer is responsible for the cost of testing, and the import procedure will be suspended until compliance is clarified.

Administrative inspection is relatively rare. Administrative inspection is carried out by food sanitation supervisors, when food has been involved in an incident, or a potentially contaminating event, during transportation for confirmation. The cost of inspection is borne by government.

‘Monitoring’ and ‘administrative’ inspections are carried out at government quarantine stations, while the other two inspections, ‘ordered’ and ‘guidance’, are conducted in designated inspection laboratories.

SIMPLIFYING AND EXPEDITING IMPORT PROCEDURES

A range of procedures has been introduced to simplify and expedite the process of food importation.

<table>
<thead>
<tr>
<th>Name</th>
<th>System described</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Notification System</td>
<td>For all food and related products, the import notification form can be submitted up to 7 days before the estimated date of the cargo's arrival. Except for cargo that needs an inspection, a copy of the certificate of notification is issued immediately, either before the arrival of cargo or after the cargo is unloaded in a ‘bonded area’.</td>
</tr>
<tr>
<td>Planned Import system</td>
<td>When a cargo is inspected by a public inspection organization in the exporting country prior to export, and a report of the result from the inspection is attached to the cargo, the inspection at the quarantine station may be waived. Inspection items whose results are subject to change during transportation (bacteria, mycotoxin, etc.) are excluded from this. For further information on specifications and standards for food, food additives, etc. JETRO's home page can be consulted: <a href="http://www.jetro.go.jp/seis/standards_regulation/index.html">http://www.jetro.go.jp/seis/standards_regulation/index.html</a></td>
</tr>
<tr>
<td>Continuous Import of Same Items</td>
<td>When foods and related products are imported repeatedly and inspection results are attached to the import notification form at the initial import, and if document examination exposes no problems, inspection can be exempted for further importation in a given period.</td>
</tr>
<tr>
<td>Advance Approval of Imported Foods and related Products</td>
<td>When the imported food is confirmed to be in compliance with the Food Sanitation Law, the items and their manufacturers may be registered. Inspection at importation is exempted for these items for a certain period of time, and the certificate of notification is issued immediately following submission of import notification.</td>
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</tbody>
</table>

MONITORING AND GUIDANCE SYSTEM FOR IMPORTED FOODS

Figure 1 summarizes the monitoring and guidance system for imported foods. Under revised legislation the Imported Foods Monitoring and Guidance Plan was introduced. The results of the Plan were published for the first time for the 2004 financial year.

The plan covers three stages of the importation process: in the exporting country, at the point of entry, and during domestic distribution.

Exporting countries

Based on ‘violation information’, the Japanese government supports the efforts made in exporting countries to achieve food safety by:

\(^1\) The Japan Frozen Foods Inspection Corporation is the author’s corporation.
• holding bilateral talks with those countries;
• dispatching experts to those countries;
• providing technical support such as hosting overseas government officers for training; and
• promoting pre-export inspection by public organizations.

At entry point
As outlined above, there are three types of inspection at entry point. Information of past violations can be used in the process of ‘monitoring inspection’. The results of entry inspection are used as ‘violation information’.

Domestic distribution
Sample inspections are undertaken by Prefectures. If there is a violation of safety standards, it is notified as ‘violation information’. Overseas food safety information, pre-guidance such as import consultation, and voluntary management by importers are all used as violation information. There is a feedback loop of notification of ‘violation information’ back to exporting countries.

Results of the Plan for 2004
The results of the Plan for the financial year 2004 indicate that:
• 1.8 million notifications were submitted, corresponding to a total of 32 million tons of food;
• 190,000 notifications were subject to inspection, amounting to 10.4 percent of total import notifications;
• 77,000 monitoring inspections were enacted, relating to 4.2 percent of import notifications;
• 85,000 inspections were ordered, which amounts to 4.7 percent of import notifications. Inspection orders are fixed to an export country, local area, and/or intended products. Orders were focused on 14 products regardless of country of origin, and on 128 products from 24 exporting countries and one region;
• Other types of inspections accounted for 24,000 inspections or 1.3 percent of import notifications;
• 1,017 products were reshipped or disposed of after rejection, corresponding to only 0.05 percent of import notifications.

Changes of imports by weight and number of import notifications
Graph 1 shows the changes in the amount of imported foods by weight and by the number of import notifications submitted. The number of import notifications has increased significantly while weight is increasing slightly but steadily, suggesting that there are more players in the import market dealing with a relatively stable volume of product. This poses a challenge to the government; the administration must be able to handle the increasing volume of notifications to ensure efficiency in the importation process.

Reasons for increased notifications
The reasons for the increase in notifications can be illustrated using shrimps as an example. In the 1980s shrimp imports were limited to wild shrimps. Potential safety hazards were limited to the bleaching agents used to prevent black discoloration. In the late 1980s the black tiger shrimp aquaculture industry was established. New potential hazards in the form of antibiotics, such as oxytetracycline and tetracycline, were introduced to prevent disease. Food processing then developed further in exporting countries. Importing packaged processed shrimp products became popular. The Japanese food industry then began shifting some of its manufacturing bases to
Asian countries, whose products were subsequently imported back into Japan. In addition, new products emerged on the market, specifically designed to meet Japanese requirements or taste. Initially these were limited to fried shrimp products. Now they include shrimp tempura (deep-fried), shrimp chili sauce and seafood mixes to name just a few. Consequently, materials and inspection items increased, corresponding to the food additives, microorganisms, antibiotics and potential food contamination substances involved. The result is that there are more notifications because shrimps are now imported in a range of different forms carrying an enlarged range of potential food safety hazards.

Other seafood has similar histories, with the development of new products bringing new safety and sanitation hazards. Examples include the following:

- 1989: Oxolinic acid found in imported cultured eels (residue of an antibacterial agent);
- 1992: Domoic acid found in Dungeness crab from the United States (marine toxin);
- 1994: Coloring agent found in frozen Ark shell from South Korea (undesignated additive, camouflage of shellfish color);
- 1997: Pieces of lead found in sandfish from North Korea (camouflaging the weight of the fish);
- 1997: Carbon monoxide found in tuna from Indonesia (undesignated additive, camouflage of fish color);
- 2001: *Shigella sonnei* in oysters from South Korea (contamination of disease-causing germ);
- 2003: Enrofloxacin found in eels from China (residue of an antibacterial agent);
- 2003: Oxolinic acid found in cultured salmon from Chile (residue of an antibacterial agent);
- 2005: Malachite green in cultured eels from China (residue of an antibacterial agent).

**FUTURE DEVELOPMENTS**

**More inspection capacity**

In addition to the Government’s efforts to smooth import procedures, the introduction of the Imported Foods Monitoring and Guidance Plan, and the related co-operation this implied with exporting countries, the revised Law also gave private sector inspection laboratories the right to participate in inspections as ‘designated inspection laboratories’. This revision enables designated inspection laboratories to play a role in government monitoring inspections. This amounts to an expansion of inspection capacities.

**Risk analysis**

Risk analysis has been introduced as part of the Food Safety Basic Law. The food safety commission is in charge of risk assessment, while the Ministry of Agriculture and the Ministry of Health are responsible for risk management. However, there is still lack of scientific data about Japan itself and about foreign countries. Consumers tend to demand ‘no risk’ which government is unable to guarantee. It will take time before risk analysis is fully understood and widely accepted.

**Positive list for residual agricultural chemicals**

A requirement of the revised Law is the development of a ‘positive list’ system for residual agricultural chemicals. The Japanese government will set out standards against which agricultural chemicals will be considered for inclusion in the positive list. This is a big challenge for the agriculture and food industry. Law enforcement will apply
not only to pesticides but also to veterinary drugs and feed additives. Pesticides are not used directly in fish feeds, but unintentional environmental pollution and veterinary drugs and feed additives used in aquaculture mean that they can appear in fish products, albeit in very limited amounts.

**HACCP**

HACCP has been partly adopted in the food industry as part of the Government’s ‘Total Sanitation Control Manufacturing Process’ and as an HACCP system designed for exporting seafood products into the United States and European Union. However, HACCP programmes are not yet fully operational in Japan, mainly due to a lack of HACCP experts. As ISO22000 reorients the industry towards an international standard and ISO 9000 experts move toward to ISO22000, there will be a need for further training to develop HACCP expertise.

**Traceability**

There are still arguments for and against traceability systems among manufactures and retailers in Japan. Many electronic companies have developed traceability devices. There is arguably too much traceability in Japan; on a cost-benefit analysis it is difficult to judge performance. Clearly however traceability is an important mechanism for keeping imported food safe. Moreover, traceability systems have been discussed in terms of ISO standardization and will be introduced as an administrative guideline, ISO22005, simultaneously with the implementation of ISO22000.

**Food labelling and place of origin**

Food labelling is increasingly important to consumers. Japanese consumers have voiced dissatisfaction with the complexity of information generated by the Food Sanitation Law administered by the Ministry of Health, and by the Japan Agricultural Standard Law, administered by the Ministry of Agriculture. In terms of imported seafood products, there is a technical difficulty related to labelling the country of origin and the area of water the products derive from.
Inspection of fish for export

The Export Inspection Law of Japan was abolished in 1997. However, there has been some recent growth in exports of agricultural and fishery products. In terms of the export of seafood products, for China an export inspection certificate is required to show compliance with food safety laws set out by the Chinese government, while HACCP systems are required for seafood products exported to US and EU countries. The Japanese Frozen Foods Inspection Corporation was considering proposing the export inspection for China to be included in the ISO17020 standard.

CONCLUSIONS

The new Japanese food safety policy is still in transition. Risk analysis is not yet fully applied. Further developments are expected in HACCP and traceability. ISO is of added importance. There are various others food safety mechanisms to be considered. As Japan relies heavily on processed imported food, food safety in exporting countries is vitally important. The Japanese Government is taking steps to co-operate more with exporting countries. Developments in the private sector in the area of food safety are also occurring in many countries. Therefore communication among private sector players will also become increasingly important.

REFERENCE

The Canadian Fish Import Inspection Program: new directions

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ABSTRACT
The Canadian Food Inspection Agency (CFIA) has examined its border and import control systems and is moving towards a risk-based system incorporating more integrated import control strategies. An import control policy framework has been developed that reflects the CFIA's vision for the future. New directions for the Fish Import Inspection Program focus on activities upstream (prior to importation), midstream (border entry points) and downstream (after products enter Canada). The new directions define changed roles and responsibilities for the CFIA and for the Canadian fish industry.

INTRODUCTION
The Canadian Food Inspection Agency (CFIA) is operating in a changing environment. The CFIA is facing rapid changes in global transportation and trade, changes that are affecting international inspection practices and regulatory standards for labelling, animal and plant health, and food safety. In response, it is examining its border and import control systems and expects to move towards a risk-based management strategy that incorporates integrated import control strategies, and the increased used of technology.

The Fish Import Inspection component of the CFIA has also been evolving in line with its vision for the future and in response to the development of its Import Control Policy (ICP). This paper provides an overview of some of the concepts that are being explored, and of the options the CFIA is developing as part of its new directions for its fish import control system.

THE CFIA’S IMPORT VISION AND THE IMPORT CONTROL SYSTEM (ICS)

The CFIA’s Import Vision
The CFIA has developed a vision for where the agency wants to be in the future.

The CFIA vision is of an organization that:
• is agile, knowledge-based, and recognized as a world leader in import initiatives;
• manages a smart and seamless border, with upstream, midstream and downstream activities based on strengthened partnerships with industry (through shared accountability), provincial and federal governments, foreign governments, and international agencies;
• oversees import control strategies and inspection activities that are guided by common risk management criteria;
• ensures importers are responsible for seeing that the products they import meet Canadian regulatory requirements;
is accountable for implementing the ICP while respecting the agency’s vision and guiding principles; and
ensures its activities are consistent with Canada’s international rights and obligations.

The CFIA Import Control Policy Framework
Out of its Vision for an updated import programme, the CFIA has developed an Import Control Framework that sets out six key policy elements, which include:

- foreign equivalency/certification;
- point of Entry control;
- tracking and informatics;
- importer Quality Management Systems (QMS);
- an inspection programme; and
- new technology.

Import control policy priorities would be described under each element of the programme for each commodity.

The CFIA Import Control Policy Framework is consistent with the following international standards:

- Codex Alimentarius Guidelines for Food Import Controls Systems;
- International Animal Health Code of the Office International des Epizooties (OIE);
- International Plant Protection Convention (IPPC)

This policy framework is also consistent with Canada’s current and anticipated responsibilities under international environmental agreements.

THE CURRENT FISH IMPORT INSPECTION PROGRAM
The Fish Import Inspection Program currently includes many facets of the CFIA’s import control framework including:

- use of international arrangements with Competent Authorities (CA) through Mutual Recognition Agreements (MRA) and/or Memoranda of Understanding (MOU);
- controls at the border using mandatory licensing and declaration requirements;
- a voluntary Quality Management Program for Importers (QMPI);
- a regulatory verification programme that includes product inspection of ‘basic importers’; system audits of QMPI, and audits of basic importer requirements; and
- defined data tracking processes for imported fish products and associated informatics support.

The Fish Import Inspection Program in moving closer to the CFIA’s import vision will have an opportunity to address some of the concerns and issues that have been identified with the existing inspection programme.

The existing programme faces ever increasing workload demands for product inspection from increased import volumes and the increasing diversity and complexity of the food safety risks associated with new products. This, coupled with the lack of a clearly defined risk based regulatory verification system, and industry pressure to merge domestic and import regulatory requirements, poses significant challenges.
NEW DIRECTIONS FOR THE FISH IMPORT INSPECTION PROGRAM: A VISION FOR THE FUTURE

The longer-term directions for the Fish Import Inspection Program are to:

• require importers to take on full responsibility for regulatory compliance, with CFIA providing regulatory verification of importer compliance;
• strengthen the system’s focus on upstream activities to ensure compliance prior to importation;
• build in risk based evaluation criteria;
• implement more efficient processes at border entry points and for verification activities after products enter into Canada; and
• develop outcome based regulations to support the framework.

It is expected that the revised programme will create a more level playing field between the domestic industry and importers, and between the two levels of importers within the current system, that is, basic importers and Quality Management Importers.

ACHIEVING THE VISION

The vision of the new Fish Import Inspection Program would be achieved by implementing:

• a mandatory importer quality assurance system (QMS);
• CFIA regulatory intervention strategies that consider product risks and the level of compliance by the processor, as well as the level of controls exercised at each stage of the process by the importer; and
• upstream controls that deal with food safety issues at the source, at the level of the processor.

FUTURE OPTIONS FOR THE FISH IMPORT INSPECTION PROGRAM

Various options and activities are being considered as part of the development of an updated fish import inspection system. Areas being considered are focused on upstream activities (prior to importation), midstream (at the border entry point) and downstream activities (after entry into Canada).

Upstream Options

Mechanisms focused on upstream activities could include:

• a mandatory Hazard Analysis and Critical Control Point (HACCP) system for processors exporting to Canada;
• foreign arrangements linked to import requirements in Canada;
• supplier Quality Assurance agreements between the importer and the exporter/processor;
• partnering with other foreign government agencies to share audit information and inspection data;
• recognition of third party auditing processes; and
• product testing offshore.

Midstream Options

Mechanisms focusing on midstream activities could include:

• mandatory import licenses and strengthened declaration requirements at border control points; and
• integration of the Canadian Border Services Agency and the CFIA’s Import Service Centre to determine compliance with license and declaration requirements at border control points.
**Downstream Options**

Downstream options can be focused on the role of importers or CFIA activities. Importer requirements might include:

- mandatory Quality Management System (QMS) import licenses that include:
  - requirements for product recall, and complaints records
  - import notification requirements
  - flexible system options that could be based on the level of food safety risk associated with the product, and the compliance level of the processor;
  - implementation of import control systems;
  - use of accredited bodies for product inspection; and
  - provision of inspection data to CFIA.

CFIA regulatory activities could include:

- verification or auditing of importer control systems;
- implementation of national sampling plans as background monitoring of importer systems;
- provision of industry tools and infrastructure to verify compliance;
- maintenance of inspection data bases, website information, alert lists; and
- implementation of regulatory enforcement or compliance actions, such as product recalls.

**THE CHALLENGES OF DESIGN AND IMPLEMENTATION OF A NEW FISH IMPORT INSPECTION CONTROL SYSTEM**

Many challenges lie ahead in the design and implementation of new directions for the Fish Import Inspection Program. A series of key challenges have been identified to date, some relating to industry, others to CFIA.

For industry, the system will depend on an importer’s acceptance of, and ability to design and implement a QMS. Currently there is a wide range of importers, from small importers supplying product to ethnic and niche markets, to large-scale importers serving major grocery chains. Consequently there is a wide range of technical knowledge of food safety amongst the importer community. Moreover, there are increased costs associated with implementing a quality management system and maintaining regulatory compliance levels. These costs will be borne by industry. For smaller operators the costs are relatively heavier.

The challenges facing CFIA are also complex. The system will depend upon:

- inspector acceptance of a fundamental shift from a product inspection to a risk-based import control system;
- inspector acceptance of shared responsibility with industry for regulatory compliance;
- defining HACCP requirements that can be verified by regulators and third parties;
- providing internal technical and informatics support to the changing system;
- developing regulatory tools to assist industry in their transition to implementation of an importer quality management system;
- developing outcome based regulations that can support future changes to the import programme;
- developing an integrated regulatory compliance strategy and regulatory audit regime that takes into account product risk and importer performance levels;
- developing a recognition process for third parties that conduct activities as part of the QMS processes, such as importer audits;
- developing a seamless electronic data and information exchange system with importers to maintain a high level of confidence in the safety of imported fish products;
• developing a refined performance measurement systems to define QMS compliance
levels and food safety conformance; and
• adequate training for inspectors and importers.

The success of the system will also depend on the extent to which national
and international relationships support it. This means that current international
arrangements need to be reviewed to ensure they are consistent with and support a
revised import programme. Processes for sharing information with other government
organizations need to be enhanced. Transparent processes to share information on
issues, and on problems between governments and between countries’ competent
authorities, would also be highly useful.

NEXT STEPS
The CFIA’s Fish Seafood and Production Division will continue to articulate this
vision for the future, and to develop a policy framework for a new Fish Import
Inspection Program. It will take some time to develop, consult on, and finalize these
new directions, before they become fully operational.

REFERENCES
The CFIA Import Control Policy has been referenced in this document and can be read
in its entirety at the CFIA website at http://www.inspection.gc.ca/english/fssa/polstrat/
import/imppole.shtml.
The management of import and export seafood safety and quality in China

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ABSTRACT
This paper outlines the management systems for ensuring the safety and quality of seafood imported to and exported from China. It describes the overall management of food safety in China including: the legal framework and administrative arrangements; the management of safety and quality in seafood exports including labelling and traceability mechanisms and the self regulation of export enterprises; and the systems for controlling the safety and quality of seafood imported into China. It concludes that food safety is an issue of common concern to the international community. International cooperation is essential for facilitating international trade and ensuring that seafood products appearing on international markets are of high quality and are safe for consumers.

INTRODUCTION
The Chinese government pays close attention to food safety management. As a large developing and agricultural country of 1.3 billion people, China not only produces various animal and plant-derived foods for export, it also represents a huge market for imported food. Following years of research and practice China has established a whole set of systems for import and export food safety management. These are designed to comply with international practice and to suit China’s specific needs. The overall goal is to ensure the safety of imported and exported food.

THE MANAGEMENT OF FOOD SAFETY IN CHINA
China joined the World Trade Organization (WTO) in late 2001. As part of its WTO commitments the Chinese government has reformed its food safety management systems.

Administrative arrangements
In April 2001, the State Council approved the establishment of The General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) of the People’s Republic of China. As one of the ministerial-level law enforcing and administrative agents directly under the State Council, the AQSIQ is in charge of quality controls, entry-exit commodity inspection, entry-exit health and quarantine, entry-exit animal and plant quarantine, import and export food safety, and the supervision, authorization and standardization of domestic food production and processing. The AQSIQ leads two vice-ministerial bureaus, the State Administration of Certification...
and Accreditation (CNCA), and the State Administration of Standardization (SAC), together with 18 functional departments and bureaus. It directly supervises 35 entry-exit inspection and quarantine agencies, and leads the operations of the quality and technology supervision agencies in 31 provinces.

The Import and Export Food Safety Bureau of AQSIQ is responsible for:
- establishing and implementing the regulations and rules for inspection and quarantine for safety of import and export food and cosmetics;
- organizing and supervising the inspection and quarantine of import and export food and cosmetics;
- organizing appraisals of relevant risks concerning food safety;
- formulating risk management policies and emergency measures; and
- investigating and dealing with major quality or safety concerns or accidents related to imported and exported food.

CNCA has a Department of Registration Management, which is responsible for:
- drawing up the system for registration and management of companies involved in the manufacture or processing of import and export food and cosmetics;
- organizing and coordinating the appraisal and review of health registration; and
- handling the registration and recommendation of Chinese companies and products to foreign countries.

AQSIQ has established 35 entry-exit inspection and quarantine bureaus (CIQ) under its direct leadership in 31 provinces, autonomous regions, and municipalities, as well as in Shenzhen, Zhuhai, Xiamen and Ningbo, which all have their respective branches. These bureaus are in charge of the specific work of inspection, quarantine and supervision of food for import and export.

Legislative framework
The Chinese government has always attached importance to the formulation and implementation of laws and regulations relevant to import and export food safety. While steadily improving the system of management of import and export food safety, the government has enhanced the legal framework for food safety. China has passed a comprehensive set of laws relating to import and export food safety, including:
- The Law of the People's Republic of China on Food Hygiene;
- The Law of the People's Republic of China on Import and Export Commodity Inspection;
- The Law of the People's Republic of China on Entry-Exit Animal and Plant Quarantine;

In addition, AQSIQ has issued a series of ordinances, national standards and industrial standards. Taken together these measures add up to a comprehensive legal system for inspection, quarantine and supervision of import and export food.

To facilitate compliance with the requirements of food safety legislation in countries or regions importing Chinese products, AQSIQ has also compiled and translated the food safety and hygiene laws and standards of the European Union (EU), the United States of America, Canada, Russia, Korea and other major importing nations.

Inspection and quarantine
To enhance its control over import and export food safety, AQSIQ has increased its efforts to build capacity for import and export food inspection and quarantine, and has enhanced its inspection and testing technology. At present, the 35 local bureaus under direct leadership of AQSIQ, together with their 328 sub-bureaus and branches, have a total of 163 food inspection and quarantine centers to undertake the work of import and export food inspection and quarantine. These laboratories have more than
10,000 sets of mostly advanced equipment such as for gas chromatography, liquid chromatography, mass spectrometry, and atomic absorption spectrometry. Up to 6000 technical staff are involved in this work. Overall there is a strong testing and inspection capability.

AQSIQ has also set up the Import and Export Food Safety Institute in its Academy of Inspection and Quarantine Sciences, to conduct research on technologies for import and export food safety. This is aimed at further raising the level of import and export food safety controls.

**International cooperation**

Economic globalization means that food safety is no longer a national or regional issue, but one that needs concerted world attention as well as participation and cooperation between countries. Consequently, it has been a basic principle for China to cooperate with various countries in the field of import and export food inspection and quarantine. In recent years, in attempts to control different food risks, China has signed cooperation intention statements with more than 20 countries, including: the United States of America, Canada, Japan, Korea, Brazil, Argentina, Australia, New Zealand, Thailand, and Viet Nam, as well as with the EU. To strengthen its cooperation with foreign countries, China annually receives nearly 100 governmental or non-governmental inspection and quarantine delegations from other countries. It also sends large groups of experts to various countries for study, training and to exchange experience and expertise.

This strengthened exchange and cooperation has led to mutual understanding, consensus, and more effective consultation and negotiation between China and other countries.

Through common efforts at all levels of governments, relevant administrative departments and related enterprises, China’s food safety management system is continuously improving. Quality management within enterprises has also been enhanced. Overall, a credible system has been built, and the overall level of food quality and safety effectively guaranteed.

**MANAGEMENT OF SAFETY AND QUALITY IN SEAFOOD EXPORTS**

China’s exports of seafood are increasing. China exported 2,218,000 tonnes, corresponding to US$63.3 billion dollars worth of seafood in 2004, up 15.5 percent and 25.6 percent respectively compared with 2003. A range of measures has been taken to ensure the quality, safety and hygiene of seafood destined for export. AQSIQ has worked with other departments, such as the Ministry of Agriculture, to improve controls at various points in the production process, including over raw materials, processing, storage, and transportation, with considerable success.

To effectively control the quality, safety and hygiene of the raw materials for seafood production, considerable effort has been made to promote the ‘company + base’ model for export seafood production. Under this model food export companies themselves play the leading control role. Seafood export companies are required to establish catch areas and breeding bases and to practice ‘standard management’. A reporting and recording system is applied to the catch area or breeding base for inspection and quarantine purposes. In cooperation with local governments and other departments (mainly those responsible for agriculture), a system of monitoring and prevention of diseases and epidemics has been established. This includes a system for monitoring residues of pesticides and animal medicines. Regular epidemic and disease monitoring should also be practiced, and preventive measures taken accordingly. This includes strict management of feeds, feed additives, pesticides and animal medicines. The programme for monitoring and control of pesticides and animal medicine residues, in both animal and plant-derived foods at their source, needs to be strictly implemented if the safety of export seafood is to be guaranteed.
Labelling and traceability
Building on good quality and safety management of seafood at the source, control mechanisms need to be strengthened at other stages of the seafood production process. An export seafood quality tracing system, with labelling and recall are important components of this, as is standardized batch management of export seafood. These are vital for ensuring the quality, safety and hygiene of export seafood as well as its traceability. In this way, the source can be traced, the product’s movement can be tracked, additional information can be acquired, and any defective products can be recalled. When a product is found to be defective, the defect can be traced back from the finished product to its raw materials. With the help of product codes, the pollution source and reason for contamination can be quickly identified, and defective products recalled quickly. Good management must extend through all phases of production, from breeding, raw materials, processing and storage, to transportation.

Registration of enterprises
To enhance control over the whole production process, registration and monitoring of enterprises engaged in export seafood production is also undertaken seriously. Individual enterprises must meet stipulated hygiene requirements to gain registration. Any enterprise without a license or registration certificate is banned from producing, processing and storing export seafood. At present, 2,043 seafood enterprises in China have won registration to engage in the export food business. AQSIQ also recommends qualified enterprises to foreign governments to assist them in gaining registration in importing nations. To date, about 1300 factories have won registration with the relevant authorities in importing nations.

Entry-exit inspection and quarantine organizations randomly check the production and processing sites of enterprises that have won hygiene registration. The findings of these checks are used to evaluate the extent to which the safety control systems governing the production and processing of products at that enterprise are functioning effectively.

Encouraging self-regulation
The system stresses that the responsibility for food safety ultimately rests with the legal representative of an enterprise. Enterprises are encouraged to build a credit system for themselves. AQSIQ together with local CIQs have been helping the enterprises to improve their internal management systems and enhance their food safety awareness. Enterprises are urged and encouraged to build their own laboratories so that they can inspect and test their own products. A ‘quality commitment’ system is exercised among all food exporting enterprises, which requires them to pledge in writing that their raw materials, production processes and export products all meet the required standards of food quality, hygiene and safety. Those enterprises that have comprehensive and effective self-control systems, good ‘credit’, and effective controls to detect safety risks will be listed as ‘good enterprises’ and will be accorded ‘preferential treatment’. Conversely, those enterprises that experience repeated quality accidents or have committed fraud will be put on the ‘black list’ and severely punished.

China practices a whole-of-chain management system for export seafood safety, which extends from fishers or farms, to the dining tables of consumers.

THE MANAGEMENT OF SEAFOOD IMPORTS
As China’s foreign trade develops, it imports more and more foods. More aquatic products, fruits, meat, tinned foods and rice, have entered Chinese markets in recent years. China imported 1,745,000 tonnes, worth some US$23.5 billion dollars, of seafood in 2004, up 21.2 percent by volume and 25.7 percent by value compared to 2003. Importing food is good for enriching domestic markets and meeting the diverse
and changing needs of consumers. However, due to uneven levels of food safety management in exporting countries, including those related to seafood, it is a fact that food-borne diseases constitute potential harm to Chinese consumers and industry.

In 2004, of the US$7.75 billion dollars worth of animal derived food that China imported, 1200 batches were found to be compromised for various reasons, such as pollution by disease-inducing microbes, above-permitted levels of poisonous and harmful residues, labels that failed to meet Chinese regulations, or excessive levels of banned or restricted additives.

**Inspection and quarantine procedures for imported seafood**

The common inbound fishery products inspection and quarantine procedure is as follows. The shipper or their agent must fill in an inbound shipment inspection sheet and must provide a business contract or letter of credit, a certificate of origin, an invoice, a packing list, a bill of lading, and an original official veterinary certificate issued by the exporting country or region. CIQ then carries out a sensory test, or a sampling test, for the imported goods, and checks the certificates. If the goods are tested to be eligible for import, CIQ will issue a certificate for inbound shipment inspection and quarantine, and will permit the import. In the event that the shipment is found to be ineligible, it will be returned, destroyed, treated in some way, or redirected for other purposes.

**WTO SPS based mechanisms**

To strengthen the safety management systems for imported food, China practices an inspection and quarantine access system according to WTO Sanitary and Phytosanitary (SPS) rules, especially in relation to the animal derived products listed in The Catalog of Entry Animals and Plants for Quarantine Permission and Authorization, which includes seafood. Procedures include the specific steps outlined below.

First, the country that plans to export food to China should provide to AQSIQ documentation about the veterinary service system, plant protection system, and food safety management system in that country (or region) as well as other documentation necessary for risk analysis. AQSIQ then analyses those documents, send experts to conduct site evaluation when necessary, and provides a risk analysis report.

Second, if the potential risks of an imported food can be effectively controlled according to the aforementioned risk analysis, AQSIQ conducts negotiations with the relevant authorities of the exporting country on how to ensure the quality and safety of the imported food, and subsequently signs a protocol of inspection, quarantine and hygiene.

Third, after the signing of the protocol, CNCA examines the export enterprise of the foreign country for its registration and hygiene, and examines the epidemic control system and food safety and hygiene management systems of the area where the company is located. It also examines the production and processing conditions. If the enterprise complies with Chinese laws, regulations, standards and rules, CNCA will approve its application for registration.

Fourth, to export to China any of the plant and animal derived products listed in The Catalog of Entry Animals and Plants for Quarantine Permission and Authorization, before signing any trade contracts, the exporting side needs to first obtain the Entry Animal and Plant Quarantine Permit of the People’s Republic of China issued by AQSIQ.

Fifth, when the import food arrives at a Chinese port, the entry-exit inspection and quarantine agencies conduct inspection and quarantine procedures according to Chinese law. Products passing inspection are approved for importation. Customs officials will accordingly allow it to enter and be sold in Chinese markets.

In accordance with the above inspection and quarantine access procedures, AQSIQ has to date signed quarantine and hygiene protocols related to the importation of about
100 animal derived food products from over 30 countries, including: the United States of America, Canada, Australia, New Zealand, Denmark, Holland, France, UK, Russia, Mongolia, Japan, Brazil, Italy, and Argentina.

**Enhanced inspection and quarantine mechanisms**

To enhance the food inspection and quarantine procedures for imported food, AQSIQ has further perfected its inspection and quarantine measures.

- Procedures for reviewing food imports have been improved. The reviewing has been made fully electronic, and the management of the reviewing and authorization work has been strengthened.
- Better results and more efficiency are being achieved by defining the inspection abilities of each port so that those with superior inspection capabilities have greater scope for authorization.
- Safety supervision and control programmes are concentrated on large batches, or key food products. Very strict measures are taken to monitor imported meat, aquatic products, and milk products for diseases, epidemics, microbes, medicine residues, additives and heavy metals.
- The construction of technological facilities for inspection and testing (laboratories) is being enhanced, including by improving testing equipment, and developing the skills and competencies of staff.
- Food smuggling is being cracked down on, in cooperation with other government departments such as customs and frontier security forces.

**Food risk emergency mechanism**

To enhance its management of import food safety, AQSIQ has established a food risk emergency mechanism and a quick response management mechanism. When it is found that an imported food product contains contagious animal diseases, parasites, harmful organisms, chemical residues and/or other risks that are potentially harmful to human health, agriculture and husbandry, or public health and security, AQSIQ will issue risk alerts to the various parties concerned. It will subsequently strengthen the inspection and quarantine mechanisms, as well as the supervision and management controls, over products imported from that country or region until the risks are believed to have disappeared.

**CONCLUSIONS**

Food is the material basis for human existence. As technologies and societies develop, people shift their concerns from basic access to food towards a focus on the safety and quality of that food. Food safety has become an issue of common concern to the international community. China is willing to cooperate with its counterparts in various countries as well as with industry representatives to promote the healthy development of global food trade. By guaranteeing the safety and quality of exported and imported seafood products, China is actively facilitating the development of robust international trade in seafood.
Detentions and rejections in international fish trade

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ABSTRACT
Fish and fishery products are one of the most traded food commodities. About three-quarters of the world's fish exports are destined for three main areas: the European Union (EU), the United States of America and Japan. These three markets dominate both in terms of prices and market access requirements.

Thousands of tonnes of seafood products are detained, rejected or destroyed each year at the national borders of importing countries. This is a post-harvest loss that can and should be prevented. Despite World Trade Organization (WTO) agreements calling for the harmonization of standards, exporters still face safety and quality standards and control regimes that vary from one market to another.

This paper summarizes a FAO study1 comparing fish safety and quality import regulations in the EU, North America and Japan, and the causes of detentions and rejections of fish products entering those markets. It calls for agreed international control systems and import standards based on objective and science-based criteria and techniques.

INTRODUCTION
Fish and fishery products are one of the most traded food commodities. This trade is likely to increase in future in response to the ever-increasing demand for fish and seafood. However, thousands of tonnes of imported fish and seafood products are detained, rejected or destroyed each year at national borders of many importing regions in the world. This is a post harvest loss that can be prevented, at least in part, thereby providing more value for fishing efforts, making more fish and seafood available for human consumption, and reducing pressure on fish stocks.

One of the most serious difficulties for exporters is that their products encounter standards and safety and quality requirements that vary from one market to another. These differences concern regulations, standards, and control procedures, including controls at the border where seafood products can be rejected, destroyed or put in detention while decisions are taken as to whether they meet importation requirements. To promote harmonization and equivalence among seafood trading nations, these differences need to be reduced and ultimately removed. They should be replaced by agreed international control systems and standards based on objective criteria and scientific techniques.

1 This paper is a summary of “Causes of detentions and rejections in international fish trade” by Ababouch et al. FAO, 2005. Fisheries Technical Paper 473. 110 p.
RELATIVE FREQUENCY OF ‘BORDER CASES’ BY IMPORTING REGION

The term ‘border case’ is used to describe any situation where a fish product is detained, rejected, destroyed, returned to sender, or otherwise removed, even if only temporarily, from the trade flow.

Figure 1 shows a quite dramatic difference in the absolute numbers of border cases in the various importing countries/regions, when shown relative to import quantities. At first glance, the United States of America has around 10 times as many border cases per 100,000 tonnes of product as the EU or Japan, and 3 to 4 times as many as Canada. This does not necessarily mean that the United States of America has a higher performance in border controls or that products exported to that market have more non-conformity problems. The data need to be adjusted to enable comparisons of performance between the regions studied. There are three main reasons why the number of border cases in the United States of America is overstated.

Firstly, a high percentage of cases end up with the product actually entering the United States of America after re-examination, sorting, re-packing, new documentation and information, or new labelling. During 1999-2001, 78 percent of detained shipments were released for import into the United States of America. Therefore, only around 22 percent of the United States of America cases should be considered as a *bona fide* border case. Taking this into account, the United States of America had only about twice as many border cases as the EU and Japan, and only 60 to 80 percent more than Canada (see Figure 1, adjusted US graphs).

Secondly, the other countries/regions, especially the EU, use some sort of ‘prevention at source’ approach. Indeed, the EU relies on national Competent Authorities (CAs) in exporting countries to examine establishments and products to assess their conformity to EU requirements prior to shipments. Therefore, some potential non-conforming cases are detected and stopped before they leave the exporting countries. This approach has proven to be more cost effective than relying solely on controls at the border. However, it can also penalize seafood companies, however well managed, in countries that do not have the resources or the capacity to establish a CA that meets EU requirements.

Likewise, Canada, and to some extent Japan, have adopted a ‘prevention at source’ approach, although less formalized and less active than that of the EU. Canada has concluded ‘agreements’ with a limited number of countries: Australia, Ecuador, Iceland, Indonesia, Japan, New Zealand, Philippines and Thailand. Japanese

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importing companies have a long tradition of fielding quality controllers to work at exporting sites. In both cases, a number of non-conformity cases are eliminated before consignments are shipped.

In more and more countries, including the United States’, experts advise administrations to adopt a ‘prevention at source’ approach because of its higher performance and cost effectiveness. Prevention at source creates a win-win situation for the exporter and for the importer. While reducing safety and quality problems experienced by the importer, the inherent costs and damages of border cases are reduced for the exporter. At the same time, administrations save significantly on resources needed to manage controls at their borders and are better able to target problem cases, thereby further increasing efficiency. Moreover, reducing losses due to rejections and detentions should eventually result in a larger supply of safe fish and less illnesses from consuming unsafe foods. However, care must be exercised when introducing the ‘prevention at source’ approach to ensure that exporting developing countries are helped to build the national capacity needed to ensure the safety and quality of their fish products destined for export.

A third difference is the types and methods of control and the standards applied at the border by the importer. In the countries studied, not only are border checks different, the analytical techniques used and the criteria or standards applied to judge conformity or non-conformity also differ from one country to the other. Most importantly, criteria and standards are not always based on fully-fledged scientific risk assessments. This can create arbitrary barriers to trade and is also costly as it may cause safe products to be refused in some regions while unsafe products are distributed in others. Consequently, there is a need to harmonize procedures and standards, at least as a first step amongst major markets, using risk assessment methodologies where applicable.

**CATEGORIES OF BORDER CASES: PATTERNS AND TRENDS**

The breakdown of border cases into three main categories: microbial, chemical, and other causes, for three countries and the EU are summarised in Figure 2. The differences in the profile of these major importers are quite obvious. The EU and Japanese border cases are predominately microbial or chemical in origin, while these causes only account for a quarter to a third of border cases in the United States of America and Canada. Notably, the well-publicised increase of chemical (veterinary drugs) contamination of fish products originating in Asia in 2001/2 (especially for shrimps) becomes evident in the EU data, where chemical contamination becomes a dominant category. Yet for other major importers there is no discernable change. As these other regions were also importing large quantities of shrimp from Asia during this period, they were clearly handling the imported products differently, or recording the relevant data differently.

The obvious differences again point to significant variations in approaches to controls at the borders of the countries being studied. For exporters, it would be helpful if these procedures were harmonized, so that products are treated the same way at importers’ borders irrespective of where those borders are. The multitude of approaches to border control imposes extra costs on traders. They may be significant but are difficult to quantify because of the dearth of relevant data, particularly the quantities and value of rejected products, and the costs of controls.

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Incidence of border cases for exporters, grouped by continents, in major markets

Available data on the incidence of border cases experienced by exporters permit only a crude analysis, but the results provide a useful basis for discussion. The only two importing regions with full data over the four year period, 1999-2002, to allow comparison of the performance of exporting continents are the EU and Canada. The Japanese data allow this comparison for the two periods 2000/2001 and 2001/2002 (Table 1).

Looking at the data from the perspective of the importing market, there are some significant differences in the relative performance of exporters in the five continents, depending on whether fish is being sent to the EU, Canada or Japan. There are two main explanations for these differences. The EU, Canada and Japan may apply different criteria for border actions (whether sampling frequencies, limits for contamination levels or other procedures) and/or, the five continents export different volumes and types of products to those markets (either different risk categories or of varying quality).

If the latter explanation is correct, given that the product exported to the EU and Canada are fairly similar (frozen fish dominates, and there are significant numbers of crustacea, cephalopods, molluscs, etc.), individual exporters seem to recognise the differences in market criteria and target their products accordingly. This certainly does happen. However, it is probably more likely that importing regions treat imports (as a whole) in different ways, resulting in different border actions. In the case of the Japanese market, the high number and frequency of border cases reported for products imported from Asia may reflect the higher risk products that Japan imports, presumably from its neighbouring countries, where the species are similar to those produced by Japanese fisheries. This can only be conjecture given the nature of the data.

A look at the incidence of border cases by each exporting continent is revealing. Oceania ranks as the best exporting region when exporting to the EU, but ranks very poorly when exporting to Canada and Japan. Africa is the poorest performer in exports to Canada and second poorest to the EU. however, the continent performs quite well in
exports to Japan. The poorest performer by some margin in exporting to the EU is Asia, exacerbated in later years by the veterinary drug issue referred to earlier. It is also the poorest performer in exports to Japan. However, Asia outperforms both Oceania and the EU in exporting to Canada, though it still only performs moderately. Central and South America perform very well in exports to Canada but less well when exporting to the EU and Japan. North America is consistently a top-performing exporter.

It is not easy to determine the significance of these differences or what has caused them. As noted above, there seems to be a tendency for countries or regions exporting the smallest absolute quantities to have more border cases per unit volume. This certainly applies in the case of exports to Canada, though not in order. However, it does not apply to the EU. Oceania is the smallest exporter to the EU market but is one of the top performers with the lowest frequency of border cases. Neither does the pattern apply to Japan, where Asia is the largest exporter but also a poor performer.

Further research to establish why these differences occur may give misleading results because of the overriding influence of two factors: importing nations use different procedures (sampling plans, analytical techniques, type of defect) and/or criteria on imports; and the products exported differ from one importing region to the other. This again highlights the importance of having the rules of importation harmonized, both in terms of their governing legislation and how they are applied. Harmonization would benefit international trade and ultimately consumers.
Economic implications of border cases

Costing the impact of products of substandard quality and dubious safety would be of interest to producers, processors, quality control authorities, and consumers, as well as to governments, donors, public health authorities, and development agencies. The economic losses incurred because of fish spoilage, product rejections, detention and recalls, and the subsequent adverse publicity for an industry and even a country are substantial. So are the human health related costs. Billions of dollars in medical expenses stem from fish-borne illnesses and the loss of productivity of those infected causes large indirect costs to the community.

Risk managers, when weighing different mitigation strategies, need economic data to assess the cost effectiveness of the different options presented to them. Currently, the detention/rejections data, as they are generally collected cannot be exploited to assess the cost of border cases. It is important to have access to such information in future.

The following is an attempt to estimate the cost of border cases in Japan using data available on the Ministry of Health, Labour and Welfare (MHLW) website. Similar data were not available from the other importing countries. Table 2 estimates the total volume of Japanese border cases at 255.2 tonnes and 490.6 tonnes respectively for 2001 and 2002. These represent a small fraction (respectively 0.0083 percent and 0.016 percent) of total imports to Japan in 2001 and 2002. They were valued at US$1 159 870 and US$2 230 465 (or 0.009 percent and 0.017 percent of total import values) respectively for 2001 and 2002. For the period 2001-2002, the average export revenue lost was estimated at US$4 546 per tonne detained and US$10 000 per border case.

The revenue lost to exporting companies when consignments are rejected are, as a rule, much greater than the costs of preventive practices that would have enabled the concerned companies to avoid these border cases. This affirmation is based on several studies, compiled by Cato (1998), which estimated the costs of implementing Good Management Practices (GMP) and Hazard Analysis and Critical Control Point (HACCP) systems. In the United States of America, 1995 cost estimates of HACCP implementation for seafood processing plants averaged US$23 000 in the first year and US$13 000 per year for subsequent years. As HACCP was introduced, prices for seafood were estimated to increase by less than one percent in the first year and less that 0.5 percent in subsequent years with the larger cost increase expected to decrease consumption by less than 0.5 percent.

### Table 2

**Estimates of volumes and value of border cases for Japan**

<table>
<thead>
<tr>
<th>Product type</th>
<th>Import</th>
<th>Border cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Volume (tonnes)</td>
<td>Value (US$ million)</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fish</td>
<td>375 000</td>
<td>1 849</td>
</tr>
<tr>
<td>Frozen</td>
<td>2 344 000</td>
<td>8 647</td>
</tr>
<tr>
<td>Canned</td>
<td>281 000</td>
<td>1 786</td>
</tr>
<tr>
<td>Cured</td>
<td>34 000</td>
<td>320</td>
</tr>
<tr>
<td>Live</td>
<td>37 000</td>
<td>351</td>
</tr>
<tr>
<td>Total 2001</td>
<td>3 071 000</td>
<td>12953</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fish</td>
<td>329 000</td>
<td>1 603</td>
</tr>
<tr>
<td>Frozen</td>
<td>2 362 000</td>
<td>8 730</td>
</tr>
<tr>
<td>Canned</td>
<td>353 000</td>
<td>2 033</td>
</tr>
<tr>
<td>Cured</td>
<td>36 000</td>
<td>329</td>
</tr>
<tr>
<td>Live</td>
<td>38 000</td>
<td>356</td>
</tr>
<tr>
<td>Total 2002</td>
<td>3 118 000</td>
<td>13 051</td>
</tr>
</tbody>
</table>


Other studies carried out in the United States of America estimated the costs of implementing the HACCP-based Model Seafood Surveillance Program (MSSP) in the United States crab industry at US$3,100 per plant or US$0.04 per kilogram, representing 0.33 percent of processor price. Compliance costs were estimated at US$6,100 per plant. Investment costs averaged US$3,200 for large plants and US$1,700 for small plants. All in all, added cost per kilogram of product for compliance was US$0.02 for small plants and insignificant for large plants. For molluscan shellfish (oysters, mussels, clams), these costs were estimated at US$5,500 per plant. Annualized compliance costs per kilogram were estimated at US$0.11 for small plants and US$0.01 for larger plants.

In Bangladesh, plant upgrades and implementing HACCP for the shrimp industry were estimated to cost between US$0.26 and US$0.71 per kilogram of product and between US$0.03 and US$0.09 for its maintenance. Those were higher than the figures estimates in the United States of America, mainly because the Bangladesh shrimp industry had to start from scratch and it also had more small and medium sized enterprises than the United States of America. It is well established that in the fish processing industry economies of scale lower the costs of safety and quality systems. Even though the costs appear high, they represent only 0.31 percent (implementation) and 0.85 percent (maintenance) of the 1997 product price. 6

More importantly, the cost of installing and operating HACCP systems remains very low in comparison with the revenue lost by exporters in border cases, estimated at US$4.55 per kilogram on average. Indeed, the per kilogram costs of implementing and maintaining HACCP or HACCP-based systems represents between 1.46 percent and 3.4 percent (for the United States of America) or 6.45 percent to 17.6 percent (for Bangladesh) of the revenue lost in border cases. Furthermore, as noted above, these revenue losses are only the tip of the iceberg. The cost of transportation, the resulting adverse publicity, the requirements for systematic physical checks of subsequent shipments, the loss of client confidence, the loss of market share, market diversions, loss of momentum, decreased prices, and reduced capacity due to temporary or permanent closures, are certainly additional costs with far reaching impacts, albeit difficult to quantify.

CONCLUSIONS
The FAO study outlined above detailed the regulations governing imports into the EU, United States of America, Japan and Canada, and analysed the available data on border cases (detentions, rejections, re-exports, etc.) in the same countries or regions.

The study highlighted the need to harmonise the procedures and methods used to govern imports. Safety and quality control systems need to be based on risk assessment, especially where consumer safety is in question, and any actions taken should be communicated to all interested parties in a manner that is unambiguous, transparent, and accessible.

Governments and industry can and should help to facilitate trade in fish and fish products by improving border control systems including by augmenting border control data collection and dissemination. Promoting harmonization and equivalence among fish trading partners will help to minimise the use of safety and quality standards as technical barriers to trade, and help to improve overall export performance. The current multitude of approaches to border controls imposes significant costs on exporters, in particular those in developing countries where there is a limited capacity to adapt safety and quality control systems to a range of market requirements. Further work needs to be undertaken in this important and not well studied part of international trade.

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REFERENCES
SECTION 3

Building capacity for safety and quality
A review of the capacity building efforts in developing countries – case study: Africa

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ABSTRACT
The paper reviews the challenges that the African food industry is facing in meeting market requirements for food safety and quality. It outlines UNIDO’s capacity building role in 25 African countries. Its food safety projects involve capacity building in the following areas: food safety awareness, inspection and auditing, risk analysis and traceability, laboratory facilities and scientific support, regulations and food safety management, and developing food safety policies. These programmes contribute to the establishment of reliable food safety and quality assurance systems; systems that are instrumental for developing a fish export industry. However, the results to date vary between countries and by the type of programme undertaken. Moreover, concerns have been raised about system and resource sustainability. Increasing the impact of UNIDO’s capacity building efforts will depend on a capacity to learn from experience and to increase synergies with other multilateral and bilateral technical assistance interventions.

INTRODUCTION
Since the conclusion of the World Trade Organization (WTO) Uruguay Round Agreements in 1994, global trade has grown considerably. Despite the positive outcome of the DOHA conference and other major world conferences and summits such as the Millennium Summit, the World Summit on Sustainable Development (Johannesburg September 2002) and the United Nations Conference in Monterrey (March 2002), developing countries have yielded few substantial benefits from increased world trade. With around 10 percent of the world’s population, Africa’s share of the world Gross Domestic Product (GDP) is only 1 percent. Its share of world trade is only 2 percent. The North African countries and South Africa are well above these averages, while Sub-Saharan Africa, including Eastern Africa, falls below.

Developing countries in general, and Africa in particular, have not benefited enough from the opportunities offered by rapidly changing global markets. These countries often lack an effective industrial productive capacity needed to ensure product diversification. They also lack the necessary knowledge of multilateral trade systems and WTO regulations and are unable to comply with the international standards required to access global markets. Moreover, companies in developing countries cannot compete on either quality or price. This situation stems from the following major problems:

• Markets: Domestic markets are very small (in terms of population and purchasing power) and do not offer the economies of scale needed to produce goods at a competitive price.
• Production technology: In most cases the production technology is outdated (with the exception of parts of the fish industry) and existing production facilities are not optimized.
• Investment: Many of the African countries do not have an attractive environment for international investment and the related transfer of technology and know-how.
• Food safety and quality management: Most of the African countries do not have reliable food safety and quality assurance systems that conform to international standards.

Despite these problems, the food industry represents for developing countries in general and African countries in particular, a valuable source of foreign income. In some African countries fish exports are now more economically important than traditional export commodities like coffee.

An analysis of the food safety programmes and projects UNIDO has implemented over the last 10 years in 2511 African countries (the fish industry being the main focus in 12 countries) offers an opportunity to review the constraints the food industry faces, and the capacity building efforts undertaken by UNIDO. These activities were designed to help countries address food safety and quality issues. These issues include; the lack of a risk-based food safety policy applying the principles of prevention throughout the food chain, outdated legislation or regulatory frameworks, weak food safety management systems, lack of qualified food safety inspectors and auditors, lack of scientific support for monitoring programmes and risk analysis, weak laboratory infrastructure and weak capacity amongst food suppliers.

The technical assistance provided by UNIDO aims to strengthen the trade capacity of beneficiary countries and relies on two main interlinked components:
• strengthening the Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) related infrastructures to manage the food safety system;
• strengthening the supply side productive capacity and the promotion of local competitive suppliers.

The food safety elements of UNIDO programmes encompass the main capacity building elements required to address these issues, including:
• strengthening the capacity of food suppliers and increasing food safety awareness/information (all projects cover this issue);
• developing inspection/auditing regimes, and risk analysis and traceability (96 percent of the projects address these issues as a priority);
• improving laboratory facilities and providing scientific support (84 percent of the programmes);
• improving regulations (76 percent);
• enhancing food safety management (75 percent); and
• improving food safety policies (68 percent of the programmes).

Globally, UNIDO programmes (worth around US$30 million) have contributed to the establishment of reliable food safety and quality assurance systems, particularly in the fish industry. This has been instrumental in securing and expanding fish exports. However, the results obtained so far vary by country and by the capacity building element introduced. There are considerable concerns about system sustainability. In response, UNIDO has systematically adopted a holistic approach involving all relevant stakeholders. To ensure the greatest impact, UNIDO’s activities have targeted exporting sectors such as the fish industry, which are subject to strong market pressures and where the private sector and recipient governments have supported legislative

1 The countries involved are: Algeria, Angola, Benin, Burkina Faso, Cameroon, Côte d’Ivoire, Egypt, Eritrea, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Senegal, Sudan, Tanzania, Togo, Tunisia and Uganda.
enforcement. Experience has pushed UNIDO to seek synergies with other multilateral and bilateral technical assistance interventions, to ensure the maximum possible impact from technical assistance.

**CHALLENGES FACING THE AFRICAN FOOD INDUSTRY**

**Food safety policy**
In most African countries, resources made available for food safety activities are scarce and scattered, and coordination systems are weak at all levels. There are no risk-based food safety policies applying the principles of prevention throughout the food chain (farm to table approach). Responsibilities may be shared between several agencies/institutions with little coordination, resulting in a lack of accountability, duplication of effort, waste of scarce public funds, and conflicting interests and confusion between stakeholders. The present structure also causes problems in relation to who is the Competent Authority (CA), an essential component of the administrative structure. Unclear lines of authority are unacceptable to trade partners. The splitting and overlapping of responsibilities continues to be the main constraint hampering progress in developing food safety systems.

**Food safety management**
Food safety management is generally weak in most African countries. Unclear responsibility means no accountability. This contrasts with a centrally coordinated system where there is clear leadership responsible for; the development of policies, for operating control and monitoring programmes, for staff training, for establishing scientific and laboratory support, and for securing public funds to the sector. Another weak point is the influence of politics on technical competencies, where food safety is directly administered by ministries and elected local authorities. Most African countries have established national Codex Committees. These play a role in finalizing standards related to Codex functions, but have little or no influence in questions related to a general food policy. Government representatives dominate the committees, and there is little or no representation from the private sector and consumers.

**Public awareness, information and education**
The capability and/or capacity to perform risk analysis, including science-based risk assessment in food safety, are scattered or non-existent in institutions reporting to government agencies. Food safety agencies pay little or no attention to the dissemination of information and advice to the relevant stakeholders along the food chain. As a consequence, the population’s awareness of food safety issues is very low. Better understanding of the need and the mechanisms for change is needed. This applies to all stakeholders, whether politicians, consumers or the private sector (farmers, industry and traders and their representative organisations).

**Laws, regulations and standards**
Regulatory frameworks and enforcement manuals are outdated and do not have the holistic/food chain (‘farm to table’) approach being introduced internationally. In most cases legislation is not flexible enough to keep pace with new technological developments, emerging hazards, changing consumer demands and new food safety requirements. Although African countries are members or observers of the Codex Alimentarius Commission (Codex), the World Organisation for Animal Health (OIE) and International Plant Protection Convention (IPPC), their implementation of the requirements adopted by Codex, OIE and IPPC is far from satisfactory. This poses considerable difficulties for these countries to participate in international trade. Harmonization of laws and regulations, including implementation of international
standards in the SPS area are an essential prerequisite for regional and international trade liberalization in agriculture, fish and food products.

**Inspection and auditing**
Through their regular contacts with food producers, traders, and consumers, food inspectors or food safety auditors play a key role in the food safety system. In most African countries there are only a few trained inspectors and/or food auditors who are familiar with risk-based food safety systems. The level of food safety awareness in the private sector also depends on the competence of, and information disseminated by these inspectors or food safety auditors.

In some countries locally elected governments are in principle responsible for inspection and auditing, including the licensing of premises and establishments for the transportation, slaughtering and storage of food. These local governments instruct inspectors in the absence of a corresponding central authority. However, they have little or no technical competence to advise local inspectors, and limited resources to introduce food safety mechanisms. In addition, information or communication hardware like telephones, computers and transportation facilities are scarce, which makes internal communications difficult.

Properly trained inspectors or food safety auditors are a prerequisite for an efficient food safety control system. The reputation and integrity of the control system depends to a very large extent on the skills of the inspectors or auditors. However, systems for training staff in the food safety area are weak or non-existent in most African countries.

**Monitoring and scientific support**
A risk-based food safety policy calls for the collection and evaluation of information/data related to the prevalence of food borne diseases, the contamination of feed and food, and animal and plant health. The availability of such data is a prerequisite for risk assessment. Monitoring programmes for biological and chemical contamination of feed and food or the prevalence of food borne diseases and animal and plant diseases do not exist. Consequently, very limited information or data is available in most African countries. In this situation, risk analysis is virtually impossible and hence the international export of food products is problematic. Scientific support for monitoring programmes and assessing risk is a prerequisite in a modern food safety infrastructure. Such support is not available in all areas in most African countries.

**Laboratory support and accreditation**

**Laboratory support**
There are a number of food safety laboratories in Africa, but most have limited equipment and capacity. Almost all the agencies or institutions involved in food safety have or aim to have their own laboratory. However, most laboratories suffer from limited financial resources, equipment, and trained personnel, resulting in a limited capacity to perform even the most basic analyses that are essential to a number of potential export commodities. This includes the determination of parameters like pesticide residues, veterinary drug residues and chemical contaminants including PCB, dioxin and heavy metals as well as mycotoxins.

**Accreditation**
Africa’s only accreditation body is located in South Africa. This is the South Africa National Accreditation System (SANAS), which is firmly established as the national accreditation body of South Africa. The scope of accreditation offered by SANAS comprises test laboratories, verification laboratories, calibration laboratories,
inspection bodies, quality and environmental management certification bodies, and GLP system certification bodies. SANAS is internationally well recognized. In 1997, following a peer assessment, SANAS entered into a Mutual Recognition Agreement (MRA) with the European Accreditation (EA, then WECC). Recently, OECD’s Good Laboratory Practice (GLP) panel has successfully evaluated SANAS with respect to GLP system certification. SANAS is taking an active role in the establishment of accreditation in other countries in Africa. The West African Economic and Monetary Union (UEMOA), the East Asia Summit (EAS) and the Common Market for Eastern and Southern Africa (COMESA) are also trying to develop their own accreditation systems.

Food suppliers
In African countries most food operations do not have a formalized food safety/quality assurance system. Levels of awareness are low and there is a lack of know-how and investment to upgrade physical facilities and equipment. Due to export market pressures, most fish processing units are engaged in the implementation of Good Hygiene Practice (GHP) and Hazard Analysis and Critical Control Point (HACCP) and a few have obtained International Organization for Standardization (ISO) certification. However, due to their limited number, demand for support services is too low to sustain the required food safety institutional infrastructure, particularly the laboratory and the certification infrastructures that have to be heavily subsidized.

DEVELOPMENT APPROACH AND STRATEGY
African countries face significant challenges in meeting the requirements laid down in the SPS/TBT Agreements, which would enable them to participate in the international trade of agricultural and fishery products. UNIDO’s assistance involves the various stakeholders (participatory approach) and its activities range from developing policy and legislation to building infrastructures like administration, inspection, auditing and laboratory structures (holistic approach). To ensure system sustainability, the objectives, outputs and activities of UNIDO’s projects are structured in two main interlinked components that are implemented in parallel, in order to:

- Strengthen the SPS/TBT infrastructure to manage the food safety system, as well as to inspect or audit and to certify product compliance and conformity to food safety and quality regulations and standards, thus facilitating product access in various markets. This covers aspects like food safety policy, public awareness, information and education, risk analysis and food chain approach, legislation (including regulations and standards), management of food safety related activities, inspection and auditing, monitoring and surveillance and developing laboratory infrastructures.

- Strengthen the supply side productive capacity with a focus on priority sub-sectors or products and the promotion of local competitive suppliers. This includes in particular the dissemination of Good Aquaculture Practice (GAP), Good Management Practice (GMP), GHP, and HACCP along the food chain through developing awareness, increasing information and training as well as the introducing quality management systems based on HACCP and ISO standards in selected pilot food operations.

While developing national food safety and quality related capacities and capabilities, UNIDO assists in strengthening regional cooperation and coordination and encouraging harmonization of SPS and TBT systems with international standards and requirements. Regional cooperation and harmonisation can facilitate trade. It can lead to the development of a regional infrastructure (accreditation system, reference laboratories, etc.) that would not be affordable or sustainable at a national level, and help to strengthen a regionally based trade negotiation capacity.
RESULTS AND DEVELOPMENTS

Food safety policy and strategies based on risk assessment and food chain approach
A risk-based food safety policy applying the principles of prevention throughout the food chain (farm to table approach) is a prerequisite for meeting international requirements and standards. UNIDO is helping African countries to set up a well-defined and well-structured food safety policy with defined objectives and strategies, and a plan of action for implementation. All stakeholders, including the private sector, academia, research institutions, consumer associations and other NGOs, are involved in policy development. While focusing on the need for food security and consumer protection, the policy takes into consideration the country’s economic situation including its export import status, and the relative development of its food industry.

About 68 percent of the UNIDO technical assistance projects include some policy aspects. Mid-term results are mixed. In most countries and in the regional groupings, coordination and cooperation mechanisms have been established between the main stakeholders and/or the relevant authorities of the countries concerned and progress has been made towards the design of a common food policy, including in UEMOA, the Southern African Development Community (SADC), COMESA and the East African Community (EAC). However, only a few countries have appropriate scientific support and have started implementing the necessary monitoring programmes required for risk assessment and for supporting the policy making process.

More progress has been made in the fish industry sector where seven countries (out of the 12 assisted where the fish industry is the main focus of UNIDO activities) have started to address the policy issues that would allow the implementation of a risk assessment framework.

Establishing an appropriate national framework for food safety management
It is important that all ministries and agencies involved in food safety act in an integrated and coordinated manner. This helps to ensure adequate controls throughout the food chain and to make the best use of limited resources. UNIDO has been assisting the African countries to establish appropriate food safety management systems by promoting the establishment of national coordination frameworks or mechanisms, or even one central umbrella food safety authority, to deal with all food safety matters. Central authorities would be given clearly defined leadership functions for issues like:
- implementation of an integrated food safety policy;
- setting or proposing new regulation or standards;
- participating in relevant international food safety related activities;
- coordinating the operation of the national food control programme including monitoring mechanisms;
- facilitating continuous training and improvement; and
- securing funds and allocating resources.

Although some progress has been made, it has been difficult to achieve the full cooperation of all government agencies involved. From the 25 countries assisted in food safety, four have established Food Safety Agencies and three have introduced National Food Safety Committees, typically coordinated by the Ministry of Health. In other countries various institutions (ministries, standardization bodies, laboratories, private control agencies, etc.) are sharing the responsibility for and implementation of food safety management with no or little coordination. This leads to poor accountability and wasted resources. Many countries prefer to go through national coordination committees as an intermediate step to a single food safety agency. UNIDO experience suggests that this step provides a useful learning phase, where stakeholders can build mutual understanding of the relevant issues and find their own niche in the overall system.
Comparing sectors, the fish industry appears to be the most developed. Of the 12 countries where the fish industry is the main focus of UNIDO programmes, seven have established the ministry responsible for fisheries as the main institution responsible for safety management. In this exporting sector, where there is a strong market pressure for reform, producers and exporters associations have been heavily involved. This is the case in Morocco, Senegal, Guinea, Uganda, Kenya and Tanzania.

Enhancing public awareness, information and education
The general population’s awareness of food safety issues is very low. The technical assistance provided by UNIDO to the African countries (all UNIDO food projects cover this aspect) addresses the enormous need for information, education and advice in food safety matters, for all stakeholders across the food chain. All relevant stakeholder groups are identified and national cooperation mechanisms or frameworks with the food safety authorities established. Tailor made awareness strengthening and training programmes targeting key players in the overall production chain are being implemented. ‘Training of Trainers’ programmes are used as an important tool to communicate food safety facts to all extension workers in the agricultural and health sectors.

Although the traditional awareness strengthening and training workshops or seminars are relatively effective, their impact on the general public remains limited. Recently UNIDO has embarked on new approaches, such as the organization of yearly national food safety weeks, involving events such as school and market competitions, TV spots and debates. UNIDO has also established a so-called ‘quality award’, which is becoming a yearly event in some developing countries. The results to date are encouraging, and call for an increased focus on education in food safety. UNIDO is considering developing information packages for teachers and schools to help them introduce curricula on basic food safety principles in school programmes.

Industry can also play an active role in increasing food safety awareness. The active role played by producers’ or exporters’ associations, especially in the fish industry, has been instrumental in disseminating information on HACCP-based food safety assurance systems and their implementation among fish suppliers. Moreover, the capacity created in the fish industry has been used extensively to promote food safety assurance in other food sectors.

Legislation, regulations and standards to conform to international requirements
Ensuring conformity with international requirements is a very important activity in UNIDO’s technical assistance programmes in Africa (76 percent of the projects cover this aspect with 85 percent of them focusing on the fish industry sector). UNIDO assistance consists of helping to review regulations and subsequently updating them in conformity with international requirements and standards.

The results obtained so far are promising. Of the 25 countries assisted, half of them (all exporters of fish products) have updated their regulations, a quarter are progressing towards harmonizing their regulation with international requirements, while the remaining quarter intend to do so.

The review of fish regulations in several countries has created a dynamic that has led to the preparation of horizontal food legislation, based on risk assessment, to replace or serve as an umbrella to detailed vertical regulations. Proposed regulations are discussed with and validated by all relevant stakeholders before they go through the official approval channels. In most cases it takes years to have regulations approved and put into effect, especially laws that require parliamentary approval. However, responding to market pressure UNIDO has been helping in the adoption and enforcement of interim regulations, while the full legal basis is being secured. This has turned out
to be an effective transitory phase allowing the countries concerned to meet market requirements.

**Strengthening inspection and auditing services**

Improving skills and competencies by training staff involved in food control is part of all UNIDO technical assistance projects. The focus is on risk analysis and a modern inspection philosophy: self-control based on HACCP and/or other safety assurance systems. High priority is given to human resources development and the systematic training of all staff in food safety issues. Training targets the staff of inspection authorities and technical support institutions, including research and development and training institutions. Training is focused on system auditing, the establishment of well structured and operational border inspection posts, including at main ports and airports, and the introduction of internationally harmonized inspection and certification systems for all agricultural and fishery products destined for export. UNIDO has helped, in addition to training, in the preparation of inspection manuals or guides. It has also provided adapted inspection kits to a pilot group of inspectors, and has established pilot inspection zones for demonstration and practical training of inspectors.

ICT support is provided to help improve communication between local and national authorities, international organizations and relevant import countries. This enables an early warning or rapid alert system. Risk assessment in all enforcement measures and a food safety management system based on HACCP are promoted throughout the food chain.

Almost all (96 percent) of UNIDO technical assistance projects involve training. At least 30 inspectors and/or food safety auditors (excluding laboratory personnel) per country were trained. A total of 750 staff were trained over the last 10 years, most of them fish inspectors or auditors. Most of the food inspectors and/or food safety auditors trained are involved to some extent in fish inspection. In 18 countries (from the 25 assisted) the trained inspectors and/or food safety auditors have shown a high level of competence in performing scientific and risk based control functions and therefore are able to meet most of the industry’s needs in implementing HACCP and ISO quality management systems. As a consequence the use of international expertise has been considerably reduced.

**Monitoring programmes and improving scientific support**

Scientifically based risk assessment is the foundation of advice given to food safety authorities. There is an ongoing need for African participation in international standardization forums, so that Africa can participate actively in the formulation of standards rather than just adopting them. This participation has to be backed by strong scientific expertise, which is currently not available or weak in several African countries. Technical food safety committees established in conjunction with Codex Committees offer a starting point, but the full involvement of research and development or training institutions (universities, specialized institutes, etc.) is still constrained, mainly due to budgetary constraints.

UNIDO projects assist in strengthening the surveillance or monitoring systems of the countries, to generate information on the prevalence and levels of biological and chemical contamination of feed and food. This is a prerequisite for risk analysis and for establishing a risk based food safety policy. To support the implementation of such a programme, UNIDO promotes the establishment of scientific panels or committees to perform relevant risk assessment. Training is extended to scientific staff in the implementation of the food chain approach and in the establishment of procedures and forums for risk assessment and risk communication. ICT support is also provided to keep updated information on food safety hazards.
Although it is included in most UNIDO projects (88 percent) in Africa, risk assessment programmes have shown progress in only about half of the countries. Moreover, it is far from being a systematic activity, even at the level of food operations (with the notable exception of those exporting fish products).

**Strengthening the laboratory infrastructure**

Most of the African countries assisted by UNIDO have more than one laboratory reporting to various ministries and institutions. However, most of them are poorly equipped and staffed. The laboratories were assessed and one to two per country were selected for appropriate reorganization and restructuring, as well as for assistance at the accreditation stage. To ensure the financial sustainability of the laboratories, the selection took into account the need for the institutions to be able to provide various food safety tests. A quality assurance programme, including facilitating laboratories to participate in an inter-laboratory testing system and preparation for accreditation, was introduced. Training of all laboratory staff in routine analysis and quality management based on ISO/IEC 17025 is carried out as a priority activity.

The results obtained so far are very good. From the UNIDO projects that have been implemented in Africa, 21 (84 percent) include the strengthening of food testing laboratories. So far, 18 laboratories (in 13 countries) have considerably improved and have obtained or will soon receive international accreditation for specific analyses, while seven laboratories (in seven countries) have made progress in implementing GLPs. The remaining laboratories (five in five countries) have operational difficulties. From the laboratories assisted only one is private and, therefore, self-sustainable. The others rely for a large part of their operational expenses on government subsidies and project donor funds and are, therefore, far from self-sufficient.

In addition to strengthening laboratory capacity UNIDO has assisted in the establishment of accreditation bodies and systems. As the development of such an infrastructure at the national level cannot be financially sustainable, UNIDO has helped establish regional accreditation bodies (UEMOA-West Africa and potentially COMESA and SADC). For the other small groupings such as the EAC and the CEMAC (Central African countries), sustainability is an issue. In the meantime, regional accreditation schemes could be developed for EAC in connection with SADC (continuing using SANAS and other foreign accreditation bodies) and for CEMAC in cooperation with the UEMOA accreditation body. UNIDO is also promoting the active participation of these regional groupings in the International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC) whereby they would become members of their multilateral agreements.

**Food safety and quality assurance systems to enhance competitiveness**

Only a few food suppliers in Africa (most of them in the fish industry sector) are implementing a food safety assurance system. This is where UNIDO concentrates its main capacity building efforts, as assistance to industry and private sector in general is one of the main pillars of its mandate. HACCP based self-control systems enabling farmers, producers, traders, importers and retailers to conform to existing regulations and standards are introduced and disseminated with priority given to establishments exporting or intending to export their food products.

The results obtained, particularly in the fish industry, are very good. All 25 UNIDO programmes over the last 10 years provided extensive assistance to food suppliers including to around 350 food-processing operations. Sixty percent of these (210 enterprises) were in the fish industry sector. The review of UNIDO reports shows the following:

- On average, three years are required to introduce and fully implement the HACCP system.
• 170 enterprises (around 48 percent of the total) have introduced and are implementing a formalized GHP and HACCP system, 90 percent of them in the fish business. Less than 10 percent (17 enterprises) have the HACCP certified by a third party.

• 80 enterprises (around 23 percent) are progressing well in GHP implementation and most of them have a HACCP manual prepared. However, in auditing substantial corrective measures are still required. Thirty of these enterprises are in the fish business.

• The bulk of the 100 remaining enterprises, only a small proportion in the fish business (8 percent), are small enterprises targeting the domestic and/or regional markets. They have started to introduce basic hygiene principles. However, the investment required for upgrading physical facilities and equipment is often prohibitive. Based on a step-by-step approach, a plan of action tailored to the specific situation and financial capacity of each enterprise is being implemented with UNIDO assistance. It is estimated that it will take five years for most of these enterprises to be able to fully implement GHP and HACCP principles.

CONCLUSIONS
The capacity building efforts undertaken by UNIDO through the implementation of food safety programmes in 25 African countries have harvested promising results. Some overall conclusions can be drawn.

• Political will and related incentive policies are critical factors for the development of an effective food safety and quality assurance system.

• Adopting a holistic and participatory approach by involving the various stakeholders is a must for achieving the sought objectives.

• Ensuring the sustainability of a food safety system requires a sustainable safety and quality infrastructure and support services (institutional capacity building) that are demand driven. Likewise, capacity building efforts targeting the supply side (enterprises) need to be considerably increased.

• Although the constraints are often the same, the methodology to address them varies depending on the country concerned and the target beneficiary. Capacity building activities have to be tailored to each specific situation. The traditional replication system, or ‘one size fits all’ approach, has serious limitations.

• To achieve conformity/compliance in food safety, pressure from both market requirements (consumers) and regulation enforcement (inspection) is required.

• The needs of developing countries in general, and Africa in particular, for technical assistance in food safety and quality are huge and diverse. More coordination between development agencies to create synergies and to make the best use of resources available for technical assistance is required.

• The ability to learn from experience and to increase synergies with other multilateral and bilateral technical assistance interventions is a crucial element for increasing the future impact of UNIDO programmes.
## ANNEX

Coverage of food safety aspects in UNIDO’s food programmes in Africa

<table>
<thead>
<tr>
<th>Countries</th>
<th>FS policy-strategy</th>
<th>Awareness</th>
<th>Laws/Regulations</th>
<th>Food Safety Management</th>
<th>Inspection-Auditing</th>
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<td><strong>24 - 96%</strong></td>
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<td><strong>21-84%</strong></td>
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XXX: Important component of the programme
XX: Covered more or less although not foreseen as a separate component in the programme
X: Not foreseen in the programme and very few activities carried out.
F: Indirect and small coverage of the fish sector
FF: Fish is the main focus
Approaches to achieving seafood safety in East Africa

Nancy Gitonga
Fisheries Department, Kenya

ABSTRACT
Nile perch constitutes over 80 percent of fish exports from the East African region. Prior to the mid-1990s, over 70 percent was exported to the European Union (EU). The EU bans on fish exports from the East African region in the late 1990s, while inflicting serious economic losses on fishers, exporters, and local economies, provided an impetus for the development of comprehensive fish quality and safety management regimes. These include an overarching legislative framework, harmonization with EU regulations, public participation in monitoring safety standards, the development of industry and export groups, and significant regional co-operation. This paper gives details of the various mechanisms for ensuring fish quality and safety and outlines new developments and challenges facing the region’s fish industry.

INTRODUCTION
The East African Community (EAC) consists of three countries; Kenya, Uganda and Tanzania, linked together by Lake Victoria. Tanzania has the largest share of the lake at 51 percent, while Uganda has 43 percent and Kenya 6 percent. Kenya and Tanzania have a coastline giving them a rich marine fisheries resource. Uganda is landlocked, but is endowed with many rivers and inland lakes, in addition to Lake Victoria, which are also rich fisheries resources.

FISHERIES RESOURCES IN EAST AFRICA
Lake Victoria is the major economic fisheries resource of the three countries from which the world traded fish commodity, Nile perch, is harvested. Other commercially important fish from Lake Victoria include Nile tilapia and fresh water sardines, *Rastrineobola argentea*, which are traded in both regional and international markets.

Marine fisheries are under-exploited by both Tanzania and Kenya. The marine fish trade commodity in these two countries includes prawns, lobsters, octopus and assorted finfish. Kenya also processes and exports tuna loins. However, there is no established land-based industry for tuna, despite its abundance in both Kenyan and Tanzanian exclusive economic zones. Most of these resources are exploited and processed by Distant Waters Fishing Nations.

THE NILE PERCH INDUSTRY
Nile perch is an exotic fish introduced into Lake Victoria in the 1960’s and again in early 1970. The Nile perch fishery started to gain its economic importance in the 1980’s, when Kenya ventured into frozen fillets as an export commodity in international markets. Nile perch has gained so much economic importance over the past ten years that it is now the most important fish export commodity in the East African region. For example, Nile perch accounts for about 53 percent of the total fish production in
Kenya and over 80 percent of Kenyan fish exports. It provides direct employment to over 200,000 Kenyans.

THE FISH INDUSTRY IN EAST AFRICA
The fish industry in the three EAC states plays a very important economic role through employment creation, income generation, foreign exchange earnings and its contribution to food security and poverty reduction strategies. Fish production, fish trade, industrial processing and export, and related enterprises such as packaging, boat building and net making, directly supports about four million East Africans. The fisheries sub-sector contributes about 3 percent to the GDPs of Uganda and Tanzania and about 0.4 percent to Kenya’s GDP. Fish is also an important source of Government revenue and as an export commodity earns the three countries substantial foreign exchange: US$50 million for Kenya, US$82 million for Uganda and over US$100 million for Tanzania annually.

Most of the fish landed in Uganda, Kenya and Tanzania comes from Lake Victoria. The lake contributes approximately 49 percent of the total fish landed in Uganda, 92 percent of the total fish landed in Kenya and 61 percent of the total fish landed in Tanzania.

FISH EXPORTS
Nile perch constitutes over 80 percent of fish exports from the East African region. Over 70 percent of this fish was exported to the European Union (EU) member states prior to the series of EU fish bans in 1996, 1997 and 1999. There has been some diversification since the bans but the EU remains the most important export market for Nile perch from the three EAC states.

Catering to the EU market, and a desire to sustain their world market share, were the drivers behind the three states’ efforts to ensure the highest safety and quality standards of their fish and fish products.

A COMPETENT AUTHORITY (CA) FOR FISH AND FISH PRODUCTS
One of the requirements of the EU market is the establishment of a Competent Authority (CA) in countries wishing to export fish to the EU. The CA ascertains that the handling of fish targeted to the EU market by any third country complies with EU standards, and that fish processing establishments adhere to their Hazard Analysis and Critical Control Point (HACCP) plans.

To ensure the sustainability of fish safety, quality and trade, the three EAC states all now have well organized Competent Authorities. In Uganda, the Fisheries Resources Department of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is the agency responsible for statutory inspection, certification and control of fish and fishery products. In Kenya, the Ministry responsible for the Fisheries Department is the Competent Authority in matters related to fish safety and quality assurance, while in Tanzania, the Department of Fisheries in the Ministry of Natural Resources and Tourism is the Competent Authority.

All three CAs have well-trained and experienced inspectors, who are also adequately trained in HACCP-based inspections. These inspectors are charged mainly with inspection of fish production areas, fish processing establishments and markets, and certification of products and the fishing environment.

In order to meet the requirements of EU Directive 91/493/EEC and to streamline their operations to achieve efficiency, the EAC governments have done the following:

- appointed and established CAs in each country to create a one-stop-shop for licensing, management, quality control and the development aspects of fisheries;
• enacted fisheries legislation related to health and safety and harmonized with EU and other international fish safety legislation;
• provided technical assistance to export processing establishments to help them meet required international processing standards, and to develop and adhere strictly to HACCP plans instituted in all their operations;
• facilitated the formation of fisheries sector associations for fish traders, especially fish processors and exporters associations, with enforceable codes of practice as a means of self-regulation.

THE EU BANS ON FISH EXPORTS FROM EAC

The EU bans on fish exports from East Africa between 1998 and 2000, while inflicting enormous economic losses on fishers, traders and governments in the region, forced the industry to focus more on safety issues. Prior to the bans, the governments lacked comprehensive legislation to enforce the necessary safety and quality standards. Moreover, certification systems were not well defined, obliging processors and traders to deal with several government agencies on fisheries matters.

The poor definition of CAs and their roles was partly responsible for the three EU bans on Lake Victorian fish exports. The three bans experienced by the East African countries were as follows:
• 1997: based on claims of Salmonella contamination. This was limited to exports to Spain and Italy;
• 1998: in response to a cholera outbreak in East Africa and Mozambique;
• 1999: based on the suspected presence of pesticides residues in Lake Victoria. This third and final ban was lifted in April 2000 for Tanzania, August 2000 for Uganda and November 2000 for Kenya.

HARMONIZATION WITH EU REGULATIONS

The EU Council Directive 91/493/EEC of 22 July 1991 lays down the health conditions for marketing fish and fishery products in the EU. Third countries fulfilling the conditions of this Directive are listed in the Commission Decision 97/296/EEC of 22 April 1997, which is regularly revised and updated. In the last few years many third countries have been included. The European Commission (EC) classifies third countries into two categories (‘lists’) for the importation of fishery products for human consumption.

The first category (List I) includes countries whose processing systems and health standards are at least equivalent to the EU’s and whose CAs have been audited by an EU inspection team. The countries in the second category (List II) are those that have not been audited by the EU inspectors, but have supplied the Commission with written guarantees that they meet import conditions. Fish products from List II may enter the EU market under bi-lateral agreements with individual EU member but may be required to comply with additional national legislation of the importing state.

The three East African countries have had their CAs, fish processing establishments, and landing sites inspected by teams from EU Directorate General for Health and Consumer Affairs (DG SANCO). The three countries are therefore harmonized with EU standards, are in compliance with relevant requirements, and are all now on List I. Tanzania was the first to be upgraded to List I in 1997. It enjoyed this status until March 1999 when EU imposed a ban on fish products from Lake Victoria. The ban was lifted in Tanzania in April 2000, after which the EU inspectors visited the country twice to ascertain that safety measures were in place, before reinstating the country back to list I. Uganda was placed in List I in 2003 and Kenya in 2004. The main impediment for Kenya and Uganda to achieve List I status was the lack of clarity on the definition and the roles of their CAs. The EU inspection teams were concerned that inspection
and certification roles were not clearly defined and were administered by a range of
government agencies.

**FISH QUALITY AND SAFETY ASSURANCE MEASURES**

**A legislative framework**
All three countries have developed fish quality and safety legislation that ensures fish and fishery products placed on any market are safe for human consumption.

**Sampling and analysis of samples for monitoring purposes**
Sampling for pesticide residue analysis has been an on-going programme since the last
EU ban on fish exports from Lake Victoria. The CAs in the region have been collecting
samples of water, fish and sediment from identified landing sites in Lake Victoria, to
test on a regular basis for pesticide residues. This exercise is carried out to fulfil the
written guarantees given to the EU by CAs to monitor pesticide residues in water, fish
and sediments. It is also envisaged that the programme will assist the CAs in building
a database on the status of the fish and the fishing environment that would in turn
assure consumers of the safety and quality of fish in Lake Victoria. Results of analysis
to date have been satisfactory. They have shown no detection of pesticides at the 'level
of detection' (LOD). In addition, microbiological analysis of fish samples and swabs
collected from fish contact surfaces, is regularly conducted by CAs in fish processing
establishments.

**Public participation in the safety and management of fisheries resources**
The three East African countries have now adopted 'Beach management units'
popularly known as BMUs, as primary grassroots or community institutions to
monitor fish industry compliance with fisheries management requirements. The role
of a BMU includes the following:
- ensuring that fishers carry out fishing and fish handling responsibly and
  hygienically;
- dissemination of information on responsible fishing and handling methods to the
  community and stakeholders;
- ensuring that hygiene standards at the landing site are maintained; and
- managing environmental issues.

**Upstream control of fish safety and quality**
To address some of the post-harvest safety management issues, the three East African
countries have also taken steps to improve fish handling facilities at fish landing
sites. Funding for the improvement of these facilities follows an integrated approach
whereby the responsible Government, fish processors, local communities and donors
all make contributions.

To ensure the traceability of fish from fishing grounds to the consumer, the three
East African countries have introduced local 'Health Certificates' at landing sites. The
certificate accompanies raw fish from landing site to the processing establishment, to
ensure that fish for export is collected at designated areas that have been certified by
CAs.

**PRIVATE SECTOR FISH PROCESSING AND EXPORT ASSOCIATIONS**
One of the useful outcomes of EU harmonization was the implied requirement to have an
organized private sector capable of self-regulation. Fish processors and exporters from
the three countries have organized themselves into strong member driven associations.
These associations include: the Association of Fish Processors and Exporters of Kenya
(AFIPK), the Uganda Fish Processors and Exporters Association (UFPEA), and the
Lake Victoria Fish Processors and Exporters Association of Tanzania (LVFPAT). These associations are also members of the East African Fish Processors Association and have been instrumental in ensuring standards are maintained by developing a Code of Conduct for its members. These associations have also acted as useful interfaces with governments on fisheries co-management and trade issues.

The above associations are focused on exports only, a sector which accounts for less than half of total fish landings. The need for business linkages between large and small-scale players in fisheries cannot be overemphasised. The associations are expected to play a key role in developing these linkages, as well as in facilitating the development of small-scale fish trade and industry.

**RECENT FISH TRADE DEVELOPMENTS AND CHALLENGES**

**Trademark**
Nile perch is now registered as “Lake Victoria perch” through the Lake Victoria Fisheries Organization (LVFO). This is expected to give the popular product a clear brand and a niche in world markets.

**Value addition**
The three EAC states need to examine the potential for value addition to maximise revenues derived from Nile perch products. This would also enhance the sustainable management of the resource, as less fish could potentially be harvested for the same amount of earnings.

**Value-chain reduction**
Fish reaching the EU market from this region often goes through four or more steps before it is retailed to the consumer. This means a substantial difference between retail and export prices. The value of Nile perch fillets to the East African exporters is US$3-4 a kilo, but they retail at between US$15-17 a kilo in supermarkets in the EU. Reducing the steps between export and retail could enhance sales by delivering a cheaper product, and could increase the subsequent revenues from Nile perch products accruing to the three EAC countries.

**Slot size**
Imposing limitations on exports of whole Nile perch and fillets below certain sizes and weights, if implemented, would discourage the fishing of juvenile stock and would encourage stock recruitment, thereby contributing to the increased sustainability of fishing in Lake Victoria. The region is implementing slot-size harvesting with very encouraging results.

**Sanitary and phytosanitary (SPS) issues**
The procedures and time required to implement SPS issues in the fish industry, and to implement transparent verification mechanisms, are sometimes problematic. Unilateral demands, such as the sudden introduction of new standards, continue to hurt the region’s fishery economy. A case in point is the current practice whereby an exporter whose consignment has suffered a rapid alert (marked as having a pathogen or unauthorized substance) has no access to the sample in question for independent verification. Even when there is access, the ensuing results are not considered if the verifying laboratory is not EU based. It also takes much longer to remove the rapid alert posted on the Internet, following compliance, than it takes to place it there.
Certification and harmonisation of fish inspection and quality assurance standards

A regional task force (RTF) composed of six members, two from each of the East African countries was formed in 2000 to develop certification and harmonization of fish inspection and quality assurance. The RTF developed three draft documents:

- a Code of Practice (COP) for fishing, fish handling and processing fish in Lake Victoria;
- an Inspectors Guide;
- a manual of standard operating procedures for fish inspection and quality assurance.

The East African Community made a decision in 2003 to harmonise their sanitary and phytosanitary measures. A joint regional harmonisation team consisting of the members of RTF and members of the Regional Working Group on Fish Quality and Assurance was established to produce fish and fishery products sanitary standards, measures, and procedures. The joint team, through consultative meetings, has developed:

- a Code of Practice for Fish and Fishery products: Part I Capture Fisheries, Part II, Aquaculture; and
- an Inspectors’ Guide, Part I and II.

The third draft report, the Manual of Standard Operating Procedures (MSOP), Part I to IV, is in the final stages of development. The drafts will be presented to stakeholders for adoption at a workshop to be held later in 2005.

CONCLUSIONS

The EU bans on fish exports from the East African region in the late 1990s provided the stimulus for the three EAC states to improve their safety and quality control mechanisms. Enormous improvements have been made, including harmonization with EU regulatory requirements. Further advances are being driven by active cooperation between the three EAC governments. The future sustainability of the Nile perch resource and its economic benefits to the EAC countries will depend on further cooperation in the region, including in seeking value chain reductions, value additions, and the development of an organized private sector capable of self-regulation. Business linkages between small and large-scale players in the industry will also be crucial.
Uptake of HACCP in developing seafood industries in Asia and the South Pacific

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ABSTRACT
Collaboration between government and industry is the most effective way of protecting consumers from food-borne health hazards. When food is traded globally importing countries must have confidence in exporting countries’ food safety management programmes. Although many processing plants in developing countries in Asia and the South Pacific currently would not comply with Hazard Analysis and Critical Control Point (HACCP) and other international requirements, these countries are attempting to introduce HACCP-based food safety systems to ensure that their processes and products meet the requirements of global markets.

INTRODUCTION
Food trade plays a significant role in the economic development of all countries and is a major contributor to the improvement of social, political and economic conditions worldwide. Most countries have some comparative advantages in the production of different raw or processed foods, which can help in promoting domestic or export trade. At the same time food imports are often the most cost-effective way to obtain supplies of other needed raw or processed foods. The continuous growth in food trade has been brought about by advances in food manufacturing and processing technology, which has in turn, led to increased product shelf life and product security. Rapid transportation and improved shipping and handling methods have reduced shipping time and distance barriers allowing traders access to new and distant markets for their products.

Technological advancement has without doubt, improved food quality and safety. However, trading food in today’s global trading environment, where there are virtually no boundaries, has also given rise to problems and causes for concern. Food products are shipped today from one part of a country to another in a few hours. However, abuses occurring along the way, during transportation and storage, may render good quality food unsafe by the time it reaches the final consumer. As the volume of food trade increases, there is increased potential for exposing consumers to food quality and safety related problems.

Food safety laws are enacted to protect consumers against unsafe products, adulteration of food, and fraud, and to protect the honest food producer and trader against the dishonest. They also facilitate the movement of goods within and between countries.
THE REQUIREMENTS FOR FOOD QUALITY AND SAFETY

In order to be a successful food exporter, a country must produce foods that are both sought after and acceptable to consumers in other countries, and which comply with the statutory requirements of those importing countries. Compliance with the statutory, compulsory or mandatory requirements of importing countries is an unavoidable and essential prerequisite to successful and profitable food exporting. However, compliance is becoming increasingly demanding because of the preoccupation of the global community with food safety and health hazards. In addition, an increasing number of importing countries are demanding inspection and examination procedures, as well as certification by governments in exporting countries that products and process are in compliance with those importing countries own quality and safety standards.

A SHIFT IN RESPONSIBILITIES FOR FOOD CONTROLS

These changes have resulted in a redefinition of food control reflecting a shift of responsibility to industry. The current internationally accepted system of control is the Hazard Analysis and Critical Control Point (HACCP) system based on a definition of food control as ‘a mandatory regulatory activity of enforcement by national or local authorities in collaboration with the food industry to provide consumer protection and ensure that all foods during production, handling, storage, processing and distribution are safe, wholesome and fit for human consumption, conform to quality and safety requirements and are honestly and accurately represented in their labelling as prescribed by law’.

This redefinition of food control requires food manufacturers to assume responsibility for their products by adopting procedures that ensure adequate levels of safety and quality. These procedures include:

- The appointment of Food Safety and Quality Control Officers to supervise the safety and quality aspects of products by maintaining continuous surveillance during all links in the production process. This was something previously undertaken by food control agency inspectors.
- The mandatory adoption by processors of food safety programmes including Good Hygiene Practice (GHP), Good Manufacturing Practice (GMP) and HACCP.
- The maintenance of detailed records of production procedures for inspection and evaluation by audit inspectors, without which food is considered adulterated according to the regulations of some major importing countries.

THE CURRENT SCENARIO IN ASIA AND SOUTH PACIFIC

In many countries in the Asia Pacific region only 30-35 percent of the existing processing establishments would comply with HACCP and other international requirements. Even in processing plants where those measures have been implemented, several deficiencies can be observed in the actual application of food safety management systems. There are several areas where major concerns exist. For example, HACCP records sometimes do not contain:

- the name of the processor;
- the names of the reviewers;
- the date of review;
- the name of the product;
- the intended use of the product; and
- do not comply with CFR 123.9.

Moreover HACCP plans often contain:

- unscientific ‘critical control points’;
- incorrect ‘critical limits’;
incorrect monitoring procedures; and
insufficient or incorrect corrective actions.
Monitoring and recording deficiencies also exist. For example:
- Sulphite monitoring often has not occurred. In few instances where the analysis has been conducted, the method of sampling and testing has been improperly documented.
- Monitoring chlorine in water is reported as <2 ppm, <20 ppm etc. which can be even '0'. The true value needs to be recorded.
- Temperature is not measured correctly during monitoring.
- Temperature recordings for Scombroid species are not adequate. Cumulative time and temperature are neither included as a 'critical limit' nor monitored and recorded.
- Cooked product fails to meet 'Time and Temperature requirements, the 'process of deviation' is not recognized, and there is no provision for 'corrective actions'
- The frequency of monitoring is not recorded.

HACCP plans are also sometimes combined when the potential hazards are different. Confusion still appears to exist in terms of identifying significant hazards, whether they are biological, chemical or physical. Clearly, HACCP training is inadequate in many cases. The United States Food and Drug Administration (FDA) has noted deficiencies in all areas of sanitation. Yet in the monitoring records of the facilities concerned, often no such deficiencies are recorded.

CONCLUSIONS
Most governments throughout the world have made a serious commitment to protecting their consumers from food borne diseases and other food related hazards. This commitment is growing and is viewed increasingly by consumers as an essential part of government responsibility. For this reason most countries have operational food laws or are in the process of developing them. They also have food control agencies to implement those laws. Until recently inspectors and other officials of those agencies carried out full inspections, on a continuous basis, to ensure the safety and quality of food products. However, now their activities are mostly restricted to audit inspection; checking the controls manufacturers themselves apply to their production processes and products to ensure compliance with mandatory or statutory requirements. This concept of audit inspection needs to be strengthened and practiced as the industry becomes more self-regulating.

As a result of these global developments, fish safety has become a priority in many developing countries. In response to FDA and EU regulations, HACCP based food safety systems are gradually changing from a ‘paper programme to a programme in practice’ throughout the Asia Pacific region. This needs to be encouraged and supported.

The importance of food safety controls cannot be overemphasized. A collaborative effort between government and industry is the most effective way of protecting consumers from food borne health hazards and ensuring honest and fair practices in the trading of food.
Rebuilding capacity after the Tsunami: lessons learned

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ABSTRACT
The massive earthquake and subsequent tsunami that originated off the west coast of northern Sumatra on 26 December 2004 killed an estimated 300,000 people and devastated the livelihoods of millions of people. Members of the Food and Agriculture Organization (FAO) of the United Nations gave the Organization the mandate to take on a coordinating role in the rehabilitation and reconstruction of fisheries and aquaculture, the worst hit production areas. FAO developed a four-level timeframe response to the tsunami crisis, from relief to development. The aim of FAO post-tsunami assistance is optimising sustainable outcomes by restoring coastal ecosystems and by “building back better” the livelihoods of the affected communities.

INTRODUCTION
The massive earthquake and subsequent tsunami waves that originated off the west coast of northern Sumatra on 26 December 2004 killed an estimated 300,000 people and devastated the livelihoods of millions of coastal people, many of them poor fishers, farmers, and their families (APFIC, 2005). Rapid assessments after the disaster confirmed that the fisheries sector was the worst hit, with crops, livestock and coastal eco-systems, including mangroves and tree crops, also suffering serious damage. Strong support from donors has allowed FAO to provide direct assistance to those victims in the form of boat repair kits and engine parts for fishing boats, fishing nets and other gear, seeds and farming tools, and repair of irrigation and drainage infrastructure. Above all, FAO has provided technical assistance and expertise for optimizing sustainable outcomes in “building back better” the livelihoods of the affected fishing and farming communities, and restoring the coastal ecosystem, including mangroves and other crop trees. This paper:
• provides an overview of the impact of the tsunami on fisheries in the affected countries of the Indian Ocean;
• summarizes the major challenges faced by all those involved in the reconstruction and development of the fisheries sector; and
• presents the FAO strategic response and framework to the Tsunami crisis, in particular introducing the role of the FAO Fisheries Tsunami Task Force.

IMPACT OF THE TSUNAMI ON FISHERIES AND AQUACULTURE
The earthquake off the coast of Sumatra of 26 December 2004 was the fourth largest in the world since 1900 and the largest in nearly half a century (World Bank, 2005). It triggered large tsunami that surged with devastating force against at least 12 countries, among which Indonesia, Sri Lanka, India, Thailand and Maldives were the most seriously affected.
During the initial stages of the disaster, FAO sent field teams to assist with rapid damage and needs assessments to India, Indonesia, Malaysia, Maldives, Myanmar, Seychelles, Somalia, Sri Lanka and Thailand. These teams also assisted in the emergency coordination responses in affected countries. Several assessments and subsequent strategies were carried out and elaborated in collaboration with the World Bank, the Asian Development Bank (ADB) and the International Fund for Agricultural Development (IFAD).

FAO estimates put the human cost of the tsunami at just under 300,000 people killed (or still missing) with a negative impact on the livelihoods of around five million people (FAO 2005a, b). The cost of recovery for the affected areas could be over US$1.5 billion (ADB 2005). The majority of those affected had agriculture or fisheries based livelihoods or were employed in associated enterprises. The degree of damage to lives and property varied within and between countries and communities, with some suffering the complete loss of villages, homes, fishing and aquaculture infrastructures (including port and post-harvest facilities), fishing boats and gear, aquaculture facilities (including ponds, cages, hatcheries and brood stock) and markets, as well as other assets important to local livelihoods. Table 1 summarizes the impact of the tsunami on each affected country. These brief summaries are developed further below.

**Indonesia**

Although the disaster was geographically limited, Indonesia was the worst affected country. The tsunami devastated the coastal areas of North Sumatra, especially the northern and western communities of Aceh Province. The number of dead or missing was estimated at 230,000 and the number of displaced people in Aceh at over 400,000. Over 50 percent of the active fishers were killed. The total estimate of damages and losses is in the order of US$4.45 billion, nearly two thirds of it in the private sector.
including housing, commerce, agriculture, fisheries, and transport. Some two-thirds of fishing equipment including boats and gear, and half of the fisheries and aquaculture infrastructure were destroyed or damaged. Up to 48,000 hectares of brackish water aquaculture ponds were seriously damaged. Fisheries sector output in the affected districts are showing a decline, estimated at as much as 60 percent as a consequence of physical loss, the large number of fishers killed, and the post-trauma fear of recommencing fishing. Direct damage to fishing and aquaculture assets, excluding income losses due to lost production, has been estimated at about US$ 140 million.
Maldives
The entire population of the Maldives was affected as the country’s more than 1,100 islands became inundated. Twenty of the 198 inhabited islands were largely devastated. Over one-third of the total population of 280,000 was severely affected; their homes destroyed or severely damaged and their water and food supply undermined. Eighty people were killed and twenty remain missing. About 12,000 people continued to be displaced as of March 2005. Tourism and fisheries, which are the main economic sectors of the Maldives, were severely affected by the tsunami. The direct damage to fishing and fish processing equipment and indirect income losses in the fishery sector have been estimated at US$25 million. Direct losses to fisheries include: 120 fully damaged and lost fishing vessels, 50 partially damaged vessels, and lost equipment of 337 cottage fish processors and of 37 commercial processors. In macroeconomic terms, the Maldives was the worst affected country. The damage to productive assets, housing and infrastructure is estimated at US$470 million, but this figure amounts to nearly two-thirds of the country’s gross domestic product.

Sri Lanka
In Sri Lanka, the devastating tsunami struck 12 out of its 14 coastal districts, killed over 31,000 people, destroyed, fully or partially, some 140,000 houses, and damaged natural ecosystems and coastal infrastructure. Vulnerable groups, such as poor fishing communities living close to the shore in simple houses and shelters, have borne the brunt of the negative impacts. Most of the people killed were fishers and their families. In addition, some 90,000 fisherfolk have been displaced due to the loss of housing and other household assets.

Overall economic damage is estimated at close to US$1 billion (approximately 4.4 percent of GDP), with losses concentrated in the housing, tourism, fisheries and transport sectors. The total damage to the fisheries sector, excluding the damage to housing and assets of the affected fishing population, is estimated at US$120 million. Extensive damage has been caused to 200 landing sites, 10 fisheries harbours and 37 anchorages as well as to the associated fish handling facilities, fishery co-operative buildings and vehicles in the affected areas. More than 20,000 of the country’s fishing fleet of about 28,000 vessels were either fully destroyed or damaged to varying degrees. Fishing inputs such as outboard motors, ice storages, fishing gear and nets have also been destroyed, as has the fisheries infrastructure. The ten most affected fisheries districts of the country account for over 72 percent of total marine landings. Over 60 percent of the national fleet and an estimated 80 percent of the active fishers were registered in these districts.

Thailand
In Southern Thailand, along the coast of the Andaman Sea, more than 5,000 people were killed, about half of them foreign tourists. People working in fishing and allied activities and in tourism were the most affected. Overall, the livelihoods of several hundred thousand people have been affected by the tsunami. Large-scale damage was inflicted upon some 400 fishing villages, including the damage or destruction of 4500 fishing boats. About 30,000 poor households that depended on fisheries lost their means of earning a living. The estimated damage reported included over 4,900 fishing vessels, more than 6,000 fish and shellfish cage farms, and 42 shrimp farms. In addition, 83 public harbours or piers were affected. Severe damage was also caused to private jetties and piers for private boats, and fishery-associated businesses, such as ice plants, gas stations, fish landing sites, markets, and ecotourism ventures.
Somalia
The north eastern coastline of Somalia was the worst affected area in Africa. The tsunami hit people already vulnerable because of civil war, chronic droughts and floods. An estimated 150 people have died, and at least 50 000 more have been directly affected through damage to houses, boats, wells, and water reservoirs. As the tsunami coincided with the height of the fishing season, the impact on fishing livelihoods and fish consumers was exacerbated. The community has suffered big losses of boats, engines, nets, traps and other fishing equipment. In total, more than 220 fibreglass boats, 250 wooden boats and engines were totally lost while others needed repairs to reverse further losses. Some 24 912 nets, 3 730 traps and 587 diving sets were destroyed.

Yemen
The most affected parts of Yemen were the two remote districts of Socotra (an island) and Al Mahara (on the south east coast). As the waves hit the beaches, most people were in the villages and only a few deaths have been recorded. The main damage was to fishing boats, engines and gear. Most boats were anchored outside the beaches, with their outboard engines mounted. Around 600 boats and engines have been lost or damaged, together with some 1 600 fishing nets and 17 000 fishing traps. There was also damage to infrastructure, beaches, natural harbours and jetties. The total value of the direct damage is now estimated to be US$2.8 million. Thousands of fishers have lost their main source of income.

FAO RESPONSE
In the first week after the disaster, FAO, like other specialized agencies of the United Nations responded swiftly to provide relief and rehabilitation assistance in the areas of agriculture, fisheries and forestry. In addition to an immediate approval of three Technical Cooperation Projects for a total of US$1.5 million and the dispatching of FAO staff to the affected areas, it launched, in cooperation with other United Nations (UN) agencies and through the UN Office for the Coordination of Humanitarian Affairs (OCHA), a flash appeal for US$29 million to fund its assistance in agriculture, fisheries and aquaculture. The resources were necessary to enable the provision of technical assistance and coordination. In the case of fisheries, this included assisting in supplying fishing gear, repairing and replacing fishing boats and engines, and rebuilding or repairing landing sites, fish storage and processing facilities and fish markets, and rehabilitating aquaculture ponds. A flash appeal review was launched three months later once a better estimate of the damage was available and FAO increased its appeal for assistance to US$103 million.

Several donors, including Japan, Norway, Germany, the United Kingdom, Italy, Canada, Belgium and China, funded 45 projects valued at US$75 million. Around 60 to 70 percent of these funds were earmarked for fisheries rehabilitation and reconstruction. Even developing countries such as Laos, Palau, Algeria and Zambia contributed to this international effort. In this context, it is important to realize that the level of funding received by FAO is relatively small when compared to the overall resources collected by the many organizations and agencies involved and estimated at several US$ billion. In Indonesia alone, some 124 International Non-Governmental Organizations (INGOs), 430 local NGOs, dozens of UN agencies, various government agencies and many others have been working in tsunami relief and rehabilitation. The Red Cross and Red Crescent Movement alone raised US$1.8 billion, while other INGOs raised hundreds of millions, largely through web-based fundraising (WB 2005).
Overall Strategic framework
Regional meetings and two important events organized in March 2005 at FAO in Rome, namely the FAO Fisheries Ministerial Conference (12 March 2005) and the 26th Session of the Committee on Fisheries (7-11 March 2005) paved the way for the development of a four-pronged timeframe response to the fisheries crisis caused by the tsunami. Figure 2 shows the framework used to address the continuum of assistance: from relief to development work (with the indicated timeframes defined from the date of the disaster). Four important phases were identified:

- **Immediate** (first 6 months) with emphasis on damage assessments and emergency work in the context of the original UN Tsunami Flash Appeal.
- **Short-term** (12 months) with emphasis on rehabilitation assistance in the context of the Mid-Term Review of the UN Tsunami Flash Appeal.
- **Medium-term** (12-24 months), through the preparation of strategic frameworks (or sectoral master plans) and specific FAO action plans for rehabilitation.
- **Long-term** (over 24 months and up to 5 years) through reconstruction programmes and projects that include elements of longer-term planning.

Guiding principles for reconstruction
FAO strove to build its tsunami-related work on the following guiding principles throughout all the reconstruction phases:

- Recognize the sovereign right of each country affected.
- Base all interventions on livelihood enhancement and poverty alleviation.
- Adopt participatory approaches, and to the extent possible rely essentially on inputs and skills and capacities used prior to the disaster and available locally.
- Promote activities compatible with sustainable fisheries, agriculture and forestry management practices. Environmental sustainability must underpin reconstruction strategies.
• Adopt flexible and adaptive methods in order to respond to the multiple dimensions and complexity of the tsunami disaster.
• Strengthen national and local institutional capacity.
• Adopt a collaborative approach with international or regional development partners and donors for improved planning, implementation and coordination and information sharing.
• Adopt multisector and integrated approaches (linked to the interdependency of communities and socio-economic linkages between sectors and geographic areas), especially in view of the fragile coastal ecosystems affected by the tsunami.

Regional strategy
Through the Consortium to Restore Shattered Livelihood Communities in Tsunami-devastated Nations (CONSRN), FAO has been instrumental in the development of a regional strategy for the rehabilitation and reconstruction of the fisheries and aquaculture sector in Asia. This strategy contains six objectives that form the basis for CONSRN partner activities in the region (APFIC 2005):

• To develop a responsive and well regulated policy and institutional environment for fisheries and aquaculture at national and local level, which involves communities and recognizes the importance of local level needs in planning, monitoring and regulation.
• To ensure that appropriate physical assets are provided to the tsunami victims in a timely, equitable way to replace what they have lost while ensuring sustainable use of natural resources in the future.
• To restore the natural environment while ensuring coastal communities impacted by the tsunami continue to have equitable access to inputs and the sustainably managed natural resources on which their livelihoods are based.
• To ensure that appropriate financial mechanisms are in place for those affected by the tsunami.
• To ensure, through the adoption of a participatory approach and capacity building, that the coastal systems of tsunami affected countries are managed in a sustainable way to the benefit of all in the communities. Specific objectives should include:
  - to improve and diversify the livelihoods of coastal resource users;
  - to improve the efficiency of rehabilitation investments through ensuring the conservation of natural barriers, which can act as protection;
  - to achieve sustainable management of the natural resources on which community livelihoods depend;
  - to ensure conflicts between user groups are resolved; and
  - to ensure the needs of the poor, marginalized groups, and small scale fishers and fish farmers are included.
• To ensure the development of communities and community organisations which are empowered to take part effectively in post-tsunami planning and rehabilitation activities.

Progress and achievements
FAO has assisted the Governments of Indonesia, the Maldives, Myanmar, Seychelles, Somalia, Sri Lanka, Thailand and Yemen in the assessment of damage to their fisheries and aquaculture sectors and related relief and rehabilitation needs.

1 Members of the Consortium are: Asia-Pacific Fishery Commission (APFIC); the Bay of Bengal Programme – Inter-governmental Organisation (BOBP-IGO); FAO Regional Office for Asia and the Pacific (FAO-RAP); Network of Aquaculture Centres in Asia-Pacific (NACA); Southeast Asian Fisheries Development Center (SEAFDEC); and WorldFish Center (WorldFish).
The FAO Fisheries and Aquaculture Department developed a Web site on fisheries and aquaculture interventions in tsunami-affected areas that seeks to provide consolidated information on needs in the fisheries and aquaculture sector and on relief and rehabilitation measures, and serves as a focal point for all stakeholders and donors. This Web site is part of the overall FAO tsunami Web site, and is connected to the UN Atlas of the Oceans website maintained by FAO on behalf of UN agencies. The purpose of this site is to coordinate the agencies’ information on ocean-related activities, and on the activities developing around the tsunami issue.

During the first year, FAO’s emergency programme for the tsunami-affected countries amounted to US$52.7 million to fund 46 projects. FAO dispatched some 35 international fisheries experts to work with nationals to provide technical assistance and coordination and assist governments in damage assessments, relief and rehabilitation efforts. The field experts were backed by some 20 officers from FAO headquarters in Rome and the Bangkok regional office, as well as the national FAO offices, all dealing with technical, logistical and operational issues. In addition to the initial relief effort, FAO was asked to provide policy advice to government institutions to develop national plans for fisheries rehabilitation and reconstruction for the medium to long term. Support has been gradually shifting from repair of boats and engines and provision of gear and engines towards technical assistance, training on boat building, development of safety standards for boat building and coordination. It is foreseen that the reconstruction of fisheries will take at least three to five years. FAO is developing project proposals to ensure that fisheries in the tsunami affected countries are “built back better”

FAO Members gave the Organization the mandate to take on a coordinating role in the rehabilitation and reconstruction work in the fisheries and aquaculture sector. FAO was also designated the coordinator of emergency and rehabilitation efforts in fisheries by the national authorities in Sri Lanka and Indonesia. As a result, the FAO Fisheries and Aquaculture Department is actively assisting affected countries in the development of country-driven national strategies and implementation frameworks. These frameworks are developed by governments with multi-agency assistance provided by the International Financing Institutions (IFIs) and the UN system. Each country framework has a fisheries component and incorporates a livelihood-based approach and other cross-cutting issues such as food security, gender, and the protection of the coastal and marine environment, reflecting the fact that fishing and farming communities were, in most countries, the worst affected by the tsunami.

The FAO Fisheries and Aquaculture Department also cooperates with the UN Development Group2, other UN organizations, other inter-governmental organizations (IGOs), fisheries networks, NGOs and civil society. During the 26th meeting of the FAO Committee on Fisheries (COFI), held in Rome in March 2005, about six hundred participants from national governments, UN agencies and observers from IGOs and NGOs discussed the rehabilitation of fisheries in the Indian Ocean. Following the COFI meeting, fisheries ministers met to discuss tsunami rehabilitation and adopted the 2005 Rome Declaration on Fisheries and the Tsunami, which emphasizes a joint commitment to assist affected countries with concerted rehabilitation and reconstruction activities.

As part of the overall FAO efforts to assist the affected countries, close collaboration has been maintained with IFIs including the World Bank, the Asian Development Bank (ADB) and the Islamic Development Bank (IDB). FAO is collaborating with IFIs in the areas of:

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2 Formed by the United Nations Development Programme (UNDP), the United Nation’s Children Fund (UNICEF), the United Nations Population Fund (UNFPA) and the World Food Programme (WFP).
• needs and damage assessments in agriculture and fisheries sectors;
• formulation of rehabilitation and recovery strategies;
• participation in missions to help design project or programme interventions; and
• facilitation of the exchange of technical and operational information.

So that the benefits of FAO’s know-how and resources reach the largest number of fishers, fish farmers and their families affected by the tsunami, a key task of the staff of FAO’s Fisheries and Aquaculture Department is to assist those who are responsible for planning and implementing relief and rehabilitation activities at both national and regional levels. At the national level, staff and consultants of the FAO Fisheries and Aquaculture Department form part of national task forces established by governments to coordinate all tsunami related assessment, relief and rehabilitation measures.

LESSONS LEARNED AND CHALLENGES

Emergency relief versus rehabilitation and development

Despite the massive and immediate worldwide support, there is a widely held impression that little was done during the first eight months following the tsunami. People are desperate to return to normality but the recovery process is very complex. In the case of fisheries, FAO was caught between immediate needs and longer-term reconstruction. There were immediate demands to deliver outputs (gear and boats) and to show results rapidly, as expected by the donors. This had to be balanced against the need for coordination to avoid duplication and careful planning to ensure medium and long-term issues in reconstruction and development were addressed.

Involvement of communities

Another important lesson is the need to develop community-based strategies and participatory processes. The involvement of fishers, through their fisheries associations (e.g. Panglima Laot in Aceh Province) and other similar schemes, enabled rehabilitation operations and provided livelihood restoration opportunities, such as cash-for-work schemes, training carpenters in boat building, and contracting local NGOs to assist in project operations. This increases the risk of misappropriation of resources and/or malpractice, depending on whether or not transparent and robust procurement practices and other checks and balances exist.

Coordination of assistance

Coordination among the providers of assistance is vital, but problematic unless planned at the highest levels of government, and at UN level. There is still an urgent need to support the capacity of the governments of affected countries in their efforts to coordinate, monitor and plan livelihood rehabilitation (specifically related to cross-cutting issues in all three sectors; agriculture, fisheries and forestry). Examples of national initiatives in the affected countries include the Aceh and Nias Rehabilitation and Reconstruction Agency (BRR), established by the Indonesian Government and reporting directly to the President, and the Task Force for Rebuilding the Nation (TAFREN) in Sri Lanka. FAO’s role is to provide technical advice to support coordination, monitoring, evaluation, information sharing and planning for the medium to long terms. Such support will assist the longer term planning for rehabilitation and ensure the most effective and efficient use of resources.

Flexibility and accountability

Flexibility of procurement and operations in project implementation in emergency situations is not always compatible with the establishment of proper checks and balances for accountability and the principles of good governance. Flexibility involves a certain level of risk that many organizations are not always able or willing to take.
Risks of rebuilding
A real risk for the reconstruction of tsunami-affected fisheries is the danger of creating or exacerbating unsustainable fisheries, through overfunding and/or insufficient coordination. There is already evidence of fishing overcapacity through the introduction of inappropriate fishing craft and gear. If appropriate and sustainable fishing practices are to be rebuilt, there is a need to provide alternative livelihoods for some fishing communities, especially in countries with a history of overcapacity.

CONCLUSION: FUTURE ACTIVITIES AND THE ROLE OF FAO
The 2005 Rome Declaration on Fisheries and the Tsunami called upon FAO to “play a leading role in advising and supporting the international community in matters relevant to sustainable fishing and aquaculture rehabilitation” (FAO Council 2005). FAO support to tsunami-affected countries should be increasingly focused on the sustainable use of natural resources through, among other things, the empowerment of small-scale fishers, local communities and resource users. The following specific activities are priorities for FAO, chiefly in the medium to long term of its four-level timeframe response (Figure 2):

• the establishment of a new Steering Group to include representatives from donor and recipient countries as well as representatives from the FAO Fisheries Department and FAO-RAP;
• the provision of advice and support by FAO Fisheries Department staff and consultants to the national governments’ task forces;
• assistance in the development of national and regional rehabilitation and reconstruction strategies; and
• the provision of technical and policy guidance to plan and coordinate all rehabilitation efforts in fisheries and aquaculture.

Despite shortcomings due to insufficient human and financial resources, and the many and sometimes conflicting demands from donors and recipients, FAO benefits from several comparative advantages in assuming its role as tsunami rehabilitation coordinator in fisheries and aquaculture. These include its international representativeness, its technical expertise, its neutrality, and its ongoing mandate to facilitate the implementation of the Code of Conduct for Responsible Fisheries.

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Regulatory convergence in a global marketplace

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**ABSTRACT**

The global seafood market is characterized by high consumer expectations and extensive product diversity. National food regulators have a responsibility to ensure a safe food supply. Yet prescriptive regulation stifles industry and innovation. Twentieth century notions of food regulation are not keeping pace with the changing food supply or consumer expectations, and their associated management strategies are not effective in dealing with the rising incidence of food-borne illness.

Regulatory convergence is occurring at the international, regional and national levels. The Codex Alimentarius Commission (CAC) is crucial for setting frameworks for national food regulation. Australia is an active participant in Codex committees. Through Food Standards Australia New Zealand (FSANZ) Australia also encourages countries in the Asia Pacific region to adopt Codex approaches.

At home, Australia has adjusted its governance and organizational structures to adopt a whole-of-government approach to the regulation of food. FSANZ has developed a national seafood standard; a mandatory standard that applies hygiene and food safety regulation to the primary and processing ends of the industry. An entire food industry is now covered by nationally consistent food safety regulation. FSANZ has also initiated a country of origin food standard that requires the labelling of seafood and other unpackaged products, both local and imported.

This paper outlines the process of regulatory convergence and its relevance to Australia, arguing that the process will enable the seafood industry to compete more effectively in the global marketplace and will help to maintain consumer confidence in seafood products.

**INTRODUCTION**

A global marketplace, with its high consumer expectations and growing diversity of product, is where twentieth century notions of food regulation are becoming increasingly irrelevant. Prescriptive regulation by government cannot provide industry with the incentives to innovate and experiment with new food technologies and products.

Traditional management techniques that attempt to control and minimise potential hazards in the food supply do not appear able to provide the levels of safety demanded by consumers or the capacity to respond adequately to new pathogens and changing consumption patterns. On top of this, one nation’s food emergency can immediately threaten public confidence in a food commodity elsewhere because of the speed of modern-day communications.
Even an island nation like Australia imports half of the seafood it consumes. This means that Australia has a vested interest in the strategies being adopted by its trading partners to ensure the safety of seafood produce, in addition to the need to regulate its own domestic catch. The same must apply to every country represented at international seafood conferences. Without a shared understanding of approaches and practices, there is a danger of inhibiting trade and confusing consumers. This is not desirable. It also makes sense for trading partners to adopt similar approaches to food safety regulation.

This paper explores regulatory convergence as a concept that recognises the growing interconnectivity of regulatory systems at global, regional and national levels. It also examines the Codex-endorsed, whole-of-chain approach to food safety as a management tool to combat the growing incidence of food-borne illness around the world. The paper then raises two issues of current interest to Australia’s seafood industry: the development of a new national standard for seafood, designed to replace existing piecemeal regulations, and country of origin labelling.

**REGULATORY CONVERGENCE**

Regulatory convergence is the coming together of ideas, principles, legal requirements, enforcement mechanisms and organisational structures used by government to protect the general population from unsafe food. It is worth noting that, these days, governments usually only intervene in food matters where there has been a failure, or potential for failure, in the marketplace (a food safety issue) or where it wants to use food regulation as a means of implementing public health policy (for example the addition of thiamine to bread). Increasingly, governments do not feel the need to regulate for quality. This is a matter for the consumer and the marketplace.

**International convergence**

Convergence can occur at international level, through the work of the Codex Alimentarius Commission, or through bi-lateral and multi-national agreements, which are normally consistent with Codex approaches. Codex provides a reference framework through which individual nations can develop their own food standards, according to individual circumstances.

Australia is very active in the work of Codex, in the context of food regulation, public health, industry, agriculture and trade. This Codex involvement encourages the various portfolios of the Australian Government to cooperate on food matters; an essential element of regulatory convergence.

**Regional convergence**

At a regional level, regulatory convergence is illustrated by the adoption by Australia and New Zealand, more than a decade ago, of a shared set of food regulations for food labelling and composition in the Australia New Zealand Food Standards Code. This harmonization of food standards recognized that the two countries are essentially a single market in traded foods, with common business interests across both sides of the Tasman.

One independent government agency, Food Standards Australia New Zealand (FSANZ), sets food standards for the composition and labelling of foods that apply in both countries. New Zealand maintains its own arrangements for food safety standards. Of course, similarities of history, culture, language and world-view have contributed greatly to this level of bi-national cooperation. However, FSANZ is experiencing significant interest from ASEAN (Association of South East Asian Nations) countries and those in the broader APEC (Asia Pacific Economic Cooperation) community for collaborative ventures. These ventures range from the adoption, either in whole or in part, of the Australia New Zealand Food Standards Code into a country’s regulations
or the training by FSANZ of regulatory officials in Codex-based approaches and systems.

Nearly 70 percent of Australia’s food exports go to APEC member countries. Food imports to Australia from APEC countries exceed AUD$3 billion a year. It is therefore in Australia’s national interest to facilitate a greater understanding and, if possible, a convergence of regulatory approaches with this important bloc of trading partners.

**National convergence**

Regulatory convergence at the national level involves a much greater engagement of government portfolios concerned with food than has occurred in the past. When Australia and New Zealand entered into their partnership in 1996, the health portfolios of the respective countries dominated the food regulatory process. In 2002, a new Food Regulation Ministerial Council was formed to provide policy guidance to FSANZ. Agriculture, trade and industry interests are represented in the Council, in addition to health. Moreover, although Australia has national food standards, enforcement of these standards is the responsibility of the States and Territories, often through local governments.

States and Territories have harmonised their own regulatory arrangements for food in parallel with national changes. For example, the State of New South Wales now has its own Food Authority, incorporating elements from its health and agriculture departments.

Structural change obviously needs to be reinforced by cultural change before it can become fully effective. After three years, the various elements of Australia’s food regulatory system have been successfully bedded down. Regulatory pathways seem to be well aligned. This bodes well for food regulation. Just as globalization is inevitable, regulatory convergence will gather pace to match a rapidly changing world and the soaring aspirations of consumers for safe food. Twenty-first century management systems are needed for a 21st century global food supply. Regulatory convergence is part of the solution.

**WHOLE-OF-CHAIN APPROACH TO FOOD SAFETY**

It could be asked: what does regulatory convergence have to do with the way seafood businesses conduct their operations? After all, it’s a long way from the sharp end of a trawler in the Pacific to a Codex desk in Rome or Geneva. The connection is food safety, or food hygiene as it is sometimes called, and the related issue of food-borne illness.

Food-borne illness is on the rise. Some of the rise is most likely due to better reporting and monitoring activities of national governments. However, it should not be forgotten that background levels of food-borne illness continue to present a burden to national economies and significant distress to individual sufferers. Spikes in illness from outbreaks related to a specific food product or food outlet add to the total burden. Australia has not been immune to food emergencies of this type. They have the potential to cripple an entire food industry sector. Even the threat or perceived threat of a food hazard, for example BSE, and non-food diseases such as foot and mouth disease or avian flu, has the ability to erode consumer confidence in the food supply and the capacity of the government to protect the population. Once again, an entire industry can be adversely affected.

Traditional management strategies to ensure a safe product for consumers have involved regulation at the manufacturing and retail end of the supply chain. Hazard Analysis and Critical Control Point (HACCP) based food safety plans for the handling, processing, transportation and delivery of foods (including prepared meals) are now an entrenched feature of the Australian food scene. But food-borne illness continues to exist around the world.
In 2002, the Food Regulation Ministerial Council decided that it would adopt a recommendation by Codex that countries should adopt a whole-of-chain approach to food safety. Instead of relying on manufacturers and food outlets to reduce the pathogen load in food to safe levels, risks would be identified along the whole supply chain for a commodity, including primary production activities. Appropriate management controls would be put in place at critical points in the chain. The rationale is that pathogen levels will be reduced to manageable proportions by the time a food is prepared for final delivery to the consumer.

One benefit of Codex’s whole-of-chain approach is that all the hazards involved in a supply chain for, say seafood, are identified and understood, from the boat to the consumer. And, of course, public confidence is always reinforced when an industry acts decisively to strengthen the safety of its products. So, the link between the trawler and the Codex bureaucracy in Rome or Geneva is real. Time will tell whether the new approach to food safety will provide the level of protection expected by consumers. Time will also tell whether those countries that are quick to adopt international practices gain a marketing edge for their food products.

**NATIONAL STANDARD FOR THE SEAFOOD INDUSTRY**

Two other issues are of particular interest to Australia’s seafood industry; the new food safety standard developed by government and industry, and the topical issue of country of origin labelling.

When the government made it clear that it was adopting a whole-of-chain approach to food safety, the Australian seafood industry put up its hand to be the first primary industry to work with FSANZ to develop a national standard. Some States were already starting to develop their own standards, while the industry itself had well-regarded codes of practice in place and were enthusiastic to build on these nationally.

Three years later, the Primary Production and Processing Standard for Seafood is now law and will come into effect two years from now. A gap in the seafood supply chain not covered by existing national food safety regulations has therefore been plugged. This is the first time in Australia that an entire food sector has been covered by national requirements.

The scientific evaluation carried out by FSANZ into the seafood supply chain has been applauded by overseas experts as the most comprehensive study attempted anywhere in the world. Such appraisals confirm that FSANZ has covered all the bases and should enhance public confidence in the safety of seafood sold in Australia. In practical terms, the new standard extends existing food safety provisions in the Australia New Zealand Food Standards Code to primary production.

Basic hygiene requirements have been applied to the whole of the seafood industry, including harvesting and primary processing. People working the trawler in the Pacific must be aware of appropriate personal hygiene and good hygienic practice like workers in other parts of the food chain. Allowances have been made for the availability of facilities and equipment on boats, but the general principles apply.

For oysters and bivalve molluscs, the new standard requires seafood businesses to implement HACCP-based food safety plans. There is also a requirement to harvest only from appropriate waters. There is nothing new in this for oyster growers. The novel features of the new standard lie in the mandatory and national nature of the regulations. State-by-state regulations will gradually be phased out in favour of the national standard. This is regulatory convergence at work within a country. FSANZ has already started to develop similar food safety standards for the poultry, meat, and dairy industries.

It is a moot point whether Australia would have embarked on this ambitious programme of food safety regulation without the imprimatur of Codex. But having the
Codex principles as an international benchmark provides a comfort that Australia will not be out of step with best international practice or its WTO obligations.

Involvement in meetings of the Codex Alimentarius Commission have shown the benefits of international collaboration and the sharing of information on approaches to regulatory issues of mutual interest. FSANZ’s engagement and collaboration in programmes conducted by international agencies such as FAO and the World Health Organization (WHO) are also useful for regional capacity building. FSANZ’s experience suggests that Codex is the right response to the challenges of a global food supply. Conversely, it could be concluded that the countries and food industries that neglect to participate in Codex affairs will be left behind.

FSANZ learned a lot while developing a whole-of-chain approach to food safety for the seafood industry. Its experience will be useful to nations in the Asia-Pacific region as they modify their food regulatory regimes to accommodate a changing environment. To this end an interpretive guide for the new seafood standard has been prepared, mainly to assist enforcement agencies, but also to help peak bodies develop their own industry guides. The document, Safe Seafood Australia, has been released as a first edition. Comments on the guide have been invited from seafood businesses and other stakeholders in the standard, which will feed into a second edition to be issued towards the end of 2005.

COUNTRY OF ORIGIN LABELLING

The right of the consumer to know the source of a product, has concerned the Australian seafood industry for some time. Country of origin labelling has obvious access-to-trade and cost implications. At present, the Australia New Zealand Food Standards Code requires imported packaged foods to carry a statement identifying the country in which the food was made or produced. This provision also applies to the importation of unpackaged fish, vegetables, nuts and fruit. However, there is no requirement to label unpackaged local food as Australian (or from New Zealand).

In late 2003, the Food Regulation Ministerial Council asked FSANZ to review these regulations. The Council stipulated that the new food standard should ensure consistent treatment of domestic and imported foods, that the views of all stakeholders be sought, that consumers have access to accurate information, and that any labelling system should not lead to price hikes.

FSANZ held two rounds of public comment on a new Country of Origin Labelling standard. For the second round, in May 2005, FSANZ proposed that the country of origin information could be provided to the consumer ‘on request’ at retail outlets, rather than on food labels. This was an attempt to address inconsistencies between the current regulations and Australia’s WTO obligations, and to achieve consistency in the Food Standards Code, where unpackaged foods are generally exempt from labelling. It would be an understatement to say that the general public, primary producers and the governments of Australia did not greet this proposal with wild enthusiasm. The Australian seafood industry was also not slow to articulate its objections to a perceived watering down of the present requirements.

Clearly community expectations were not met. And this is the dilemma: to provide a benefit to consumers through labelling, while being mindful of Australia’s WTO responsibilities for fair trading and possible reciprocal action by its trading partners. Alternative options for achieving FSANZ objectives were then explored.

FSANZ subsequently completed a further round of consultations with consumers, growers, retailers and food manufacturers. The FSANZ Board is to consider a revised draft Country of Origin Labelling standard, prior to a discussion of the matter at the October 2005 meeting of the Ministerial Council.

FSANZ, the standard-setting agency for Australia and New Zealand, has had to re-evaluate its approaches in the light of broader community views. Standard setting
is not a popularity contest. However, for regulations to work, there needs to be a consensus of acceptance for a food standard in the community, or the system will fail. FSANZ’s consultation processes and their ability to provide stakeholders in the food regulatory system with a real input into regulatory decisions, appear to have been very effective. This is where peak bodies such as the Australian Seafood Industry Council and Seafood Services Australia come into their own. They are an integral part of the regulatory process.

CONCLUSIONS
The challenges facing food regulatory systems in the 21st century owe as much to the international environment and trade as to national inward-looking considerations. Food regulations should reflect the minimum necessary standards to achieve the desired outcomes. They should be outcomes-based rather than overly prescriptive to encourage food industries to innovate; to achieve the goals of regulation as they see fit. It is not the role of government to intrude unnecessarily. At the same time, however, government has a legitimate role in protecting the population from microbiological, chemical and physical hazards in the food supply. This role extends to making sure that consumers are properly informed about the content and nature of the food they buy.

Australia’s federal system of government led to a fragmented approach to food regulation that it is only now overcoming. Regulatory convergence has been forced on Australia by the global food supply and by the growing solidarity of consumers around the world in demanding that this food supply be safe. A consequence of regulatory convergence has been the extension of FSANZ’s standard-setting work to the primary sector.

Historically, food standards in the Australia New Zealand Food Standards Code applied largely to processed foods. Over the years, excellent working relationships have been established with food manufacturers and retailers. Food safety standards applied to secondary processing, retail, and the delivery of foods and meals. Then, in 2002, with the new whole-of-government approach to food regulation, FSANZ’s responsibilities were extended to the primary sector. New relationships have been established with a whole new range of stakeholders, some of whom were unfamiliar with the Food Standards Code, and many of whom had only a limited knowledge of FSANZ and the food regulatory process.

Government agencies at national and State levels concerned with agriculture and primary industries offered considerable support in forming these new relationships. Contact with the seafood industry came mainly through the development of the Primary Production and Processing Standard for Seafood and the participation of so many elements of the industry on the Standard Development Committee. It was a difficult process. There were no models for such a standard or for the level of industry participation in the scoping and planning phases of the standard. However, the partnership was successful because all parties could see the benefits of the standard, especially the added assurance that it would give to international markets and the confidence that would give domestic consumers of seafood.

Difficult though the process may have been, perhaps the most difficult part is yet to come; the implementation phase. Government and industry now have to sell the new standard to seafood businesses and put in place training programmes and other forms of assistance that will enable them to be compliant by 2007.

The global food supply is a reality. Regulatory convergence, within an international framework, is an unstoppable process.
Regulatory options for processing vessel inspections

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ABSTRACT
The traditional Canadian fish processing industry has evolved over the past 20 years in response to changes in supply and demand. One area of change is the increased utilization of at-sea processing technology for the harvest of northern shrimp, posing a significant challenge for the Canadian Food Inspection Agency (CFIA) in assessing the regulatory compliance of the vessels involved. These vessels have a unique processing environment and normally operate for long periods of time in very remote areas such as the Davis Strait off the coast of Greenland. The industry implemented specific quality management controls relevant to this environment, while the CFIA assessed the vessels at the time of unloading. This approach however did not provide information on the actual at-sea operating conditions that is essential for determining regulatory compliance.

To address this lack of information, the CFIA considered two options; CFIA fish inspectors could accompany the vessels to sea, or a third party could be used to collect information on the operating conditions while at-sea. A feasibility study determined that the first option was not practical mainly because of resource constraints. The second option, of using fisheries observers who must be present for quota management reasons anyway, was found to have many benefits. The observers were trained by the CFIA and were then given a list of operating conditions to observe while at-sea. Observers would report their observations to CFIA upon return. The CFIA would then consider this information in their overall assessment to determine compliance. This option proved to have significant potential as the resource requirement was minimal and the information collected was valuable to both the CFIA and the processing vessel operator.

The implementation of this option is ongoing and is being considered for future application to other processing fleets and for use in the issuance of export certificates for foreign markets.

INTRODUCTION
Canada, due in part to its close proximity to some the most lucrative fish stocks and commercial infrastructure, has developed a large and very diverse fish and seafood processing sector. Annually over 42,000 fishers harvest some one million metric tonnes of fish from Canadian waters representing a landed value of CDN$2 billion. This fish, along with a growing portion of imported fish, is processed in about 1000 federally registered establishments situated throughout each of the ten provinces and three territories, resulting in a total processed value of product of CDN$5 billion.

Canada is a significant exporter of fish and fishery products to international markets. The vast majority of these products (80 percent) are exported to some 95 countries abroad representing a value in 2000 of CDN$4 billion. The principle market is the
United States of America representing around 65 percent of export value. Japan (12.9 percent), the European Union (EU) (8 percent) and China are other major markets.

Traditionally the fish processing industry in Canada was a land-based industry. Fishers would harvest various local species (cod, salmon, lobster, shrimp etc.) and then bring the fish to land-based processing establishments. After processing, the fish would be exported to markets around the world. This situation has evolved over last 15 years due to the many challenges fishers and processors had to address. Traditional fish stocks have become depleted (e.g. northern cod) so processors have shifted their capacity to different stocks (e.g. crab). They have also changed their sourcing of raw material by importing product for further processing. Market needs have also changed from land based operations to at-sea processing technology to exploit stocks not traditionally available.

This paper describes the experience of the Canadian Food Inspection Agency (CFIA) in dealing with a specific at-sea processing sector, northern shrimp, and the options considered for the regulatory verification of the vessels involved.

**NORTHERN SHRIMP AT-SEA PROCESSING**

The annual value of exports from the Canadian northern shrimp-processing sector is approximately CDN$250 million. Primary markets are the EU and China. There are currently 14 large vessels harvesting this stock year round in the North Atlantic. These vessels are fully self-contained processing establishments, harvesting and processing on-board packaged ready-to-eat product. As with any land-based establishment in Canada producing fish products for export, these vessels must meet the requirements of the Fish Inspection Regulations (FIR). The FIR specify that establishments must be registered with the CFIA, meet construction and equipment requirements, and have in place a Quality Management Program (QMP).

**THE CANADIAN QUALITY MANAGEMENT PROGRAM**

The QMP was the world’s first regulatory Hazard Analysis and Critical Control Point (HACCP)-based system, originally developed in the late 1980’s, and becoming mandatory in 1992. The QMP was re-engineered in 1999 to fully incorporate the principles of HACCP and to meet changing market requirements such as the United States Seafood HACCP rule. The QMP is based on ISO principles, where processors are required to develop and implement a documented series of controls for all food safety hazards and other regulatory requirements. A processor’s documented QMP plan is based on a reference standard which is designed around three key food safety and regulatory control elements: a Perquisite Program; Regulatory Action Points; and HACCP. Processors are required to assess their particular products and processes, identify the applicable potential food safety hazards and related regulatory requirements, and develop and document controls on how they will ensure that the products produced will be safe and compliant with those regulatory requirements.

As the Competent Authority (CA) for Canada, the CFIA must assess each registered establishment to ensure that processors are operating in accordance with their documented QMP plan and that the implemented controls are effective. The CFIA accomplishes this though its regulatory verification activities conducted on several fronts and at various times. There are two key opportunities for the CFIA to assess the fish-processing sector: at the time of initial registration, and during the operating season.

At the time of initial registration with the CFIA, processors are required to submit their documented QMP plan outlining the applicable controls. The CFIA assesses the construction and equipment to be used in the processing facility and
the controls presented. This stage is referred to as 'system verification'. If these two areas are found to be acceptable then the processor is registered and is permitted to commence processing. It is during actual processing that the CFIA can best ascertain the effective implementation and maintenance of the controls. This activity, referred to as 'compliance verification' (CV), is the on-site assessment of the implemented QMP plan and is based on ISO 10011 audit principles.

Compliance verification has a two-fold objective: to verify that the processor's QMP plan been implemented as designed, and to verify that the system is effective in meeting the requirements set out in the reference standard. The compliance verification is organized using a typical audit approach including the planning, opening, execution and closing phases associated with an audit.

The planning phase involves the establishment of a CV team to develop checklists based on the company's QMP plan, in advance of the on-site verification. Checklists contain specific activities to test the application and effectiveness of the QMP plan. The CV begins with an opening meeting with the plant management to discuss the audit scope and plan. The CV is then conducted by having the inspector following the audit plan established with the CV checklist and collecting objective evidence to determine compliance of the QMP elements assessed. Objective evidence can be qualitative or quantitative information and can be gathered by:

- recording or copying information contained on company records;
- recording facts related during an interview with a plant employee;
- making Inspector observations;
- collecting samples for laboratory analysis;
- inspecting product;
- investigating corrective actions; and
- performing tests.

If objective evidence demonstrates that a specific element is not effective in meeting the requirements of the reference standard, then this is deemed a 'non-conformity'. Evidence suggesting dangers to health and safety or potentially fraudulent activities, are referred to as 'critical non-conformities'.

The CV is closed when the company initiates an acceptable corrective action plan for each non-conformity. The inspector will verify at the next CV that the company has taken the appropriate corrective action.

**QMP CHALLENGES WITH THE NORTHERN SHRIMP-PROCESSING SECTOR**

Registered vessels that process shrimp in the north Atlantic present some unique inspection challenges that do not have to be considered for the traditional fish processing sector. Harvesting, processing and packaging of ready-to-eat products occurs onboard the confines of vessels that operate in extreme weather conditions over extended periods of time in an environment which requires specific controls. The limited space available for the processing area results in exceptions to the construction and equipment standards normally met by all land based facilities to accommodate low ceiling height, overhead electric and hydraulic lines, and painted steel floors and walls. Operating conditions are also challenging as these vessels normally process continuously while at-sea thus leaving little opportunity for the traditional cleaning between shifts. The processing method used also requires very large volumes of water, but there is no access to approved water supplies as is required for traditional processing establishments. The vessel owners address these challenges by instituting enhanced sanitation controls to ensure that operating conditions do not impact on the product safety or quality.

As explained above, processors are required to document and implement these controls as part of the QMP, while the CFIA is responsible for verifying the effectiveness of those controls. However, the very nature of this processing sector
renders this responsibility a particular challenge. Vessels fish in isolated areas as far north as the Davis Strait off the coast of Greenland, on voyages that last up to 30 days. It is not realistic for the CFIA to be present during their actual operations.

The current regulatory verification approach involves an assessment when the vessels return to port to unload their product. At this point the CFIA inspectors will assess record keeping and compliance with construction requirements, and will also conduct product inspection. This approach however gives an incomplete assessment; it cannot verify conditions during operation, which is a key objective of the compliance verification. There are also other logistical challenges with this approach. It is difficult to coordinate due to a short turn around time and variable schedules at port. Moreover, the vessels do not necessarily return to a port near CFIA offices.

As the CA for Canada, the CFIA also has the responsibility to provide assurance to foreign authorities of compliance with food safety and other requirements. The challenges and the limitations of the regulatory verification approach for this sector means that the CFIA does not have the same information on compliance compared with the information it has on land based operations. The CFIA in consultation with the industry agreed that the approach was not adequate and that the sector might be vulnerable to challenge or increased scrutiny due to this regulatory gap. It was decided therefore to conduct a study to test alternative regulatory verification approaches. The results of that study are presented below.

**ALTERNATIVE REGULATORY VERIFICATION APPROACHES**

The first option to be considered and tested involved having a CFIA inspector conduct compliance verification on board the vessel during its operation at sea. This approach provided a very complete assessment of the operating conditions, but was inefficient. The inspector was dedicated to a single establishment for up to 30 days to perform compliance verification activities that required only 15 to 20 hours of direct time. Moreover, in a time of limited resources the inspector was taken away from other regulatory verification activities, which impacted on the overall delivery of the fish inspection programme. It was agreed that this inefficiency, as well as other considerations such the occupational safety of and appropriate compensation to the inspector, meant that this option was not viable in the long term.

Another option was explored involving a mechanism to gather objective evidence on compliance during actual operating conditions. This option involved the utilization of a third party to collect necessary information.

As part of the quota management responsibilities, the northern shrimp fleet is required to have onboard, at all times, an independent observer who assesses harvest volume, by-catch, etc. It was suggested that these observers would have the capacity to collect information and report on the operating conditions while at sea. This was an interesting proposal but presented some significant challenges, in particular related to the use of non-government personnel to perform regulatory verification activities. After extensive discussion with all stakeholders it was agreed to conduct a feasibility study.

**AT-SEA OBSERVERS**

The feasibility study involved training observers on the QMP and its related programme aspects, which are of concern while operating at sea. The basic concept was that the CFIA would continue in its current compliance verification approach but, prior to commencement of a voyage, the inspector would provide a trained observer with a series of activities that were based on the processor’s QMP plan, to be conducted during processing at-sea. These activities consisted of conducting observations at anytime over the course of the voyage. The observer did not have the authority to do anything more than just record what was observed. Examples of recorded observations
included information about clean up and sanitation activities, the operation of freezers, and how employees recorded monitoring and corrective actions during the vessel’s operation. When the vessel returned to port, these observations are reported to the CFIA to supplement the normal CV approach. This information is then used to determine compliance or to initiate further investigation.

After the initial study it was found that there were several benefits to this approach that warranted further policy analysis. These benefits included the following:

- The industry for the first time had an independent view of the operating conditions while at sea, and was able to take action to improve those aspects that required attention.
- There was an awareness benefit gained by the presence of the observer. Even though the observers may or may not be tasked with recording observations for a CV on every voyage, the production workers were more cognizant of regulatory requirements and consistent application was enhanced.
- Most importantly, this option provided an efficient use of resources without impacting on the fisheries management duties of the observers. In a time of limited resources and expanding regulatory responsibilities, this is a very important consideration.

Although it was agreed by all participants that this option had great merit there were some qualifying considerations. Training of the observers is essential. It would be difficult to use the information collected by the observer without adequate training. It was also recognized that verification of the observers’ activities was also required. Having CFIA inspectors accompany the vessels to sea on a set basis would be of great benefit in providing this verification.

It was also recognized that role definition was crucial. Observers must understand their role and stay within its defined limits while conducting their activities. Inspectors must also be aware of their roles, and understand how the information collected fits into the regulatory verification context.

Other opportunities associated with the continued development and implementation of this approach will be explored further. These include using the approach to collect information to improve export certification procedures. The approach will also be evaluated to determine its application to other fleets and other programme aspects. For example, other processing fleets, such as those harvesting and processing scallops and clams, do not have observers working full time. Further work is required to determine how this concept could be applied elsewhere.

**CONCLUSION**

The study outlined above demonstrates that it is possible to ‘think outside the box’ to find sources of information that can be used by regulators to assist them in fulfilling their regulatory responsibilities in an efficient and non-confrontational manner. Even more importantly, the study demonstrates how challenges can be identified and addressed in partnership with industry and other stakeholders. This is encouraging for all those involved in the seafood industry. It shows that it is possible to work together as seafood professionals to deal with new and emerging challenges as the industry grows and adapts to changing conditions and market demand.
Human resources in seafood processing: the Canadian experience

Johanna Oehling
National Seafood Sector Council, Canada

ABSTRACT
The Canadian seafood industry faced many challenges in the early 1990s including: the cod moratorium in the Atlantic, the downsizing of the industry, local and international labour market pressures, and changing global market conditions. The National Seafood Sector Council (NSSC) was created as part of the Canadian sectoral management approach, whereby companies, managers and workers come together to explore solutions to common concerns. The NSSC collaborates with relevant stakeholders to develop appropriate human resources strategies that meet the specific needs of the seafood processing labour market, recognizing that a well-trained labour force is a key component of ensuring the future overall competitiveness of the industry.

INTRODUCTION
This paper describes how the Canadian seafood industry is addressing a key pillar of competitiveness from a human resources perspective. It provides an overview of the seafood industry in Canada and some of the challenges facing it. It outlines how these challenges are being met, in the context of a ‘skills and learning environment’ and an enhanced training culture, and based on a sector management approach.

Frank Sonnenberg (1996) said it well in his book on organizational management when he stated that, “…Learning and change go hand in hand. Without a focus on learning, change is slow and costly to implement, something no organization can afford in the word we are living in today.” Nowhere is this more true than in the seafood industry, where organizations are having to adjust to changing global product markets and local and international labour market pressures.

A BRIEF OVERVIEW OF THE CANADIAN SEAFOOD INDUSTRY
Canada is the fifth largest seafood exporter in the world. Approximately 90 percent of its production is exported. Seafood products are exported to over 120 countries, with the United States of America as the largest market, followed by Japan, Denmark and Germany.

Crustaceans account for the single largest component of Canadian exports. The three main seafood exports are lobster, crab and salmon (both farmed and wild). There is also a freshwater capture fishery valued at approximately $C75 million, and includes products such as pickerel yellow perch, whitefish, northern pike and lake trout. Canada also now imports a considerable amount of raw material for further processing, particularly in groundfish.
The future stability of the Canadian industry depends on the sustainability of the resource and on increased productivity. A skilled and efficient labour force is an important part of this equation.

**CHANGING CONDITIONS**
Global markets continue to change at an accelerating pace. The emergence and development of low cost processing and large export players in other nations means stiffer competition. Global pressures in the marketplace to meet international quality standards have also accelerated. Clients demand increased quality from vendors.

Canada also faces the challenge bought about by its geography. It has a large land base with many remote communities. Access to services in these remote communities is problematic.

Competitiveness in today’s world will depend on reducing costs, improving operating efficiencies and producing higher value added products. A knowledge-based economy requires increased innovation and technology.

**LABOUR MARKET ISSUES IN THE SEAFOOD INDUSTRY**
Canadian manufacturers face a wave of retirements over the next decade. With an aging workforce the seafood industry, like others, will lose its experienced workers on retirement. Alongside this is the lack of new recruits. Since the cod moratorium in the Atlantic in the early 1990s there has been little new recruitment into the seafood industry. The challenge for the future is to attract and retain workers.

Several years ago it became clear that the Canadian labour market had to respond to new needs and expectations and had to function with increasing efficiency. The need to improve competitiveness required a co-operative effort by the key players in the labour market. That meant individual plant owners, corporate leaders, labour organizations, educators and government representatives working together to create the conditions necessary for firms to become more productive. It was argued that the sector council approach, with an emphasis on skills and learning, was a means to increase productivity and enhance overall prosperity.

**THE NATIONAL SEAFOOD SECTOR COUNCIL**
The National Seafood Sector Council (NSSC) is one of over 30 sector councils in Canada. Councils operate on a voluntary basis and cover diverse sectors such as tourism, aviation maintenance, steel manufacturing and trucking.

The activities and strategic directions of NSSC are identified through comprehensive stakeholder research. Its human resources initiatives are led and driven by the industry. While addressing the particular human resources needs of the industry the NSSC also supports the overall Workplace Skills Strategy of the Government of Canada. That national strategy seeks to improve competitiveness on the basis of a highly skilled labour force, with a focus on workplaces that are committed to skills development.

The NSSC collaborates with processors and workers and key regional groups across Canada, to build consensus and to develop appropriate human resources strategies that meet the specific needs of the seafood processing labour market.

The NSSC has a team of regional representatives that are mainly located in fishing communities across Canada. Our representatives provide services to processors at the local level. They disseminate information to processors, make presentations to the industry on new NSSC initiatives, and help to create new partnerships with economic development centers. Their job is to keep the region informed about human resources issues and to enhance the local training culture.
AN ENHANCED TRAINING CULTURE

The overall goal of the NSSC is to enhance the training culture across Canada. To this end, a multi-pronged approach is employed in the delivery of training. While NSSC does not usually deliver training directly, it encourages the uptake of training through a national network of training providers, which includes community colleges (TAFES) and private trainers, particularly in remote areas.

NSSC work to date has focused on developing training tools to enable production workers to enhance their skills, including in the sensory evaluation of fish, Hazard Analysis and Critical Control Point (HACCP) management, and in ergonomics in processing. The training products are in compliance with regulatory standards, and are informed by standards set by processors themselves. Training materials can be used on a flexible schedule. Training can occur in remote communities and can be organized around industry processing needs. The approach helps to keep the industry up-to-date and progressive and is mutually beneficial for processors and workers.

The NSSC has also introduced a certification project to develop a national certification standard in Sanitation and Hygiene for production workers in the Canadian seafood processing industry. The project includes assessment tools to review and subsequently adapt NSSC training tools in line with certification standards. The benefits of investment in training will accrue to both employers and employees.

By way of comparison, The Canadian Sector Council Program is similar, in purpose if not in the way it functions, to the Australian National Training Framework. Both national entities seek to ensure that the skills of their respective labour forces are sufficient to support internationally competitive commerce and industry. Sector councils in Canada face many of the same industry challenges being addressed under the Australian Qualifications Framework model. One of the obvious advantages in the Australian model is the close collaboration between the territories, state and national government on skills upgrading and training support, particularly to factories at the local level. In Canada, while there is federal support for the development of training tools to meet industry needs, there is no permanent agreement on how the various provincial jurisdictions work together on the actual delivery of training support.

CONCLUSIONS

The competitiveness of the Canadian seafood industry depends on reducing costs, emphasizing operating effectiveness and producing higher value-added products. Seafood processors will need to increase innovation and to engage new technologies if they are to thrive in a knowledge-based economy. A well-trained workforce is an essential part of that equation.

The challenges faced by processors in coastal communities are formidable, especially if approached individually. The sectoral approach to skills and learning offers a measure of support that can ease the burden for individual processors, production workers and their affiliates. An investment in skills can contribute to overall productivity and competitiveness, with returns accruing across the industry.

In its 10th anniversary year the NSSC is developing partnerships in human resources development with the broader food manufacturing sector. To this end, the NSSC is currently conducting labour market research of this much larger industry. This research is still in the formative stages, but initial findings suggest that the human resources challenges facing the seafood industry are shared by the wider food processing industry. Working together to develop strategies for addressing these challenges is likely to produce synergies and to be mutually beneficial.

REFERENCES

SECTION 4

New partnerships for achieving fish safety and quality
ISO 22000: food safety management systems and their related requirements

Philippa Seagrave
Standards Australia

ABSTRACT
More and more food products are traded internationally. International standards such as ISO 22000 are crucial for giving final consumers confidence that the products they buy are safe, regardless of where they have been produced. They need to know that potential safety hazards have been identified and controlled throughout the food chain, from production, to handling, transportation, and supply. This paper outlines the development of ISO 22000, with particular reference to the role of Australian participants in the process.

INTRODUCTION
The word “standard” is used frequently in everyday speech, most often in an imprecise descriptive manner: “That’s fairly standard for the time of year” or “standard English”. But in the standards world, a Standard has to have a very precise meaning. The definition that best describes a contemporary standard is the following:
“A standard is a document established by consensus that provides, for repeated use, rules, guidelines or characteristics of products, services or systems”.

By themselves, standards merely indicate criteria, but do not actually ensure that these criteria are met.

‘Conformity Assessment’ on the other hand, refers to the systems sitting behind and supporting any given standard. These systems provide confidence that the specifications of a standard have been met. It is the practice of determining if a product, service or system meets the requirements of applicable standards.

The standards landscape has many important players who contribute to the public good through a variety of standards. These include individual and organizations that develop codes of practice for regulated professions and non-regulated associations. In Australia, these players provide standards to Australians such as industry associations, technical associations, governments and regulators.

STANDARDS AUSTRALIA
Standards Australia is one of the important players in the standards landscape, and has been recognised by the Federal Government as the peak non-government standards organization. It is not-for-profit, with members representing a broad cross-section of Australia’s technical and commercial infrastructure, industry, unions, academia and government. It has no shareholders, no dividends are paid and any surpluses are put back into further standards development work.

Its primary role is to prepare standards through an open process of consultation and consensus in which all interested parties from a variety of industries are invited to
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
ISO is a network of the national standards institutes from 153 countries, on the basis of one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. It is a non-governmental organization. Its members are not, as is the case in the United Nations system, delegations of national governments.

ISO occupies a special position between the public and private sectors. Many of its member organizations are part of the governmental structure of their countries, or are mandated by their government. However, other members have their roots solely in the private sector, having been set up by national partnerships of industry associations.

There are currently over 3,000 ISO Technical Committees, Subcommittees and Working Groups. Australia participates on many of these. Of particular interest to food safety and quality is ISO/TC 34: Food Products. This is the committee that produced ISO 22000.

ISO 22000
Failures in food supply can be dangerous and very costly. There is an increasing requirement by customers of organizations that produce, manufacture, handle or supply food, to demonstrate and provide adequate evidence that they are able to identify and control food safety hazards, and the many conditions impacting on food safety.

Prior to the development of ISO 22000, the relevant standard was ISO 9001:2000, but this is concerned with quality management and does not deal specifically with food safety. As a result, many countries such as Denmark, the Netherlands, Ireland and Australia, amongst others, developed voluntary national standards and other documents specifying auditable requirements for food safety management systems. This meant a proliferation of national standards; that led to some confusion.

A need was seen to harmonize those national standards on an international level. This is the reason why, in 2001, the Danish Standards Association submitted to the ISO technical committee ISO/TC 34, Food products, a new work item proposal for a food safety management systems standard.

Working Group 8, Food safety management systems, of ISO/TC 34, with experts from 23 countries, participated in the development of the standard, together with the international organizations that had liaison status. There was also close cooperation with the Codex Alimentarius Commission, the body jointly established by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Also included in the development were the Confederation of Food and Drink Industries of the European Union (CIAA), the CIES/Global Food Safety Initiative, and the World Food Safety Organization (WFSO).

The major benefit of this cooperation is that it will make it easier for organizations worldwide to implement the Codex HACCP (Hazard Analysis and Critical Control Point) system for food hygiene in a harmonized way. This will help to avoid variations between countries and between food products.

AUSTRALIA’S ROLE IN THE PROCESS
Australia actively participated in the development work of this standard by forming a mirror-working group to generate input from Australian experts. Australian Mirror Group (FT-024-00-01-Food Safety) had members from many organizations, including:
- NSW Food Authority
- Certification Bodies
• Department of Agriculture, Fisheries and Forestry (Commonwealth)
• Consulting companies
• Dairy Australia
• Food Standards Australia New Zealand
• Joint Accreditation System of Australia and New Zealand
• Retailers
• Australian Quarantine and Inspection Service
• Meat and Livestock Australia

The Australian experts submitted their technical contribution to the meetings of the ISO working group, thus ensuring that Australia had a significant say in the development of this standard. To align with international standards and to facilitate trade, the Standards Australia Technical Committee FT-024-Food Products recommended the adoption of ISO 22000:2005 as an Australian Standard.

WHY IS THE STANDARD IMPORTANT?

Food safety is related to the presence of and levels of food-borne hazards in food at the point of consumption (intake by the consumer). As food safety hazards may be introduced at any stage of the food chain, adequate control throughout the food chain is essential. ISO 22000 is intended to provide security by ensuring that there are no weak links in the food supply chain.

It is important to note that food safety is a joint responsibility that is principally assured through the combined efforts of all the parties participating in the food chain. For any organization along the food chain, ISO 22000 provides requirements for a food safety management system that allows that organization to:

• demonstrate its ability to control food safety hazards so that it consistently provides safe end products that meet both the requirements agreed with the customer and those of applicable food safety regulations; and
• enhance its customer satisfaction through the effective control of food safety hazards, including processes for updating the system.

INTENDED USERS

ISO 22000 may apply to all types of organizations within the food chain ranging from feed producers, primary producers through food manufacturers, transport and storage operators and subcontractors to retailers and food service outlets, together with inter-related organizations such as producers of equipment, packaging material, cleaning agents, additives and ingredients.

As mentioned above, it is important to emphasize that food safety is a joint responsibility that is principally assured through the combined efforts of all these parties participating in the food chain.

WHAT DOES THE STANDARD COVER?
The standard combines generally recognized key elements to ensure food safety along the food chain:

• interactive communication;
• systems management; and
• hazard control.

Interactive communication

Communication along the food chain is essential to ensure that all relevant food safety hazards are identified and adequately controlled at each step within the food chain. This implies communication of the needs of the organization to other organizations both upstream and downstream in the food chain.
Communication with customers and suppliers, based on the information generated through systematic hazard analysis, will also assist in substantiating customer and supplier requirements, to determine their feasibility, need, and impact on the end product. The standard requires that such communication is planned and maintained.

**Systems management**
The most effective food safety systems are designed, operated and updated within the framework of a structured management system and incorporated into the overall management activities of the organization.

This provides maximum benefit for the organization and interested parties.

ISO 22000 gives due consideration of the requirements of ISO 9001:2000 in order to enhance compatibility of the two standards. Thus ISO 22000 can be applied on its own, or in combination with other management system standards such as ISO 9001:2000, with or without independent (third party) certification of conformity.

**Hazard control**
Effective systems must be capable of controlling food safety hazards to acceptable levels in end products to be delivered to the next link in the food chain. They require the balanced integration of prerequisite programmes and a detailed HACCP plan.

ISO 22000 dynamically combines the HACCP principles and application steps with prerequisite programmes, using the hazard analysis to determine the strategy to be used to ensure hazard control. The standard further clarifies the concept of prerequisite programmes, of which there are two subcategories:

- Infrastructure and maintenance programmes, which are used to address basic requirements of food hygiene and accepted good practice of a more permanent nature.
- Operational prerequisite programmes, which are used to control or reduce the impact of identified food safety hazards in the product or the processing environment.

The HACCP plan is used to manage the critical control points determined during hazard analysis, to eliminate, prevent or reduce specified food safety hazards from the product.

**THE BENEFITS OF ISO 22000**
Organizations implementing the standard are likely to reap the following benefits:

- More efficient and dynamic food safety hazard controls that are focused on what is necessary for achieving the desired end results
- Confidence that all their control measures have been subjected to hazard analysis
- Systematic management of prerequisite programmes
- A more solid and valid basis for taking decisions
- Increased due diligence
- More efficient use of resources by reducing overlapping system audits.

Other stakeholders can have more confidence that the organizations implementing the standard have the ability to identify and control food safety hazards.

Overall the standard adds value to the food safety system because it:

- is international in scope
- provides potential for harmonisation of national standards
- provides a reference for the whole food chain
- provides a framework for third party certification
- fills a gap between ISO 9001:2000 and HACCP
- contributes to a better understanding and further development of Codex HACCP
• is an auditable standard with clear requirements
• takes a systems approach, rather than product approach
• is suitable and workable for regulators.

THE CURRENT STATUS OF THE STANDARD
ISO published ISO 22000:2005 on 1 September 2005. The Australian adoption of the standard AS ISO 22000:2005, was published on 15 September 2005. ISO 22000:2005 is the first in a family of standards that will include the following documents:

• ISO/TS 22004 Food safety management systems – Guidance on the application of ISO 22000: 2005, which will be published by ISO in November 2005, and is under consideration for publication as an AS ISO standard. This technical specification provides important guidance that can assist organizations including small and medium-sized enterprises around the world.

• ISO/TS 22003 Food safety management systems – Requirements for bodies providing audit and certification of food safety management systems, will give harmonised guidance for the accreditation (approval) of ISO 22000 certification bodies and define the rules for auditing a food safety management system as conforming to the standard. It is expected to be published by ISO in the first quarter of 2006.

• ISO 22005 Traceability in the feed and food chain – General principles and guidance for system design and development will shortly be circulated by ISO as a Draft International Standard.

• ISO 22000: Are you ready? This is an easy-to-use checklist for small business and developing countries. It is being prepared in partnership with the International Trade Centre (ITC), the technical co-operation agency of the United Nations Conference on Trade and Development (UNCTAD), and the World Trade Organization (WTO)

CONCLUSIONS
International standards are important for ensuring that hazards are controlled throughout the food chain regardless of where products are produced or finally consumed. The ISO process allows a variety of stakeholders to participate in designing systems and standards that are appropriate and workable around the world. As more and more food products are traded internationally, standards such as ISO 22000 become crucial for giving consumers confidence that the food they have access to is safe.
Mercury in fish: using targeted consumer advice as a key risk management tool

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New South Wales Food Authority, Australia

ABSTRACT
This paper examines a public education campaign to inform pregnant women, those planning pregnancy, and breastfeeding women how to maximise the health benefits of fish while reducing mercury risks. It outlines an innovative three-prong approach used by the New South Wales (NSW) Food Authority to reach the 85,000 women who give birth in NSW each year. Early indications suggest that the campaign, launched in May 2005, has successfully deflected previous negative media about the risks associated with fish consumption, and has provided the target group with accurate dietary information. This in turn has enabled those women to make healthy and informed dietary choices, to maximize the benefits of fish while reducing the potential risks from mercury.

INTRODUCTION
Some species of fish (for example, shark, swordfish, marlin) have elevated mercury levels. Mercury in fish is predominantly a problem for pregnant women and those planning pregnancy as mercury can negatively affect the development of a baby’s central nervous system (Food Standards Australia New Zealand, 2004). On the other hand, fish is an important part of a pregnant woman’s diet because of the numerous nutritional benefits, notably Omega-3 fatty acids, which assist the development of a baby’s brain. The Australian Dietary Guidelines advise eating one to two meals of fish per week (NHMRC, 2003).

In March 2004, the national standard setting body, Food Standards Australia New Zealand (FSANZ) issued new dietary advice on mercury in fish. The mass media was used to promote the FSANZ advice. However, using the media as the primary dissemination tool has its limitations. The media has a propensity to focus on negative or sensational information, and because it tends to simplify information is sometimes a problematic vehicle for delivering complex messages.

The NSW Food Authority was established in April 2004, and is responsible for implementing national standards in NSW. While the Authority supported the FSANZ advice it also noticed considerable community confusion around the issue.

RESEARCH MATERIALS AND METHODS
Market research
Research by the Food Authority revealed that women in the target group were sacrificing the benefits of fish due to fears about mercury; fears that were driven by inaccurate or ‘sensationalist’ media reporting. An analysis of media coverage further confirmed this. Over the previous two years (since early 2003) a number of negative
stories had eroded public confidence in fish. This was true for all population groups, not just the target market. Further analysis revealed these stories were highly ‘cyclical’, and generally ran on a six to eight monthly basis. While print and magazine coverage was generally negative, ‘tabloid’ television programmes produced a series of highly emotive and extremely negative stories linking miscarriage and conception problems with excessive mercury consumption from fish.

The women featured in the media had been unaware they should reduce their exposure to mercury in fish by avoiding certain species. They were also unaware that they could safely consume other species to maximise the numerous health benefits from fish. This lack of awareness was compounded by misunderstandings among the professionals many women turned to for information. Initial research by the Food Authority revealed widespread misunderstandings among doctors, midwives and dieticians on the issue.

The challenge for the Authority was to develop a campaign that:

- educated women planning pregnancy and pregnant women on how to safely include fish in their diet;
- educated public health professionals on fish consumption during pregnancy;
- encouraged appropriate fish choices at point-of-sale; and
- facilitated balanced media coverage of the issues.

One of the first tasks was to assess awareness levels among the target group about mercury in fish. Roy Morgan was commissioned to conduct a Benchmark Survey to measure issue awareness and understanding. Some 403 females in the 18 to 40 year cohort were interviewed NSW-wide.

The benchmark survey confirmed the Food Authority’s concerns. While 64% of women were aware of mercury in fish, the majority didn’t know which fish to avoid: 44% couldn’t name a fish; 39% named an incorrect fish; and 40% had cut fish from their diet. In most cases they eliminated the wrong types of fish.

The market research confirmed the extent of the problem and confirmed that a strategy to inform women about how to avoid mercury while enjoying the benefits of fish was necessary.

**Stakeholder partnership**

It was decided that any public education campaign needed broad support from a number of different community, medical, and industry groups to help with message dissemination and to give it credibility in the eyes of the public and the media. It was also felt that these groups could channel the message via their membership more effectively than a single agency. Given that women in the target group often turn to doctors, midwives, and dieticians for information, the support of those professionals was considered critical to the success of the campaign.

The support of the seafood industry was critical as well because industry was a vital outlet for any information relating to mercury in fish.

The Food Authority amassed a coalition with broad government, industry, medical and community focus. Members included: NSW Health; Australian Medical Association; Australian Consumers’ Association; Australian Midwives Association; Australian Dieticians’ Association; Australian Obstetricians and Gynaecologist Association; Australian Breastfeeding Association; Sydney Fish Market; Master Fish Merchants’ Association and Food Standards Australia New Zealand. A major retailer, Coles, agreed to support the campaign by distributing point of sale material in its supermarkets.

All stakeholders agreed that there was an information vacuum and were concerned about negative media creating misunderstandings among consumers, particularly in the target group. Stakeholders agreed that a coordinated message supported by a broad coalition would help correct misunderstanding. Some groups gave specific suggestions.
Midwives explained that because expectant mothers face information overload and message complexity the message should be made portable, for example in the form of a wallet card. Retailers supported point of sale materials endorsed by reputable third parties.

**Campaign criteria for success**

Further research determined that the following elements would increase the likelihood of success:

- partnership between industry, government and public health organizations;
- multiple distribution channels, including point-of-sale, media and health professionals;
- careful targeting of the message to ‘at-risk’ groups;
- message portability, for example, a wallet card which women could carry with them and use when making food choices;
- reinforcing the positive effects of fish consumption;
- recognizing that the cohort of pregnant women is constantly evolving and ensuring that information is continually available to this renewing target market;
- ensuring a strong Internet presence.

A paper in the *Journal of Nutrition Reviews* (Smith and Sayhoun, 2005) analysed various approaches to informing pregnant women about mercury in fish. The paper was critical of campaigns that warned women about high mercury fish without providing balanced messages on the nutritional benefits of fish. There have been examples in other countries of how poorly crafted and targeted campaigns can reduce fish consumption, meaning fewer women consume fish and therefore miss out on its benefits.

An estimated 85,000 women give birth in NSW each year. Food Authority research suggested up to 14,000 of these did not eat any fish during pregnancy because of misunderstandings and fear about the potential risks. Clearly, if more women were armed with scientifically based advice presented in a non-sensational way, they would be able to include fish in their diet without fear.

It was determined that to be truly successful, the campaign had to address a number of criteria:

- Portability: The campaign needed to be based on the FSANZ advice, but this was in tabular format and had proved to be difficult to remember. A card was designed that could be carried by pregnant women and used when shopping.
- Accessiblility and multiple channels: Cards and merchandisers needed to be suitable for both seafood retailers and public health channels; they were waterproof for fish shops and looked suitable for a doctors surgery.
- Credibility: Message acceptability by pregnant women and doctors required endorsement from a broad coalition of stakeholders.

**THE CAMPAIGN MESSAGE**

The following message was used for the campaign.

“A Healthy Fish Message for Women Planning Pregnancy and Mums to be….

Fish are full of many nutritional benefits for pregnant women and young children.

Fish are a valuable source of protein, minerals, vitamin B12, iodine and are low in saturated fat and contain omega-3 fatty acids. Omega-3 fatty acids are important for the development of the central nervous system in babies, before and after they are born.
But eating too much of a good thing when you are a soon-to-be mum or breastfeeding can be bad. That's because some fish contain mercury levels that may harm an unborn baby or young child’s developing nervous system.

The good news is you can receive all the benefits of eating fish without the risk if you follow some simple dietary advice.

Most fish in Australia have low mercury levels. The following table will help you safely include fish as an important part of a balanced diet.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Dietary advice on fish consumption (Source: Food Standards Australia New Zealand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant &amp; breastfeeding women &amp; women planning pregnancy</td>
<td>1 serve equals 150 grams</td>
</tr>
<tr>
<td>2 – 3 serves per week of any fish and seafood not listed below</td>
<td>1 serve equals 75 grams</td>
</tr>
<tr>
<td>OR</td>
<td>1 serve per week of Orange Roughy (Sea Perch) or Catfish and no other fish that week</td>
</tr>
<tr>
<td>OR</td>
<td>1 serve per fortnight of Shark ( Flake) or Billfish ( Swordfish / Broadbill and Marlin) and no other fish that fortnight</td>
</tr>
</tbody>
</table>

MESSAGE DELIVERY

Previous attempts at communicating this message proved that the media could not be used as the only dissemination tool. The specificity of the target market required well-targeted message delivery tactics. The campaign was spearheaded by a three-prong approach, allowing for the message to be reinforced in multiple ways.

Partnership with public health professionals

Public health professionals are often called upon to provide dietary advice for pregnant women. Their involvement in the campaign was critical for message delivery and credibility. The following associations agreed for their logos to be printed on the card, and assisted in distributing materials and publicised the campaign:

- NSW Health
- FSANZ
- Australian Medical Association
- Australian Consumers Association
- Australian Midwives Association
- Australian Obstetricians and Gynaecologists Association
- Australian Dieticians Association
- Australian Breastfeeding Association

Partnership with industry

Fish purchase decisions are most often made at point of sale. It was important for this health message to be reinforced by fish retailers so that advice was also available at point of sale. The campaign is supported by the following organizations that committed to distributing the card in their stores:
• Coles Supermarkets
• Sydney Fish Markets
• Master Fish Merchants Association
• NSW Seafood retailers

The media
The media played an important part in initial message dissemination, but could not be relied on to repeat the information on a long-term basis.

RESULTS AND DISCUSSION

Distribution
Five hundred thousand wallet cards were produced, and were mailed to retailers and doctors in a custom designed merchandiser. Posters complemented the cards. All material was provided free of charge and could be replenished from the Food Authority. Table 1 identifies the distribution points for materials. A pregnancy section was also added to the Authority’s website, including a series of translated fact sheets. Information was provided through the Authority’s contact centre.

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution point:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>Over 1000 GP practices(^1)</td>
</tr>
<tr>
<td></td>
<td>All 180 Obstetricians and Gynaecologists(^2)</td>
</tr>
<tr>
<td>Ante-natal clinics, Midwives</td>
<td>All NSW Public Hospitals</td>
</tr>
<tr>
<td></td>
<td>1500 Midwives(^3)</td>
</tr>
<tr>
<td>Dietitians</td>
<td>3000 Dietitians(^4)</td>
</tr>
<tr>
<td>Fish Shops</td>
<td>350 fish shops(^5)</td>
</tr>
<tr>
<td></td>
<td>134 Coles supermarkets</td>
</tr>
<tr>
<td>Authority Contact Centre</td>
<td>Pregnant women, women planning pregnancy</td>
</tr>
<tr>
<td></td>
<td>Medical professionals</td>
</tr>
</tbody>
</table>

\(^1\) To be cost effective, practices were targeted on advice from AMA Division of General Practices.
\(^2\) List provided by Australian Obstetricians’ and Gynaecologists’ Association.
\(^3\) List provided by Australian Midwives’ Association.
\(^4\) Members of Australian Dietitians’ Association, and Direct Mail.
\(^5\) Covers majority of fish shops in NSW. List Provided by Master Fish Merchant’s Association and Yellow Pages.

The challenge for the campaign is to ensure longevity of the message. The Authority is consulting with stakeholders to ensure that the cards continue to be available through these distribution points.

Media activity
Media launches can generate good publicity to leverage a campaign. A launch event was held at the Sydney Fish Market on 11 May 2005. The campaign was officially launched by the NSW Minister for Primary Industries, The Hon. Ian Macdonald. He was joined by: the NSW Australian Medical Association President, Dr John Gullotta, a pregnancy nutritionist Tania Nash, Managing Director of the Sydney Fish Markets, Grahame Turk, and the NSW Food Authority Director General, George Davey.

The campaign was successful in both media reach and balanced messaging. All media reports mentioned the benefits of fish, and information about fish choices when pregnant or planning pregnancy. There was no negative media on the issue.

In summary, the campaign was reported by:
• Newspapers: The Sydney Morning Herald, Daily Telegraph, Sun Herald
• Magazines: Women’s Day, NSW Doctor, Sydney Child Australian Table, FoodWeek
• Radio: multiple reports on ABC, 2UE, 2GB, 2NM, Nova
Television: ‘Sunrise-Seven’
• Web-based: FoodWatch, BubHub, FeMail, Birth.com.au, Coles Baby Club

The campaign achieved a successful media turnaround: balanced messages reached a potential audience of 1.5 million through television, radio, print media, and Internet channels.

It is important to note this was not a marketing campaign, but rather a carefully targeted public education campaign to raise consumer awareness about an important health issue. While the Food Authority takes a neutral stand on the sale of fish as a commercial activity, it wanted to see more pregnant women consuming the recommended amount of low mercury fish because of the nutritional benefits.

According to the Sydney Fish Market, previous unbalanced media reports had impacted negatively on fish sales. While figures are not yet available for analysis, the campaign appears to have had positive market impacts. This suggests that the message has been communicated to the target market in a balanced way.

Many pregnant women and public health professionals sought further information from the Food Authority. This is reflected in increased call centre volumes and website enquiries. Feedback on the card and information has been very positive.

**CONCLUSION**

The Food Authority’s Mercury in Fish education campaign attempted to fill an information void through an innovative three-pronged strategy harnessing a synergistic approach of media, point of sale and stakeholder information dissemination. Overseas evidence suggests this is the first time such an approach has been attempted. The campaign was highly successful in bringing together a coalition of disparate groups to cooperate on an important health issue.

The campaign succeeded in providing balanced information to pregnant women and women planning pregnancy on how to maximise the health benefits of fish while reducing the potential risk from mercury.

Importantly, the campaign also conforms to international best risk management practice as recommended by the World Health Organization. It provides consumers with timely and accurate information to empower them and to enable them to make informed food choices.

**REFERENCES**


Proactive environmental management: Clean Green rock lobster presents a fully-integrated product management strategy

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ABSTRACT
The annual production of Australian Southern rock lobster (Jasus edwardsii) is about 4500 tonnes returning more than AU$200 million in annual export revenue. As applied to this fishery, the Clean Green programme represents the world’s first fully integrated product management system for commercial fisheries. Embracing contemporary quality assurance protocols, Clean Green presents an auditable system of standards applicable to ecological sustainability, food safety, product quality, workplace safety, and animal welfare across the supply chain, from the point of capture to point of consumption. Based on successful development and application in South Australia, the Clean Green programme has now been extended to the other southern rock lobster-producing states of Victoria and Tasmania.

The principle driver of the Clean Green programme was the South Australian rock lobster industry’s response to adverse community perceptions and perceived threats to their commercial fishery. Even without this pressure, there were obvious marketing advantages in presenting a robust framework of product quality and food safety to super premium seafood markets. The challenges of defining workplace standards amenable to independent audit under internationally recognized protocols have been successfully addressed. With an emphasis on working closely with industry participants across the supply chain and assisted by a targeted training programme, a responsive culture has been developed yielding high participation rates. So far, more than 250 industry participants have completed training in three states of Australia. More than 130 vessels have been audited against Clean Green standards. The overall programme offers a successful model to other seafood sectors.

INTRODUCTION
The Clean Green strategy is a quality assurance system covering the supply chain, from point of capture to consumption, for Australian Southern rock Lobster (Jasus edwardsii). It represents the industry’s vision of environmental sustainability, product quality, food safety, safe working environment, and animal welfare embedded in a quality assurance programme that can be independently certified against internationally recognized criteria. In this regard it goes well beyond standards of environmental sustainability embodied in other programmes, such as the Marine Stewardship Council’s Fish for the Future system of certification.
A vision, shared by fishers and processors working in the South Australian seafood industry, has been realized with the development and application of a fully integrated product management system. To date, more than 250 fishers have been trained and audited in Clean Green protocols in South Australia. This outstanding success (more than three quarters of the participants in one fishery) has been extended to other rock lobster producing states (Victoria and Tasmania). Many operators are expected to be certified as compliant against the internationally recognized suite of standards applicable to the Clean Green strategy. The scope of coverage across the entire supply chain exceeds any comparable system applicable to commercial fisheries. This paper describes the system of management as it applies primarily to the catching sector. Future articles will explain its application at higher levels of the supply chain, including distribution and sales.

PROACTIVE ENVIRONMENTAL MANAGEMENT
Some time ago fishers in South Australia’s AU$100 million a year rock lobster industry were concerned that negative community perceptions of commercial fishing could adversely affect their industry. Commercial fisheries worldwide are under increasing threat because of concerns about environmental damage and sustainability. In contrast, the South Australian rock lobster fishers believed that the demonstrably responsible management of their fishery (and its associated coastal ecosystems) should be recognized and celebrated by the community including their primary export markets. Their proactive response to environmental management and product quality prompted the Clean Green strategy.

In Australia, rock lobsters are caught in baited traps deployed on coastal reefs where they are usually retrieved within a day by fishers working from fast planing hulled vessels (about 20 m LOA). The practice of fishing for rock lobster is far less damaging to the environment than many other forms of fishing such as demersal trawling. Although incidental capture of animals, other than rock lobsters, does occur (for example octopus and fish), the bycatch is returned safe and alive. The South Australian rock lobster fishery was recently independently assessed as ecologically sustainable by Australia’s Department of Environment and Heritage, the national agency responsible for environmental protection. Australia leads the world in requiring all export-based fisheries to be assessed against protocols of ecological sustainable development. Decisions are legally enforced.

These more general attributes of environmental and fisheries sustainability are complemented with specific work practices covering other aspects of the supply chain in the Clean Green strategy. These other aspects include food safety, product quality, a safe working environment and animal welfare. These are presented as work practice standards to be followed by fishers, processors and other participants in the rock lobster industry, as part of a fully integrated product management strategy (McShane 2002).

THE CLEAN GREEN STRATEGY
The Clean Green strategy provides:

- supply chain standards, from point of capture to consumption. These are environmental and product standards developed with guidance from the Joint Accreditation System of Australia and New Zealand (JAS-ANZ). JAS-ANZ is an internationally recognized accreditation agency facilitating the alignment of standards to audit protocols and certification;
- training materials and resources to develop competencies in the desired work place standards;
- industry training to meet the standards;
• best practice manual;
• audit protocols;
• independent third party certification of the rock lobster supply chain; and
• branding materials for those achieving certification.

The Clean Green strategy is supported by a customized training programme specifically developed to meet the needs of industry. Graphically informative learning resources designed to present the desired work practices (aligned to standards of environmental management, food safety, product quality, workplace safety and animal welfare) have been produced in close consultation with industry practitioners. Draft training resources, and trial training sessions also provided an opportunity to get valuable feedback from industry participants. The response from industry was helpful in developing a user-friendly approach to training and getting the desired response to best practice standards. Furthermore, the programme has been developed specifically to provide a career path, to assist participants in the supply chain in fulfilling their legal obligations related to the above issues, and to subsequently achieve certification of compliance with the suite of workplace standards.

The standards in the Clean Green strategy reflect existing best practice principles and, as a minimum, the relevant legal requirements. The existence of workplace standards is not intended to replace or avoid the obligations specified by any legislation. Indeed, working to the standard presents an opportunity to ensure legislative requirements are met in practice, which is often not the case when working to industry Codes of Practice.

The Clean Green strategy is framed within an environmental management system (EMS) similar to that prescribed by the ISO 14000 series. An important part of any EMS is the ability for the system to encourage continuous improvement. This means that actions that are being implemented as part of the Clean Green strategy are also monitored to make sure that they are achieving the desired outcomes.

TRAINING AND INDUSTRY PARTICIPATION
The high degree of ownership by industry participants is evident from the enthusiastic voluntary participation in Clean Green initiatives. Building from overwhelming support in port visits, formal training sessions were scheduled and conducted in ports, aboard rock lobster fishing vessels and in processing facilities. In South Australia, more than 250 industry members (including vessel operators, licensed fishers, and deckhands) have participated in best practice training in two different training rounds, in 2004 and in 2005.

The training, conducted at local ports, involves hands-on experience aboard rock lobster vessels with qualified workplace trainers experienced in commercial fisheries. It includes development of competencies in bycatch management, marine mammal interaction, first aid, oil spill management, waste management, and workplace safety as well as many other issues relevant to managing a safe, sustainable industry producing a product for premium export markets.

The outstanding participation rates of fishers in the Clean Green programme is in contrast to the generally unresponsive training culture characteristic of the commercial fishing sector in Australia. Overwhelmingly, fishers believed in the programme and were willing to fund their own training. This unrivalled voluntary participation in Clean Green Training can be attributed to:
• a shared vision for a sustainable industry;
• ownership of the Clean Green strategy by industry;
• clear, accessible, training resources supported by credible trainers;
• practical hands-on training (aboard fishing vessels, in processing facilities);
• positive brand image of the Clean Green logo extending awareness to the community and developing pride amongst industry participants;
• positive reinforcement from the ‘bottom up’ rather than a punitive top-down approach to environmental management.

This success provides valuable guidance for others considering similar initiatives in other sectors (including other commercial fishing sectors and other industries including aquaculture).

AUDIT AND CERTIFICATION

For the audit process to have credibility, bodies that are both independent and competent undertake evaluations for certification. A requirement is that audit against the Clean Green standard shall be carried out by bodies formally accredited to the Australian standard AS/NZS 3843 (general requirements for bodies operating product certification systems) and equivalent international standards. To comply with AS/NZS, certification bodies must be independent of the organizations and activities that they are evaluating, while evaluators must have technical competence, including appropriate qualifications, training and experience, for specific product categories. In addition, audits must be supervised by competent staff, following documented policies and procedures. Client confidentiality must be ensured.

The 134 vessels already audited have met and/or exceeded the standards, which demonstrates that industry is adhering to best practice standards. These operators will be certified as Clean Green. The resultant change in culture within the industry will need to be developed over time to allow operators to adapt their work practices. Following the audit process, evidence is gathered on an ongoing basis to ensure that industry members involved in the Clean Green strategy are meeting the standards. Ongoing monitoring is imperative.

Standards developed in the current project have been extended to Australian southern rock lobster more generally by also applying it to the Victorian and Tasmanian industries.

Conclusions

The template of supply chain protocols could be extended to other sectors of the Australian seafood industry by following the pathway successfully taken in the Clean Green strategy. That pathway would include:

• assessing current work practices in the seafood industry sector concerned;
• identifying gaps in existing best practice compared with current (or proposed) national and international regulations and legislation;
• drafting standards in plain accessible language descriptive of desired best practice and aligned to current requirements (regulations, market, legislation);
• working closely at all times with an appropriate internationally recognized accreditation agency (e.g. JAS-ANZ) and with industry participants;
• seeking and acting on feedback from end users;
• finalizing standards and audit protocols;
• developing training programmes reflecting standards and audit protocols aligned to modules of the National Seafood Industry Training Package;
• delivering training; and
• auditing participants.

Ongoing monitoring is also vital to ensure a process of continuous improvement.

REFERENCE

The Global Food Safety Initiative

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ABSTRACT
In April 2000, a group of international retailer CEOs identified the need to enhance food safety, to ensure consumer protection, to strengthen consumer confidence, to set requirements for food safety schemes, and to improve cost efficiency throughout the food supply chain. As a result, the Global Food Safety Initiative (GFSI) was launched in May 2000. The initiative is facilitated by CIES (the Food Business Forum) and is supported by a Task Force that today has representatives of more than 40 retailers, which in turn account for over 70 percent of food retail sales worldwide.

INTRODUCTION
The Food Business Forum (CIES) is the only independent global food business network. It serves the CEOs and senior management of 175 retailer and 175 supplier member companies and their subsidiaries, in over 150 countries. CIES retailer members alone generate over US$2,000 billion, employ 4.5 million people and operate close to 600,000 stores representing a total sales area of 160 million square metres. CIES has been growing with the food business for over 50 years. Its strength lies in the active commitment of its member companies and its privileged access to key industry players. CIES is based in Paris but has regional offices in Washington, Singapore and Tokyo. From these bases The Food Business Forum serves its members throughout the world.

In April 2000, a group of involved CEOs identified the need to enhance food safety, to ensure consumer protection, to strengthen consumer confidence, to set requirements for food safety schemes, and to improve cost efficiency throughout the food supply chain. In response to this need the Global Food Safety Initiative (GFSI) was born.

THE GLOBAL FOOD SAFETY INITIATIVE
The main objective of the Global Food Safety Initiative (GFSI) is to implement and maintain a scheme to recognise food safety management standards worldwide. In doing so, GFSI aims to also:
• facilitate mutual recognition between standard owners; and
• work towards world wide integrity and quality in the certification of standards and the accreditation of certifying bodies.

The overall vision is to achieve a simple set of rules for standards, harmony between countries, and cost efficiency for suppliers.

In their day-to-day business, retailers accept certificates based on standards in order to assess whether suppliers of private label products, fresh products and meat, have carried out production in a safe manner. There are many of these standards, and many suppliers with many customers. Suppliers may be audited many times per year, at a high cost and with little added benefit.
GFSI does not undertake any certification or accreditation activities. Instead, GFSI encourages the use of third-party audits against benchmarked standards. The goal is to reduce the number of audits so that resources can be redirected towards continually ensuring the quality of food produced and sold worldwide.

**HOW THE GLOBAL FOOD SAFETY INITIATIVE WORKS**

To support this objective, GFSI has developed a Guidance Document, now in its fourth edition. It lists key requirements against which food safety management standards can be benchmarked. The benchmark requirements in the Guidance Document are made up of three key elements:

- Food Safety Management Systems;
- Good Practices for Agriculture, Manufacturing or Distribution; and
- HACCP (Hazard Analysis and Critical Control Point).

In addition, requirements for the delivery of auditing and certification based on these standards have been added to the document.

Once a food safety standard has been benchmarked successfully, the standard is ‘acknowledged’. The conforming benchmarked food safety management standards can be applied by food suppliers throughout the whole supply chain. This includes when making agreements with retailers and when defining contracts for the sourcing of products. The application of the benchmarked standards to particular products will be at the discretion of retailers and suppliers. This process will vary in different parts of the world, depending on:

- company policies;
- general regulatory requirements; and
- product liability and due diligence regulations.

At present (September 2005), there are four compliant benchmarked standards:

- BRC Technical Standard
- Dutch HACCP Code
- International Standard for Auditing Food Suppliers (International Food Standard)

Over the past year, these standards have been revised by their respective standard owners. GFSI will now re-benchmark these standards against the fourth edition of the GFSI Guidance Document, in order to verify their compliant status.

One standard has already been benchmarked against the fourth edition of the Guidance Document: the BRC Global Standard: Food (Version 4). Several other standards have been accepted for re-benchmarking. They are:

- International Food Standard (Version 4)
- Safe Quality Food 2000.

Yet another group of standards is under consideration for benchmarking. They are:

- The Dutch HACCP Code (Requirements for a HACCP-based food safety system) 3rd Version, September 2002 (Netherlands).
- China Retailers Standard
- New Zealand Fresh Produce Programme.

Benchmarking of farm assurance standards for agricultural produce has also started this year. One standard has been benchmarked so far and has been found compliant with the fourth edition of the GFSI Guidance Document: the SQF1000 Code.

GFSI is also engaged in two other important projects: the development of traceability guidelines, and the co-ordination of Good Retail Practices.
CFSI Governance

The GFSI Board is the main governing body. It is responsible for policy-making and overall decisions. The Board is made up of representatives from the following companies:

- Royal Ahold
- Carrefour
- Delhaize
- Metro
- Migros
- Tesco
- Wal-Mart


CONCLUSIONS

Through the various projects of the CFSI, retailers are stepping up their actions to strengthen consumer confidence by providing safe, quality food in retail outlets.

More details on GFSI are available in the GFSI Yearbook, which can be downloaded from www.ciesnet.com.
SECTION 5

Research, science and risk analysis
SEAFOODplus: international seafood research

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ABSTRACT
SEAFOODplus is probably the largest ever research project on seafood. It is funded by the European Commission, which contributes four million euro, and European research and industry groups contributing a further 12 million euro. It has a nominal four and a half year lifespan and includes 70 partners in 16 countries. It is organised into six Research and Technology Development (RTD) areas (named ‘pillars’), and a further six Information Technology and Development (ITD) pillars. SEAFOODplus has provided a major boost to seafood research in Europe and may spawn similar activities in other regions. Its existence gave the impetus for the formation of a Cooperative Seafood Research Centre in Australia. The strategic objectives of the project are to reduce health problems and increase wellbeing by promoting the consumption of safe and healthy seafood.

INTRODUCTION
The strategic objective of SEAFOODplus is to reduce health problems and to increase wellbeing among European consumers by promoting the benefits of consuming healthy, safe and high quality seafood products. The term ‘seafood’ used here encompasses wild and farmed fish and shellfish, both of marine and freshwater origin (see www.seafoodplus.org).

The extent to which a diet rich in seafood can reduce the increasing incidence of cancer, cardiovascular and inflammatory disease, will be assessed by performing dietary intervention and epidemiological studies. Other areas focus on the health of young populations, including the prevention of osteoporosis and postpartum depression in women.

The determinants of consumers’ seafood consumption will also be assessed, including the impact of health-related communication strategies on consumer decision-making. This will give information that is useful for adapting seafood products to consumer demands.

The seafood safety components of the research are aimed at making seafood safe for the consumer by identifying risk factors, reducing the risks associated with viral and bacterial contamination as well as biogenic amines, and undertaking risk-benefit analysis. All parts of the seafood industry are covered from traditional fisheries to innovative aquaculture. In terms of aquaculture, one challenge is to find a compromise between intensive rearing and consumer demands for healthy, high quality seafood that is ethically produced with minimal environmental impacts. Validated traceability systems will also be assessed in an attempt to apply a total food chain approach: tracing the live fish to the final consumer product, and back, from fork-to-farm. Figure 1 shows the components of the total food chain approach and its ‘fork-to-fish’ traceability objective.
SEAFOODPLUS: BACKGROUND AND ORGANIZATIONAL ARRANGEMENTS

The European Union (EU) wanted to tread new paths in its sixth research framework programme. Instead of the usual small projects for which administrative input tends to be high and the development boost low, they were looking for a project with better cost/benefit ratios and with integrated sub-projects directed towards common goals. To this end, it was able to build upon a well-established European network of institutes and scientific facilities, namely WEFTA, the Western European Fish Technologists Association. For 30 years WEFTA had been promoting practical research in the fish sector. Following a year of monthly meetings to establish structures and content, partners from the fields of nutrition, medicine and consumer science were invited to join technologists to create a truly multidisciplinary research consortium.

The European Commission (EC) in Brussels confirmed the work programme for SEAFOODplus in October 2003, the necessary contracts were signed at the end of 2003 and activities proper commenced in 2004. In contrast with traditional research approaches, the starting point for the SEAFOODplus research is the consumer. Contemporary consumers demand healthy, safe products that are produced using modern yet sustainable, environmentally sound, production methods.

SEAFOODplus was one of the few programmes selected by the EC, from the nearly 900 original projects submitted. Only six proposals out of 69 were selected for grants in the food area of its sixth research framework programme. The points in favour of SEAFOODplus were the high scientific standard, the strong links between the sub-projects, the complexity of the multidisciplinary programme, and the meaningfulness of the anticipated results. About 70 partners from 16 European states, among them both research facilities and small and middle-sized companies, are involved in one or other of the 20 sub-projects. Some non-European partners are also involved, including the Canadian enterprise ‘Aquanet’.
Organizational structure
Figure 2 outlines the organizational structure and governance relationships of SEAFOODplus, which have been designed for maximum integration of activities, full transparency and adequate oversight. All coordination of technical activities as well as legal, contractual and administrative activities at consortium level is performed by the Council, whereas the management of technical details of RTD activities is done within the RTD pillar and at project level respectively. Issues related to industry training, information dissemination, and intellectual property protection, are managed by the ITD team.

![Diagram of the overall organizational structure of SEAFOODplus](image)

Internal information exchange between project teams
The integration of research streams and adequate information flows between projects is achieved through a comprehensive spectrum of measures and methods, including training courses, the handling of research topics by several teams, exchanges of personnel, workshops, the joint use of data bases and information exchange via an Intranet site.

Commercial companies integrated within the project
Cooperation with small and middle-sized companies is important for ensuring that results will be commercially useful and subsequently used. The faster the results can be translated into action, the sooner the high personnel and financial costs of SEAFOODplus can be justified. Significant results are immediately available on the website, including to the public, even while the programme is ongoing. This applies in particular to findings related to new technologies, which could create economic benefits for users. The intention is that some findings may lead to the setting up of new companies and thus to the creation of jobs.
Fast distribution of results
A special working group is charged with the distribution of research results. It targets politicians, consumers and companies, using for example, specialist publications, the Internet, leaflets, being present at conferences and trade fairs, interviews and press releases.

Close contacts with processing companies, aquaculture enterprises, and the European associations of seafood processors, mean that they can also be used to distribute information quickly to their networks. Information stands and presentations at important European seafood exhibitions and trade fairs are part of the dissemination and publicity strategy. Seafood retailers are a particularly important target group as they have direct, daily contact with customers. The ‘Dissemination’ team offers support in translating the scientists’ technical jargon into everyday, generally comprehensible language.

Integration activities
Research is conducted by groups familiar with seafood as a commodity and by groups that are more associated with a particular scientific discipline. Both research environments need to be integrated. The instruments for doing this include training, exchange of personnel, PhD projects, joint studies, common work-ins, establishment of shared databases, and the operation of shared websites. In addition to training activities for researchers, a programme is also being prepared for the training of key personnel in industry, particularly small - and medium - sized enterprises (SMEs), thus integrating the research and industry environments, and assuring that any outcome from the SEAFOODplus research and development activities will be utilized by industry. To encourage the industrial exploitation of results, a special demonstration programme has also been established.

Research structure
SEAFOODplus research is organized into five Research and Technology Development (RTD) areas, called RTD pillars, and one horizontal activity spanning all RTD pillars (Figure 3). Each of the RTD pillars deals with a specific discipline oriented research area, but there is a strong interdependence between them.

RTD pillar 1: seafood and human nutrition
The major causes of premature morbidity and mortality in Europe are cardiovascular disease (approximately 40 percent) and cancer (approximately 25 percent). Epidemiological studies provide convincing evidence that seafood consumption can improve health and reduce the risk of chronic diseases. Increasing evidence supports an important role for long chain n-3 polyunsaturated fatty acids from seafood. There is increasing concern that the ratio of the n-6/n-3 fatty acids in the diet in some European...
populations is too high, in the region of 12:1 where a desirable level is estimated to be nearer to 6:1, or according to some scientists even lower. By consuming more seafood could this imbalance be rectified?

The research in this pillar addresses the question: ‘How important is seafood consumption for the health of the consumer?’ On the basis of mainly epidemiological research there are strong indications that regular seafood consumption could help to reduce gastrointestinal diseases, such as colon cancer and inflammatory bowel disease, and other diseases with an inflammatory component, such as diabetes type 2 and osteoporosis. Seafood consumption may play a significant role in weight management, and help in the prevention of obesity. There is good evidence that regular seafood consumption reduces cardiovascular mortality.

These beneficial effects of seafood need to be verified and the underlying mechanism elucidated. This can only be done through intervention studies in humans. In this pillar, three projects are focused on the physiological effects of seafood protein and seafood fatty acids. All involve intervention studies in humans to explore the effects of seafood consumption and how it works to improve health. Indications of a preventive effect of seafood against postpartum depression, a disease affecting 5-20 percent of childbearing women, will also be studied epidemiologically, as will the effects of seafood on colon cancer. An attempt will be made to distinguish between the effects of seafood protein versus seafood lipids, the results of which will feed into the development of seafood products that deliver the greatest possible health benefits to the consumer. In a later stage of SEAFOODplus, the links to other pillars, especially to pillar 4, will be developed with the efficacy testing of seafood based functional foods.

RTD pillar 2: seafood and consumer behaviour and wellbeing
It is generally agreed that seafood is a valuable resource for human nutrition. Epidemiological studies indicate that seafood contributes to a healthy diet, and populations that eat seafood regularly have a lower risk of coronary heart diseases, hypertension and cancer. Seafood may thus play an important role in a healthy diet, and in securing consumer health and wellbeing in Europe. However, seafood consumption seems to be declining in several European countries. No information is available to explain this decline due to lack of valid and comparable data at the European level. Thus, from a European health policy perspective, knowledge on what determines the consumption levels across Europe from a cross-cultural consumer perspective will be crucial for attempts to change or increase seafood consumption.

Attempts to modify consumption patterns might be aimed at either adapting seafood products to changing consumer demands or at changing consumer attitudes or perceptions of seafood. Both require a better understanding of what determines seafood consumption in Europe. In general, studies on the determinants of food acceptance or choice have distinguished between three types of factors; properties of the food product, factors related to the consumer, and environmental factors. Most research on food and seafood choice has tested the effects of a single type of determinant. Future research should take a more comprehensive and integrated approach.

In RTD pillar 2, four unique consumer projects complement each other, and together will reach new scientific insights and provide methodological innovations in relation to consumer research. At the core, a consumer survey will provide the basis for describing and predicting consumer preferences and attitudes towards seafood on an aggregate level. This project provides results to the other three projects as well as to other pillars in SEAFOODplus. The three other projects all extend this knowledge in relation to three crucial areas related to seafood products: on the eating quality of seafood, on consumer perceptions of new seafood products, and on consumer perceptions of information about seafood.
RTD pillar 3: seafood safety

Although seafood is generally regarded as a wholesome, safe, and nutritious food, it sometimes poses consumer risks. This pillar conducts research towards identifying and reducing the potential risks associated with seafood.

From reviews of international epidemiological data, the most clearly identified consumer risks from seafood are from human enteric viruses contaminating bivalve molluscs, pathogenic bacteria such as *vibrio* species, the formation of biogenic amines (histamine poisoning) in certain fishery products, and marine biotoxins. Other potential risks have been described, including, bioaccumulation through the food chain of persistent organic pollutants and heavy metals through environmental or aquaculture food contamination, and residues of veterinary medicines used in aquaculture.

Management of the consumer risks from seafood in the EU is either through direct legislation requiring monitoring and control, through prescribed standards for specific risks, or through generic controls using Hazard Analysis Critical Control Point (HACCP) procedures. Such risk management options are usually underpinned by risk assessment, but this approach is currently underdeveloped in the seafood safety area. Health statistics and continuing EU Rapid Alerts relating to seafood, suggest that despite the controls in place, the risks persist and seafood consumers continue to suffer illness.

The partners within the SEAFOODplus consortium have a wealth of experience with seafood safety risks and, collectively, constitute a unique pool of expertise within Europe. Following extensive consultation among key European fisheries institutes, SEAFOODplus has developed an integrated package of proposals for research in the seafood safety area. The projects build on existing knowledge and experience and aim to provide a very practical contribution towards improving consumer protection within the European Union. Projects cover the following areas:

- the development of improved test methods for both viral and bacterial contaminants of seafood (projects 3.1 and 3.3);
- the development of HACCP procedures for better control of viral pollution risks in shellfish harvesting areas (project 3.2);
- a better understanding of why EU consumers still continue to experience histamine food poisoning leading to predicative models; and
- improved industrial processing measures (project 3.4).

These projects are underpinned by a comprehensive risk assessment, which will provide risk managers and consumers with targeted and contextual information on risks associated with seafood (project 3.5). Overall the projects comprise a balanced and integrated package addressing key issues that should facilitate the development of better controls for seafood production and lead to less consumer illness.

RTD pillar 4: seafood from source to consumer product

Consumers are concerned about the sustainability of fish stocks. They are also concerned about the increasing amount of byproducts from the seafood production chain due to a growing aquaculture sector in various European countries. Although the majority of byproducts are used for feed production, manufacturing byproducts into human food with beneficial health effects represents a larger and a more challenging potential. This full utilization approach would contribute to a positive consumer image of the fishery chain.

Seafood byproducts are an important source for protein hydrolysates (bioactive peptides), n-3 lipids, nucleotides, collagen, gelatin, chitosan and mucopolysaccharides, with proven and potential positive health beneficial effects. However, the recovery and utilization of byproducts from wild fisheries and aquaculture could be improved. The potential health benefits of new components from seafood byproducts also need to be tested.
The market for convenience food is growing and in the case of seafood this may help to overcome some barriers for seafood consumption, such as the off-putting presence of bones or the inexperience of consumers in seafood preparation. Convenience seafood products tend to be lightly (semi) preserved. Safety issues are therefore of great importance, due to the potential contamination with pathogens. Different methods, including ionisation or chemical preservatives, have been tested for killing or inhibiting the growth of unwanted micro-organisms in food, but they all affect flavour or texture and are not compatible with the ‘fresh’ image of these foods. The synergistic combination of subtle preservation factors or advanced technologies, including the use of protective bacterial culture (biopreservation), anti-microbial active food-packaging and non-thermal processes such as ‘pulse light’, to control, destruct or inactivate undesirable micro-organisms may help to overcome these problems.

Another problem affecting consumer acceptance of seafood is rancidity and softening of the texture of seafood. Oxidation reduces the already limited amount of n-3 lipids in diets, and renders the use of these fatty acids as bioactive functional food ingredients difficult. During oxidation the fatty acids are converted into radicals and hydroperoxides that are further transformed into a wide array of (non)-volatile end products. Radicals, both hydroxyalkenals and aldehydes, are found to be highly reactive and can affect colour, protein functionality and enzyme activity. Enzymatic degradation of proteins in seafood after slaughter affects texture. Until recently softening was mainly ascribed to two groups of proteases, namely the cathepsins and the calpains. Lately there has been a growing interest in the protease, 20S proteasome. However, the mechanisms and kinetics of these processes, leading to deterioration of sensory properties and nutritional quality, are not understood. This knowledge will ensure the high nutritional and sensory quality of seafood.

The current interest in the role of seafood in human health relates to n-3 lipids that are highly susceptible to oxidation. The prevention of oxidation by a natural marine anti-oxidant, which has an additional beneficial health effect as dietary fiber, is one of the options for developing seafood products as functional food beyond the existing intrinsic nutritional value of seafood. Dietary modulation of farmed seafood is another option. Compounds like Se-(alkyl)cysteines present in, for example, alliums are of significant importance in combating cancer, as has been shown already in human intervention studies. However, feed modulation using this vegetable selenium source to change the selenium content and bioavailability of selenium in farmed fish, has not yet been investigated. The idea of developing functional seafood products with benefits beyond their intrinsic nutritional value is an unexploited area.

Research will be consumer driven to ensure that the resulting seafood products fulfill the needs and demands of target consumers, especially with respect to their being healthy and convenient.

RTD pillar 5: seafood from aquaculture
Seafood from capture fisheries is limited and in some cases not sustainable. Future demand for seafood will have to be met from aquaculture sources. There are some major consumer concerns about seafood from aquaculture, including:

- its poor taste and texture compared to wild fish;
- its potential contamination from fish feed;
- the ethics of the intensive production and slaughter of farmed fish;
- the sustainability of marine fish feed sources;
- the adverse environmental impacts of pollution; and
- the potential environmental impacts from interaction with wild stocks.

Projects in pillar 5 directly address these concerns to help overcome consumer resistance to aquaculture products. Some key elements need to be better understood. Seafood from aquaculture can potentially overcome the problem of the over exploitation
of scarce wild resources. It can potentially deliver a product of defined quality and composition to the market throughout the year, thereby enabling a greater penetration of ‘healthy foods’ in the diet of Europeans. Moreover, increasing intensification offers an ability to determine the quality of the product in several ways, allowing more tailor-made seafood products. Similarly, high seafood quality can be linked to ethically acceptable husbandry practices and aquaculture systems, both in reality and in the perceptions of consumers.

It will be important to diversify farming away from salmon to various white fish species, such as cod and carp. Research on how genetic background, growth and husbandry affect the biological properties of the muscle and hence eating and processing quality traits will be particularly useful.

Unless these quality problems are resolved there will be a decline in the consumption of healthy seafood. The research in pillar 5 focuses on major deficiencies in scientific understanding, which must be addressed. The relevance of the research proposed is shown by the participation of SMEs in the work packages.

**RTD 6: Horizontal activity on seafood traceability to ensure consumer confidence**

The seafood sector faces considerable challenges in the next few years as full traceability is introduced into the EU area. However, it is an outstanding opportunity to introduce traceability not only as a defensive system, but also as a proactive tool to ensure and verify the credibility of new seafood products.

Against this background, RTD 6 has been created as a horizontal activity to develop a traceability tool for the whole project, in particular as a support for RTD pillars 3, 4 and 5. The results of RTD 6 will also feed into RTD 2, with a focus on the consumer as the end user of the traceable data. The overall objective is to develop validated traceability systems for seafood and seafood products tracking them from consumers and retailers back to fishers.

This is a multi-scientific and multi-technological task ranging from methodology through implementation to validation. Electronic solutions are the only option for a practical and feasible traceability system. A range of scientific and technological problems must be solved before a validated traceability system can function in an open EU marketplace. Until now, general definitions of traceability for fish and fish products have come out of EU project QLK-2000-00164 ‘Tracefish’. RTD 6 builds on this work to develop a uniform methodology with a universal vocabulary as well as operational guidelines for traceability. This requires an extensive study of data capture equipment, data flow, development of management models, validation methods and analyses of selected seafood chains.

The technology transfer and information dissemination from this activity will be important especially given EU legislation requiring the implementation of traceability systems by all players in the seafood production chain (from January 2005). While there is no requirement for these systems to be validated, the system will have limited value and inadequate credibility without validation.

**Information technology and development (ITD)**

ITD activities are organized in pillars analogous to those of RTD (Figure 4).

**Dissemination**

The dissemination plan is designed to disseminate the results of research beyond the consortium, including through publications, a website, specialized leaflets, editorial pages, conferences (especially those with an emphasis on innovation), press releases, interviews, exhibitions and trade fairs. These activities also include training activities, such as workshops and conferences, providing operational manuals, an e-learning
platform, and the provision of consultancy and advisory services. Information will be tailored to particular groups such as consumers and their associations, industry groups, trade and retail organizations, the government sector, medical doctors and nutritionists and the research community (universities and public research institutions).

Information about SEAFOODplus, including progress to date, training courses and conferences offered, important milestones reached which are of particular interest to the scientific community is available at www.seafood.plus.org.

THE AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE (SEAFOODCRC)

Following two years of intensive collaboration between the Australian seafood industry, government agencies and research providers, it was agreed to establish the Australian Seafood Cooperative Research Centre (Seafood CRC), to commence operations from 1 July 2007 (see www.seafoodcrc.com). SEAFOODplus provided a convincing model of a large integrated research project between industry and research organizations.

Seafood CRC will be Australia’s first national entity to stimulate and provide comprehensive seafood-related research and development. Its competitive advantage was seen as follows:

- it has the support of the industry’s major wild-harvest and aquaculture sectors, key companies and industry leaders throughout the value chain, and the nation’s leading fisheries, aquaculture and seafood research institutes;
- it will improve on the successful collaboration and knowledge gained from other CRCs and programme such as those of the Fisheries Research and Development Corporation;
- it will build on existing private and public infrastructure investments to address institutional and market failures in the seafood industry; and
- it will attract and develop research and vocational capabilities required to support the value chain beyond production.

These advantages will enable Seafood CRC to advance research in seafood well beyond what is currently being undertaken in pursuit of the overall outcome of a “substantially improved contribution to national economic growth by a profitable, internationally competitive, robust Australian seafood industry”.

The structure will be as follows:

- Research Program 1: Value chain profitability. Outcome: Increased profitability and industry value through production innovation and efficient delivery of Australian seafood to the consumer.
- Research Program 2: Product quality and integrity. Outcome: Increased access to premium markets by meeting consumer demands for safe, high quality, nutritious Australian seafood.
• Research Program 3: Health benefits of seafood. Outcome: Increased demand resulting from consumers’ improved recognition of the health benefits of Australian seafood.

Two further programmes, Education and Training, and Commercialization and Utilization, are designed to support the outcomes of these three research programmes.

CONCLUSIONS
SEAFOODplus has provided a major boost to seafood research both in Europe and elsewhere. The full measure of its success will not be seen until its research is completed and results are disseminated. Progress to date suggests that it will achieve its overall objective of ensuring that consumers have access to healthy, safe and high quality seafood, and that in the long term this will have positive impacts on the general health and wellbeing of the European population. By providing the impetus for similar activities in other countries, such as the Cooperative Seafood Research Centre in Australia, the benefits of SEAFOODplus are likely to extend well beyond Europe.
Tailoring farmed Atlantic salmon with low levels of dioxins

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ABSTRACT
Norway is a major exporter of seafood, including of around 500 000 tonnes of farmed fish annually. To ensure the continuity of this trade it is essential to be able to clarify the effects, from ‘feed to fork’, of the undesirable substances and of the beneficial nutrients found in that fish. Since safe and healthy production of farmed fish starts with fish feed, the development of fish feeds with low levels of undesirable substances has become pivotal. The typical undesirables derived from marine feed ingredients are persistent organic pollutants (POPs), which are associated mainly with fish oil. In farmed salmon, the fat-soluble polychlorinated dioxins and furans (PCDD/F) and dioxin-like PCBs (DLPCB), commonly known as ‘dioxins’, are among one of the greatest challenges to food safety. Strategies are being developed to produce fish that are low in undesirables, by designing diets and optimizing feeding strategies while also taking into account issues of cost-efficiency and fish welfare. There are three main approaches that singularly or in combination can reduce the levels of PCDD/F and DLPCB in fish feed and farmed fish:

• selecting marine feed materials with relatively low natural levels of dioxins;
• using of alternative, terrestrial feed materials with naturally low levels of dioxins;
• technical removal of undesirable substances from marine fish oils.

The selective use of marine oils with low natural levels of organic pollutants reduces the level of dioxins in farmed fish, but has a lesser effect on the level of PCDD/F than DLPCB (Lundebye et al. 2004). The use of vegetable oils effectively reduces the level of both PCDD/F and DLPCB, but may also affect the positive nutrients normally found in marine fish (Berntssen et al. 2005). The use of purification techniques has the potential to reduce the level of lipid soluble organic pollutants while maintaining the high nutritional value of the marine ingredients used in fish feeds.

This paper gives an overview of current and potential strategies to control and reduce the levels of dioxins in farmed salmon. Research examples and a discussion of two previously published articles will also be presented.

INTRODUCTION
Norway is a major exporter of seafood. In 2004, around 500 000 tonnes farmed fish were exported. For major exporters of seafood such as Norway, it is of utmost importance to clarify the levels and the effects, from ‘fjord to fork’, both of the undesirable substances and the beneficial nutrients found in this fish. Since safe and healthy production of farmed fish starts with fish feed, the development of fish feeds with low levels of undesirable substances has become pivotal. Typical undesirables
derived from marine feed ingredients used in fish feeds are persistent organic pollutants (POPs). There is currently considerable focus on food safety aspects of persistent organic pollutants (POP) in farmed fish (for example, Hites et al. 2004). In salmon culture, dioxins (polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)), as well as dioxin-like polychlorinated biphenyls (non-ortho PCB and mono-ortho PCB), are among the greatest challenges.

Dioxins (PCDD/F) and dioxin-like PCBs (DLPCB) are highly persistent, and fat-soluble environmental pollutants that are ubiquitous in the marine ecosystem and are readily biomagnified in the food chain. Fish oils, extracted from marine pelagic fish species, used in high energy fish feeds are considered to be the main source of these lipophilic organochlorines in farmed salmon (WHO 1999; Jacobs et al. 2002).

Several strategies are being developed to produce fish low in undesirables by designing diets and optimizing feeding strategies, while taking into account cost-efficiency and fish welfare concerns. There are three main approaches that singularly or in combination can reduce the levels of PCDD/F and DLPCB in fish feed and farmed fish. One is to select marine feed materials with relatively low natural levels of dioxins (Isosaari et al. 2004; Lundebye et al. 2004). Besides seasonal variation, there is a large variation in fish oil PCDD/F and DLPCB levels depending on factors such as fish species, age, or geographical origin (EC 2000, NORA 2003). Another strategy is to substitute fish oil with alternative, terrestrial feed ingredients that contain lower levels of dioxins than fish oils. Vegetable oils have lower PCDD/F and DLPCB levels than most commonly used fish oils, and substituting fish oil with vegetable oil has great potential to reduce the level of dioxins in farmed salmon (Bell et al. 2005; Berntssen et al. 2005). Finally, several techniques exist to remove POPs from fish oils (deKock et al. 2004; Breivik and Thorstad, 2004) without affecting the nutritional status of the oils.

This paper gives an overview of current and proposed strategies to control and reduce the levels of dioxins in farmed salmon. A summary of research examples and a discussion of two previously published articles (Lundebye et al. 2004 and Berntssen et al. 2005) on the selective use of fish oils or substitution of fish oils with vegetable oils in salmon feeds will also be presented.

MATERIAL AND METHODS

Experimental design
The potential to reduce the levels of persistent organic pollutants, such as PCDD/F and DLPCB was investigated in a series of experiments using different approaches. In the first experiment, Atlantic salmon (Salmo salar L) with an initial mean weight of 1.8 kg was fed one of four diets with graded dioxin and dioxin-like PCB content for 7.5 months, in triplicate (final mean weight was 4.9 kg). The graded levels of dioxins and DLPCB were obtained by using two different fish oils: of Pacific origin (low dioxin) and of Baltic origin (high dioxin). The composition of the oil in the four diets was as follows:

- Diet A: 100% Pacific
- Diet B: 75% Pacific and 25% Baltic
- Diet C: 25% Pacific and 75% Baltic
- Diet D: 100% Baltic fish oil (for details see Lundebye et al. 2004).

In the second experiment Atlantic salmon were fed a fish oil based feed or a 100 percent substituted vegetable oil-based feed throughout an entire life cycle (from start feeding at 0.5 g until slaughter size at 2.2 kg), in triplicate for 22 months. The life cycle study included seven different feeding periods, with a different feed size for each feeding period. Fish and feed were sampled for all feeding periods from both vegetable oil (VO) and fish oil (FO) fed fish. The relative importance of several biological factors (growth, lipid deposition etc.) for the final contaminant levels in the fish, was
assessed by partial least square regression (PLS) modelling (for details see, Berntssen et al. 2005). In both experiments, fish and feed were analysed for those PCDD/F and DLPCB congeners that have been assigned Toxic Equivalency Factors (TEFs) by the World Health Organization (WHO), and results are given in WHO-TEQ. Feed–to–fish assimilation efficiencies were calculated for the various PCDD/F and DLPCB congeners after correcting for biological factors (for details see Berntssen et al. 2005).

**Dioxin analyses**

Concentrations of PCDD/F and DLPCB were analysed using the following method (Berntssen et al. 2005). Briefly, fish and feed samples were homogenised and freeze-dried. Sample material was pressure solvent extracted using a Dionex accelerated solvent extractor (ASE 300™ Dionex, USA), at 125°C and 1500 PSI. To quantify the PCDD/F and DLPCB congeners, the extracts were spiked with 13C labelled PCDD, PCDF, non-ortho- and mono-ortho-PCB standards (Cambridge Isotope Laboratories, Canada). The extracts were purified in a Power-Prep System™ (Fluid Management System, Waltham, MA, USA) using a sequence of columns (H2SO4 on silica, multilayered silica, basic alumina, and carbon column, respectively, FMS, Waltham, MA, USA) to separate and clean different groups of PCDD/F and DLPCB congeners. After extraction, the samples were concentrated by pressurised evaporation (Turbovap II™ Zymark., USA). Prior to analysis, a mixture of 13C labelled PCDD and PCB was added to the purified extract to provide relative recovery data on injection.

Analysis was performed by high-resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS, MAT 95XL Thermo Finnigan, Bremen, Germany), equipped with a fused silica capillary column (RTX-5SILMS, Restek, Bellefonte, USA). Quantification of each congener was based on the isotope dilution methods (1613 and 1668) of the US EPA (US EPA 1994, 1999). The congeners analysed included the 17 PCDD/Fs and 12 dioxin-like PCBs for which WHO has established TEFs for human risk assessment (Van den Berg et al. 1998). The concentrations of PCDD/F, dioxin-like PCB, or sum–TEQ of PCDD/F and DLPCB are expressed as pg upper-bound WHO-TEQ g⁻¹ wet weight. Upper-bound is defined using the limit of quantification for each non-quantified congener to the TEQ (EC 2002)

**RESULTS**

**Reducing dioxins and dioxin-like PCB by selecting fish oils.**

The mean PCDD/F and DLPCB concentrations in two different fish oils (high and low), feeds and

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**FIGURE 1**

Mean concentrations (in WHO-TEQ pg g⁻¹ wet weight) of dioxins (PCDD/F; top open bar) and dioxin like PCB (DLPCB; bottom hatched bar), as well as total-WHO-TEQ PCDD/F and DLPCB (total bar as mean, standard deviation as error bars) in two different oils with low or high contamination level (left panel), four diets with different inclusion level of these oils (middle panel), and Atlantic salmon (Salmo salar) (mean initial weight 1.8 kg) fed on these diets for 30 weeks (right panel). Bars with different superscripts are significantly different from each other (P<0.005). (Lundebye et al. 2004.)
fish fillets (n=3 pooled samples per diet) at 30 weeks of the feeding trial (with four different diets, A–D) are given in Figure 1. The concentrations of PCDD/F and DLPCB in the fish reflected the levels present in the feed, and DLPCB contributed a greater proportion to the total TEQ than PCDD/F. After 30 weeks of dietary exposure, there were significant differences (p<0.05) in the concentrations of PCDD/F and DLPCB in the salmon fillets among all dietary treatments. The contribution of DLPCB to the total TEQ decreased with increasing concentration in feed and fillet. The decline was less apparent in fillet (from 79 percent to 63 percent) than in feed (from 79 percent to 52 percent).

Reducing dioxins and dioxin like PCBs by substituting fish oils with vegetable oils

The mean PCDD/F and DLPCB concentrations in feeds based on fish (FO) or vegetable oils (VO), and fish fillets (n=3 pooled samples per diet, per sampling time) after 22 months exposure are given in Figure 2. At the end of the experiment the levels of dioxins and dioxin-like PCBs were significantly (p<0.05) lower (8 and 12-fold, respectively) in the fillets of Atlantic salmon fed on VO compared to FO diets. As was the case for the fish fed on different fish oils, the contribution of DLPCB to the total TEQ was lower in feed (34 percent) than the fillet (64 percent).

Other factors influencing dioxin levels

A long term study on the levels of total-TEQ PCDD/F and DLPCB in fish fed on vegetable oil and fish oil diets during an entire production life cycle showed that the changes in PCDD/F and DLPCB levels were related to other factors in addition to total TEQ PCDD/F and DLPCB levels in the feed. Periods with low growth (expressed as specific growth rate, SGR) and poor food utilisation (expressed as feed conversion ratio, FCR) caused the PCDD/F and DLPCB levels in the fish to increase and vice versa. A PLS (partial least square regression) model showed that the relative changes in total-TEQ PCDD/F and DLPCB levels over time was significantly correlated to the changes in feed concentrations, specific growth rate (SGR) and feed conversion factor (FCR) (Figure 3). Whole fish lipid content, changes in lipid content,
and lipid efficiency ratio (LER) had no significant effect on changes in whole body sum-TEQ PCDD/F and DLPCB levels (Figure 3).

**Accumulation efficiencies**

Accumulation efficiencies were calculated for 2.2 kg Atlantic salmon (Table 1), and were corrected for the additional factors that influenced tissue levels such as growth and feed utilisation. The accumulation efficiency for dioxins (sum PCDD/F congeners) was significantly lower (2-fold) than for dioxin-like PCB (sum DLPCB congeners). For dioxins, congeners with a lower degree of chlorination (4-5 chlorines) and higher WHO-TEF had a higher accumulation efficiency than dioxins with a higher degree of chlorination (6-8 chlorines), and lower WHO-TEF. For dioxin-like PCB no significant differences were observed among the dioxin-like PCB congeners with the chlorines in non-ortho position (higher WHO-TEF) compared with mono-ortho position (lower WHO-TEF). This difference in accumulation explains the relative increase of dioxin-like PCBs over dioxins in feed compared to fish that was observed in the two aforementioned feeding trials. This has also been reported for rainbow trout (Oncorhynchus mykiss) fed commercial fish feeds and feeds based on Baltic herring (Isosaari et al. 2002).

**TABLE 1**

Accumulation efficiencies (α%) for dioxins and dioxin-like PCB congeners in Atlantic salmon fed a fish oil diet (n=3, mean ± SD). Dioxins are divided into a group with a low degree of chlorination (Tetra-Penta chlorine) and a low range of WHO-Toxic Equivalency Factors (WHO-TEF), and high chlorination (Hexa-Octa) and high WHO-TEF. Dioxin-like PCBs were divided into non-ortho chlorinated PCB with a higher range of WHO-TEF and mono-ortho PCB with a lower range of WHO-TEF among the DLPCBs. (Berntsen et al. 2004.)

<table>
<thead>
<tr>
<th>Congeners (chlorination)</th>
<th>TEF (WHO)</th>
<th>α%</th>
<th>Congeners (chlorination)</th>
<th>TEF (WHO)</th>
<th>α%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dioxins</td>
<td>1.0-0.0001</td>
<td>43±6</td>
<td>Dioxin like PCB</td>
<td>0.1-0.00001</td>
<td>74±9</td>
</tr>
<tr>
<td>Tetra-Penta</td>
<td>1.0-0.5</td>
<td>49±7</td>
<td>Non-ortho</td>
<td>0.1-0.0001</td>
<td>72±9</td>
</tr>
<tr>
<td>Hexa-Octa</td>
<td>0.1-0.001</td>
<td>27±5</td>
<td>Mono-ortho</td>
<td>0.0005-0.00001</td>
<td>75±8</td>
</tr>
</tbody>
</table>

*Values in columns with the same superscripts are not significantly different (ANOVA, Tukey’s t-test, P<0.05).
DISCUSSION

Feed to fish transfer of ‘dioxins’

The potential threat to human health is not related to a single chemical component, but to a mixture of several related congeners of different chemical ground structures. For dioxins (polychlorinated dibenzo-\textit{p}-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)) and dioxin-like polychlorinated biphenyls (non-ortho PCB and mono-ortho PCB) a total of 17 out of 210 dioxin congeners (135 PCDF and 75 PCDD congeners) and 12 out of 209 PCB congeners are considered to have a common toxic. Dioxin and dioxin-like PCB concentrations can be expressed in terms of WHO Toxic Equivalents (WHO-TEQs), which are generated by applying Toxic Equivalency Factors (TEFs) to the 29 congeners. These factors are related to the toxic potential of the individual congeners in relation to the most toxic dioxin congener, 2,3,7,8-tetrachlorodibenzo-\textit{p}-dioxin (Van den Berg \textit{et al.} 1998). ‘Dioxin’ concentrations are occasionally expressed as the sum of all 29 PCDD/F and DLPCB WHO-TEQs.

The profile of these 29 congeners, and hence the sum WHO-TEQ, in feed is often not reflected in the fish. Some congeners (such as dioxin-like PCB) are more predominant in the fish than in the feed compared to other congeners. This can be explained by the difference in accumulation efficiency observed among certain congeners. The accumulation efficiency of PCDD/F and DLPCB have been reported in detail for both rainbow trout fed commercial fish feeds and feeds based on Baltic herring (Isosaari \textit{et al.} 2002), Atlantic salmon fed on Pacific and Baltic fish oil (Isosaari \textit{et al.} 2004) and Atlantic salmon fed vegetable oil and fish oil based diets (Berntssen \textit{et al.} 2005). The accumulation efficiency of DLPCB in these studies was two to three-fold higher than that of PCDD/F (Isosaari \textit{et al.} 2004; Berntssen \textit{et al.} 2005), and seemed to be independent of feed contamination levels (Isosaari \textit{et al.} 2004). Within the PCDD/F congener groups, tetra- and penta-chlorinated congeners were preferentially accumulated in salmon, whereas hepta- and octa-chlorinated dibenzo-\textit{p}-dioxins were excreted in the faeces (Isosaari \textit{et al.} 2004). Substitution patterns that were associated with a preferential accumulation of PCB in salmon included non-ortho substitution and tetra-chlorination (Isosaari and others 2004). The different carry-overs show the complexity of aiming for a “feed to fork” control of undesirable substances along the food chain. When selecting new feed resources to tailor a fish low in certain contaminants, differences in feed-fish transfer among the many contaminant congeners have to be taken into account.

Biological factors affecting dioxin levels in farmed fish

Generally, the PCDD/F and DLPCB burden in fish correlates with the level of lipid included in the diet, as shown for Atlantic salmon and rainbow trout (Karl \textit{et al.} 2003; Berntssen \textit{et al.} 2005). From ecotoxicological studies it is well-known that growth rate, which is strongly influenced by the feeding rate, also seems to be one of the predominant factors in determining PCB accumulation in wild fish (Nakata \textit{et al.} 2002). Growth rate (leading to growth dilution of persistent organic pollutants (POPs)) is negatively correlated, and feed conversion ratio (increased deposition of POPs) is positively correlated with PCDD/F and DLPCB levels in fish (Berntssen \textit{et al.} 2005). In addition to the reduction in the level of contaminants in the feed, the maintenance of an efficient feed conversion and high growth rate can be used to keep the level of dioxins as low as possible in farmed fish.

Tailoring farmed fish low in contaminants

Selective use of marine fish oils with naturally low levels of dioxins and dioxin-like PCBs, such as oil obtained from fish in the Pacific Ocean, has been reported to reduce the levels of dioxins, and to a lesser degree dioxin-like PCBs in farmed Atlantic salmon
Tailoring farmed Atlantic salmon with low levels of dioxins

(Isosaari et al. 2004; Lundebye et al. 2004). The relatively low reduction in dioxin-like PCB by using ‘low dioxin fish oils’ to reduce fillet contamination, is the combined effect of the relatively high contribution of DLPCB to the total WHO-TEQ level in these oils, and the dominant carry over of DLPCB from feed to fish. Salmon fed a ‘low dioxin’ fish oil diet had a total-TEQ PCDD/F and DLPCB level of 2.9 ng WHO-TEQ kg-1 w/w, which was not lower than the ‘typical’ level found in Norwegian farmed Atlantic salmon fillets on the market (approximately 2.5 ng WHO-TEQ kg-1 w/w (Hites et al. 2004). Data from monitoring studies include randomly sampled Atlantic salmon farmed in Norway that have most probably been fed different types of feeds, which may therefore vary in the source of fish oil, fish meal, and may include alternative feed resources (see Norwegian Seafood data base at www.NIFES.no).

CONCLUSIONS

Substitution of marine oils with vegetable oils has been shown to be an effective approach to reducing the levels of both dioxins and dioxin-like PCBs in fish feeds and in Norwegian and Scottish farmed salmon (Bell et al. 2005; Berntssen et al. 2005). The full substitution of fish oil with vegetable oil gave a sum-TEQ PCDD/F and DLPCB level (Berntssen et al. 2005) that is eight to nine times lower than the current level found in Norwegian farmed Atlantic salmon fillets on the market. The use of vegetable oils seems to be a valuable tool for tailoring farmed Atlantic salmon low in dioxins and dioxin-like PCBs, and can therefore reduce the total intake of these contaminants by the consumers of farmed fish.

However, the increased use of vegetable oils in fish farming will also reduce the levels of health promoting nutrients such as very long chain omega-3 poly unsaturated fatty acids (VLCn-3 PUFAs) (Bell et al. 2005; Berntssen et al. 2005). Clearly, there is a trade-off between reducing undesirable substances and maintaining the nutritive status when tailoring farmed fish to be low in contaminants by using vegetable oils in the diet.

An approach to reconstituting the typical marine fatty acids in salmon fed on vegetable diets, is feeding with a full fish oil diet as a finishing diet during the last phase of salmon culture, until market size. Feeding fish oil diets to salmon previously fed on vegetable oil diets for six months nearly completely (80 percent) restored flesh VLCn-3 concentrations, while the dioxins and dioxin-like PCB concentrations were still 60 percent and 47 percent lower than salmon fed fish oil diets throughout the production cycle (Bell et al. 2005).

Decontamination of fish oils by the technical removal of POPs while maintaining the beneficial nutritive status (deKock et al.2004, Breivik and Thorstad 2004), is a further option that may support the production of Atlantic salmon low in contaminants and high in health promoting nutrients.

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International risk assessment for *Vibrio cholerae* in seafood

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ABSTRACT

Seafood exports are a major source of foreign exchange for many Asian countries. However, this trade is affected when there are reports of cholera in one or other of those seafood-exporting countries. This paper summarizes the results of a risk assessment for *Vibrio cholerae* in warm water shrimp processed for export. It concludes that the risks to human health are very low. It is hoped that this risk assessment will help regulatory agencies in importing countries to take more appropriate risk management measures, and in particular to avoid making false alerts when non-01/non-0139 *Vibrio cholerae* are detected in raw shrimp.

INTRODUCTION

Seafood exports are a major source of foreign exchange for many Asian countries. Cholera is endemic in some of the seafood exporting Asian countries. Exports are affected whenever there are reports of a cholera outbreak. Shrimp constitute the major seafood commodity that is affected. In 2003, there were 4.3 million tonnes of shrimp in international trade, of which 70 percent was warm water shrimp. Considering the importance of shrimp from warm waters in international trade, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) set up a joint expert committee to perform a risk assessment for *Vibrio cholerae* in warm water shrimp processed for export. This paper summarizes the findings of the FAO/WHO Drafting Group¹.

*VIBRIO CHOLERA*: A PROFILE

*Vibrio cholerae* is a heterogeneous species consisting of over 220 serotypes. The disease cholera is caused only by serotypes O1 and O139. These are also referred to as choleragenic *V.cholerae*. Strains belonging to non 01/non-0139 serotypes of *V.cholerae* are widely distributed in the aquatic environment and they are mostly not pathogenic to humans, though occasionally, they may be associated with sporadic cases of gastroenteritis (Kaper et al., 1995; Desmarchelier, 1997). Choleragenic *V.cholerae* are characterized by their ability to produce a cholera toxin that is a complex protein consisting of A and B subunits. The production of cholera toxin is encoded by ctxAB

¹ For the complete risk assessment document, see FAO/WHO Microbiological Risk Assessment Series No 9, Risk Assessment of choleragenic Vibrio cholerae O1 and O139 in warm water shrimp in international trade.
genes. The ctx gene is present in a filamentous bacteriophage that infects *V. cholerae* through a pilus called toxin co-regulated pilus (TCP) (Waldor and Mekalanos, 1996; Faruque *et al.*, 1998). Since the ctxAB gene is phage encoded and there may be loss of bacteriophage in some environmental strains, it is possible to isolate non-toxigenic *V. cholerae* O1 from the environment, and occasionally from seafood like shrimp (Colwell *et al.*, 1977; Kaper *et al.*, 1979; Dalsgaard *et al.*, 1995). Serotyping alone is inadequate to detect choleragenic *V. cholerae* due to serological cross-reactions. Therefore the use of molecular techniques, such as polymerase chain reaction or DNA probe hybridization, have become important in determining the presence of choleragenic *V. cholerae* in seafood (Koch *et al.*, 1993; Karunasagar *et al.*, 1995).

In the aquatic environment, *V. cholerae* may be associated with copepods. However copepods are planktonic organisms and shrimp are demersal organisms and therefore *V. cholerae* are generally not associated with shrimp in their natural environment. Under an FAO sponsored shrimp microbiology project during late 1980s, shrimp surface and shrimp gut were tested for the presence of *V. cholerae* in a number of countries such as India, Thailand, Sri Lanka, Indonesia, Malaysia and the Philippines. The data indicated an absence of choleragenic *V. cholerae* associated with shrimp (Karunasagar *et al.*, 1990; Fonseka, 1990, Rattagool *et al.*, 1990; Karunasagar *et al.*, 1992). Though one study in mid 1990s detected O1 *V. cholerae* in tropical shrimp, molecular studies indicated that the isolates were non-toxigenic (Dalsgaard *et al.*, 1995).

**RISK ASSESSMENT**

For risk assessment, it would be important to consider the prevalence and concentration of choleragenic *V. cholerae* in shrimp during all stages of the food chain, from farm to fork. Warm water shrimp intended for export is handled according to Hazard Analysis and Critical Control Point (HACCP) guidelines. This involves the use of adequate clean ice to cool shrimp immediately after harvest, the use of potable water to make ice, and hygienic practices in handling and processing etc. Studies conducted in Peru during an epidemic of cholera in 1991 show that contamination of seafood with *V. cholerae* can be prevented by adopting HACCP measures.

Freshly harvested shrimp have a bacterial count of about $10^3$-$10^4$ cfu/g, and diverse bacterial groups are present (Karunasagar *et al.*, 1992). If contamination with *V. cholerae* occurs in raw shrimp, the organism has to compete with other natural flora on the surface of the shrimp. Indeed, studies indicate that *V. cholerae* is unable to multiply in raw shrimp (Kolvin and Robert, 1992). Studies conducted in our laboratory show that icing and storage in ice for 48 hours could lead to 2 log reduction in *V. cholerae* levels, even if the organism was present on shrimp before icing (Table 1). Studies conducted in Argentina show that freezing and frozen storage of shrimp could lead to 3-6 log reduction in levels of *V. cholerae* (Reilly and Hackney, 1985; Nascimento *et al.*, 1998). Moreover, shrimp are usually consumed after cooking. *V. cholerae* is sensitive to heat with a D value of 2.65 minutes at 60°C. Thus it can be expected that there will also be about 6 log reduction in numbers during the cooking of shrimp.

For risk assessment, dose response data would be important. The data based on human volunteer studies conducted in United States of America in connection with cholera vaccine trials (Cash *et al.*, 1974, Black *et al.*1987; Levine *et al.*, 1988), indicate that the infective dose would be $10^6$ choleragenic *V. cholerae*. Data on the prevalence of choleragenic *V. cholerae* in warm water shrimp was based on ‘port of entry testing for *V. cholerae’ in Japan, the United States of America and Denmark. Out of 21,857 samples of warm water shrimp tested, only two were positive (0.01%) for choleragenic *V. cholerae*. The risk assessments assumed that 90 percent of warm water shrimp are eaten cooked and 10 percent are eaten raw (sashimi etc). Qualitative risk assessment indicated that the risk to human health is therefore very low. The risk of the organism...
occurring in shrimp is low, and the organisms would need to multiply in the product to attain infectious levels, but during processing of warm water shrimp (icing, freezing, cooking), significant reductions in level are expected to occur (Table 2). Moreover, epidemiological evidence shows no link between imported warm water shrimp and cholera in importing countries. Semi-quantitative risk assessment using Risk Ranger (Ross and Sumner, 2002) estimated one case per century in Japan, 0.4 cases per century in the United States of America and 0.1 cases per century in European shrimp importing countries.

**TABLE 1**

<table>
<thead>
<tr>
<th>Processing step</th>
<th>Temperature distribution</th>
<th>Time distribution</th>
<th>Effect on population of <em>V. cholerae</em> O1</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARVEST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handling time before icing</td>
<td>15-35°C</td>
<td>0-1 hrs</td>
<td>No effect</td>
</tr>
<tr>
<td>Aquaculture shrimp</td>
<td>10-30°C</td>
<td>0-3 hrs</td>
<td>0-1 log increase</td>
</tr>
<tr>
<td>Wild caught shrimp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WASHING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing and icing of aquaculture shrimp</td>
<td>0-7°C</td>
<td>1-4 hrs</td>
<td>1 log reduction</td>
</tr>
<tr>
<td>Washing in seawater of wild caught shrimp</td>
<td>0-30°C</td>
<td>1-4 hrs</td>
<td></td>
</tr>
<tr>
<td>ICING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icing during transport (including on board fishing vessel for wild caught shrimp) to processor</td>
<td>0-7°C</td>
<td>2-16 hrs (aquaculture)</td>
<td>2-3 log reduction</td>
</tr>
<tr>
<td>WATER USE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water use during handling at processing plant</td>
<td>4-10°C</td>
<td>1-3 hrs</td>
<td>No effect</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature during processing before freezing</td>
<td>4-10°C</td>
<td>2-8 hrs</td>
<td>No effect</td>
</tr>
<tr>
<td>COOKING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking at processing plant</td>
<td>&gt;90°C</td>
<td>0.5-1.0 min (This is the holding time at &gt;90°C)</td>
<td>&gt;6 log reduction</td>
</tr>
<tr>
<td>FREEZING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezing of cooked and raw products, storage, and shipment time</td>
<td>-12 to -20°C</td>
<td>15-60 d</td>
<td>2-6 log reduction</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>Product</th>
<th>Identified hazard</th>
<th>Severity</th>
<th>Occurrence risk</th>
<th>Growth in product required to cause disease</th>
<th>Prod*/process/handling hazard</th>
<th>Consumer terminal step</th>
<th>Epidemiological link</th>
<th>Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw shrimp <em>V. cholerae</em></td>
<td>II</td>
<td>Low</td>
<td>Yes</td>
<td>‡ Inactivation during washing, icing, freezing</td>
<td>No</td>
<td>No</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Shrimp cooked at the plant and eaten without further heat treatment <em>V. cholerae</em></td>
<td>II</td>
<td>Low</td>
<td>Yes</td>
<td>‡ Inactivation during washing, icing, cooking (optional), freezing</td>
<td>No</td>
<td>No</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Shrimp cooked immediately before consumption <em>V. cholerae</em></td>
<td>II</td>
<td>Low</td>
<td>Yes</td>
<td>‡ Inactivation during washing, icing, (optional), freezing, thawing and cooking</td>
<td>Yes</td>
<td>No</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSIONS
The findings of this risk assessment are very important for risk managers in shrimp importing countries. For some shrimp importing countries, the term ‘V.cholerae’ means the causative agent of cholera. However, the FAO/WHO risk assessment has clearly shown the differences in pathogenicity and the relative health risks due to choleragenic V.cholerae and other non-01/non-0139 V.cholerae. It is hoped that this risk assessment will help regulatory agencies in shrimp importing countries to take appropriate risk management measures to avoid making false alerts when non-01/non-0139 V.cholerae are detected in raw shrimp. The evidence suggests that the risks to human health are actually quite minimal.

REFERENCES
FAO/WHO 2006 Risk Assessment of choleragenic Vibrio cholerae O1 and O139 in warm water shrimp in international trade, Microbiological Risk Assessment Series, No. 9. Rome


Cost-benefit analysis and risk management

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ABSTRACT
The paper presents a general review of cost-benefit techniques applied to public health regulations. It reviews those techniques from the perspective of official government agencies having jurisdiction, from the perspective of industry, and from the perspective of society as a whole. In the formulation of new food safety regulations government agencies can assess the costs and benefits of regulatory alternatives in order to select those that maximize net benefits. Compliance with a regulation represents a cost to industry, albeit partly offset by preventing product rejections, consumer illness, and potential liability. The benefit exists only if the system works properly and ensures continued market access for those products. However, industry typically seeks additional profitable uses for the information and/or the systems that the specific regulation obliges. Cost-benefits to society are assessed using two indices: willingness-to-pay (WTP), which measures how much individuals are willing to pay in exchange for the reduction of a risk to their health; and the cost-of-illness (COI), which estimates the cost of disease in the population. In general WTP is greater than COI.

INTRODUCTION
Methods for analyzing the costs and benefits of food safety regulations can be classified into two broad groups: (i) methods of interest to public health agencies when studying the cost-benefit of new or revised regulations and, (ii) methods of interest to industry. Public health agencies are more interested in the overall cost-benefit picture, “including potential economic, environmental, public health and safety and other advantages; distributive impact and equity” (US Federal Register, 1993). The industry is more interested in methods that allow assessment of specific cost-benefits. In both cases, cost-benefit analysis is a key tool for analyzing different risk management alternatives.

In the United States regulations require agencies not only to assess the costs and benefits of regulatory alternatives, but also to select those that maximize net benefits. Similar provisions can be found in Australia (Council of Australian Governments, 2004) and Canada. This raises the question of what is the most appropriate method for estimating the costs and benefits of a risk management decision from the point of view of society overall. Public health agencies aim to systematize and eventually standardize methods in order to achieve transparency and consistency between and within government agencies (Kuchler, 2001). Transparency and consistency are essential to allow estimates to be reviewed and discussed by interested stakeholders, such as industry, consumer associations, political parties, government control bodies, academia, and foreign commercial partners, etc.

A regulatory requirement represents a cost to industry; the benefit exists only if the system works properly (preventing product rejections, and consumer illness, injury or
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deadth) and reduces eventual (or potential) liability costs. These kinds of benefits, as well as affecting market access, are perceived by industry as common benefits; accruing to all companies that implement the requirements. Industry management is particularly interested in identifying additional uses for the information and/or the systems that the specific regulation obliges them to have; uses that could provide an additional comparative advantage to their company. It should be possible to verify results in practice, based on information obtainable at the company level (Zugarramurdi et al., 2000). This focus on tangible benefits does not mean that the industry lacks vision or social commitment; it is part of the legitimate approach of any company attempting to deliver safe food in compliance with regulatory requirements.

This paper presents a general review of cost-benefit techniques applied to public health regulations, from the industry perspective as well as from the perspective of society as a whole.

**COSTS OF ACTUAL FOOD OUTBREAKS AND COST-BENEFIT ANALYSIS**

The consequences to the consumer of a food incident can range from simple diarrhoea to premature death. In monetary terms the overall costs could range from the cost of an anti-diarrhoeal pill and a temporary decrease in an individual’s productivity (with no direct cost to the company responsible), to several million and even billions of US dollars (in fines, compensation, legal costs, etc.), or even the bankruptcy of the company found liable. Some costs of food outbreaks, associated with *C. botulinum* toxin in fish appear in Table 1.

**TABLE 1**

Costs of botulism associated with canned fish products (Todd, 1985)

<table>
<thead>
<tr>
<th>Year</th>
<th>Product</th>
<th>Where eaten</th>
<th>No of fatal cases</th>
<th>Total costs (US$ of 1986)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963</td>
<td>Canned tuna</td>
<td>USA</td>
<td>3</td>
<td>167 300 600</td>
</tr>
<tr>
<td>1978</td>
<td>Canned salmon</td>
<td>UK</td>
<td>4</td>
<td>6 277 650</td>
</tr>
<tr>
<td>1982</td>
<td>Canned salmon</td>
<td>Belgium</td>
<td>2</td>
<td>150 181 900</td>
</tr>
</tbody>
</table>

(1) The negative economic impact of this incident on the UK fishery industry was estimated in some additional US$4 million.

Evaluation of the costs of food outbreaks in Canada and the United States of America, based on all available information, show that company losses and legal action are much higher than medical/hospitalization expenses, lost income or investigational costs (Todd, 1989a). In addition, the average cost for industrial food processing incidents is found to be 70 times higher than the average costs of incidents linked to food-service establishments, markets, homes, farms and communities (Todd, 1989b). Depending on the country’s regulations and its compliance with due diligence, products can be seized, injunctions can be presented, companies and executives fined, licences withdrawn and, in extreme situations, those responsible can be prosecuted and imprisoned (Todd, 1987) (Zugarramurdi, et al. 1995). However, safety regulations are also intended to protect the industry, particularly the industry that is in compliance with regulations, from unfair competition and undesired economic effects of food outbreaks. The information presented in Table 1 is useful to measure the economic impact of actual food outbreaks but not to estimate *a priori* normal costs or benefits for specific risk management measures.

The challenge raised by new regulations is that of assessing *a priori* normal costs and possible benefits. The economic significance of any failure is linked to the efficiency and effectiveness of the specific food safety methods adopted, rather than to the normal costs and benefits inherent in the method chosen. Something equivalent could be said from the industry perspective. Avoidance of failure is a hypothetical and general benefit derived from compliance with the law, but it can not be taken *a priori* as a benefit. Different methods have been proposed to analyze costs-benefits *a priori* in the
Cost-benefit analysis and risk management


**Cost-benefit analysis from a regulatory point of view**

Caswell (1998) reviewed different monetary and non-monetary benefits and costs of improved safety and nutrition. Kuchler and Golan (1999) examined five different methods of cost-benefit analysis. The Economic Research Service of the United States Department of Agriculture (USDA) utilizes two monetary methods to research the cost-benefits of food safety regulations: the willingness-to-pay (WTP) and the cost-of-illness (COI) (USDA, 2001). The WTP is the preferred method for analyzing cost-benefit at the United States Food and Drug Administration (FDA) (Williams and Jessup; 2004). The main features of both methodologies are as follows:

**Willingness-to-pay (WTP):** measures how much individuals are willing to pay in exchange for the reduction of a risk to their health. Information on willingness-to-pay is worked out from a number of different sources such as: how much people are actually spending in fire alarms, life insurance premiums and coverage, etc.

**Cost-of-illness (COI):** Estimates the cost of disease in the population, including medical costs and lost income, without the provisions of a given food safety regulation, and then estimates the same kinds of costs with the regulation in place. The difference between the two is considered the regulation’s benefits. In the case of the COI for those who die during either the acute illness or with chronic organ failure (extreme situation), the present value of the reduced stream of earning is calculated. The “Value of Statistical Life” (VSL) proposed by Landefeld and Seskin (1982) is represented by the equation:

\[
\text{Value of statistical life} = \alpha \times (1)
\]

Where:

- \( T \) = remaining lifetime
- \( t \) = a particular year
- \( Y_t \) = after tax income, including labour and non-labour income
- \( r \) = individual’s opportunity cost of investing in risk-reducing activities (e.g. \( 0.02 – 0.05 \))
- \( \alpha \) = risk aversion factor (\( \alpha > 1 \)) (this factor is not accepted by all the authors)

Formal comparisons of costs and benefits, with regulatory purposes, are not straightforward, as has been discussed by different authors (Kuchler and Golan, 1999) (Wilson and Crouch, 2001) (Kuchler, 2001). Some difficulties are of a technical and conceptual nature while others, like the need to define the “Value of a Statistical Life” (VSL), may trigger discussions on ethical and political issues. These issues are outside the scope of this paper.

In general WTP is greater than COI and some authors have suggested that COI is the lower boundary of WTP (Caswell, 1998). Viscusi (1993) reviewed different studies and suggested that the VSL is somewhere between US $2 million and US $8 million, from the overall range of US $100,000 to US $10 million. From this range of estimates, the VSL utilized by the different agencies of the United States Federal Government was US $5.9 million (1997 US$ dollars) (Shogren et al., 2001). An example of a regulation that has been introduced in the United States of America, following this type of analysis is the USDA-FSIS regulation on “Nutrition labelling of meat and poultry products” in 1993. In this case the benefits were estimated at US$ 1.75 billion, whereas the costs were estimated in the range of US$ 218-272 million. The depreciation was taken over 20 years, and discounted at 7 percent (US Federal Register, 2003).

There are other monetary and non-monetary methods not discussed in this paper.
The USDA has an online “foodborne illness cost calculator” (USDA, 2003) that allows examination of the impact of different assumptions on cost estimates and risk rankings. It is also possible to introduce one’s own data to predict the potential costs of foodborne illness for new conditions.

**INDUSTRY AND REGULATORY REQUIREMENTS**

Faced with new regulatory requirements even the smallest industry will conduct some sort of cost-benefit analysis, to determine if it can bear the cost, or investment. The fact that a given regulation might be advantageous for society overall does not mean that it would be economically advantageous, or feasible, for a specific industry. Regulators cannot assume that the whole industry will seek to comply with a new or modified regulation. The industry has, in practice, a number of initial options such as the following:

(i) stop production: to quit the industry by stopping operation of the product/ line/plant;

(ii) change products: to move operations to a product with lower safety requirements (for example, from value added to (just) frozen fillets to frozen fish to fresh fillets);

(iii) change markets: to shift production to a market without the new requirement (either international, regional, national);

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**BOX 1**

Possible scheme for cost-benefit analysis from a regulatory point of view

1. Determine the number of people affected per year (e.g. hospitalizations, sequel and premature deaths) *without any new* regulatory intervention (risk management option (*)). Base of reference, to check against epidemiology records.
2. Determine the number of people affected per year with risk management option 1 (*).
3. Determine the number of people affected per year with risk management options 2, 3, etc. (*).
4. Determine the difference in people affected for each risk management option.
5. Based on the differences found in step (4) calculate the benefits for each risk management option (either based on COI or WTP).
6. Calculate the costs for implementing each risk management option, including regulatory costs. These costs will depend on the cost of the technological alternatives associated with each risk management option.
7. Find the difference between benefits and costs for each risk management option. Concentrate on options that maximize net benefits.
8. Analyze trade-offs and risk-risk situations that may be created by each risk management option (e.g. solutions that require increased transport by road will increase the risk of people killed in road incidents).
9. Analyze to determine if there is more than one technological alternative to produce about the same net benefits. If there were more than one alternative, then probably the regulation would not need to prescribe a specific technological method.
10. Open the results to scrutiny by stakeholders (consumers groups, industry, and academia).

(*) A proper quantitative risk assessment would be necessary. Most traditional food regulations are based on hazards for which there is already strong epidemiological evidence.
(iv) stall: take advantage of the inevitable long explicit or implicit implementation time (no regulation is enforced overnight);
(v) fake compliance: pretend to have achieved compliance; and
(vi) become compliant: achieve compliance because it is profitable (in some way) for the industry.

The quit option actually occurred in developing countries following the introduction of the requirement for Hazard Analysis and Critical Control Point (HACCP) based systems for export; the number of fish exporters was drastically reduced. The amount of fish exported may eventually reach the former level but it would come from a smaller number of exporters. The effect of the HACCP in the international market was to consolidate the offers from the exporter country and in some cases to reduce intermediation.

Options (ii), (iii) and (iv) have also occurred in practice. Option (v) is the “gambling” option; since detentions and rejections continue it is clear that a part of the fish industry opts for it. Option (vi) is the most positive from the point of view of the status quo of the overall existing market, however, actual implementation could depend on many factors, including the nature of the specific regulation and what is asked for in practice (e.g. in terms of new equipment, procedures, labour) to achieve it. The decision to achieve compliance is, in turn, based on one of the following:

- assuming the costs as a (bearable) market entrance fee (pure cost);
- capitalization of possible marketing advantage (e.g. quality claim, consumer assurance);
- capitalization of possible reduction in production costs; improvements in productivity and/or management associated with the methods to achieve compliance;
- some combination of the previous two.

As discussed above, the first advantage to industry of compliance with regulatory requirements is market access. The second advantage is the prevention of crisis situations resulting from rejections, recalls and withdrawals. Industry naturally prefers that the costs of implementation and the operation of a new regulatory system are covered by the benefits it generates or that it creates additional benefits.

**COSTS AND BENEFITS FOR SOCIETY**

Since COI and WTP as well as VSL are strongly influenced by local and national conditions, calculations in two different countries will yield different values. Large differences in such values are de facto at the root of misunderstandings related to food safety regulations between (developed) importing and (developing) exporting countries. For most developing countries it is likely that:

\[
\text{[Average VSL developed country]} \gg \text{[Average VSL developing country]}
\]

However, the implementation costs, particularly if investment and new technologies are required, will be the same or even higher in developing countries, particularly if the new technology must be imported.

In a developing country, under this situation new food safety regulation may either not be adopted or only adopted for export foods. This is particularly so for HACCP where a large number of developing countries meet European Union (EU), United States, Canadian and Australian HACCP-based regulations but have not yet adopted a HACCP regulation at national level. This asymmetry creates a number of practical problems that are likely to become more critical as developed countries adopt more regulations and decisions based on systematic risk analysis. Under this scenario individual regulations are not isolated one from the other, because they are all targeted
with the express purpose of achieving FSOs (Food Safety Objectives) consistent with a risk analysis approach.

**COSTS AND BENEFITS FOR THE INDIVIDUAL INDUSTRY**

Cost-benefit analysis from the point of view of industry can also vary depending on regulatory requirements. However, the fishery industry in developing countries may still gain additional benefits from implementing safety regulations (Zugarramurdi et al., 2000). Lower labour and other costs can give a comparative advantage compared with developed countries but it is improved productivity that will ensure a sustainable place in the international fish market. The costs of machinery (refrigeration and freezing, processing), stainless-steel components, and energy are more or less equivalent throughout the world.

Over the last decade the export fishery industry in developing countries has become technologically similar to the industry in developed countries. This is not only because of pressure from external regulations, but also the need to achieve comparable productivity levels both in physical and economic terms. As a result, the safety and quality of fish and fish products in many developing countries has improved, despite not having an explicit HACCP regulation at national level in such countries.

Difficulties may also arise due to the lack of equivalence or harmonization in international fish regulations. This can occur when each importing country sets slightly different requirements, and in particular procedures and records, which can increase the cost to the fishery industry in exporting countries without the potential to develop additional sources of income. For instance, the costs of traceability required by the United States FDA Public Health and Bioterrorism Preparedness and Response Act, are paid for by companies in exporting countries, but have no benefit in terms of improving supply-side management for individual companies. They are also irrelevant in relation to the ‘traceability’ that has to be provided, for instance, to European importers. For the exporting company the costs of such traceability represent a new market access cost, with no corresponding returns.

Other potential conflicts with the costs and benefits of regulatory requirements for developing countries are those that may affect artisanal capture and aquaculture production and live bivalve exports. Many regulations (e.g. in the United States of America and the EU) incorporate chapters on “flexibility” in their food safety regulations in relation to their own artisanal and small-scale production. However, these provisions are not extended to producers in developing countries. As noted by Buzby (2003) there is definitely a need for further studies on the economic impact of food safety regulations on international trade. The costs and benefits of improved fish (and food) safety regulations in developing countries also merit further research.

**CONCLUSIONS**

It is definitely advantageous to analyze food safety regulations from the point of view of their costs and benefits, both in monetary and non-monetary terms. From the literature it is clear that this view permits a different understanding than can be reached by consideration of food safety, processing, politics and even marketing. The analysis of costs and benefits is a useful tool for assigning resources both at the level of industry and for society overall. Although cost-benefit analysis is a very powerful tool in risk management, final decisions may depend on other value criteria both at the regulatory level as well as at industry level.

It is possible to separate the analysis of costs and benefits of regulatory measures in a cost-benefit analysis for society and for an individual company. In the case of cost-

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2 The cost of such traceability system for the industry is in the order of US $ 450 per year to keep the mandatory communication agent in the USA plus US$ 29.95 per shipment (record) (FDA Registrar, 2005).
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benefit analysis of regulations for society, there are already some methods in use in developed countries. Of particular interest for individual companies are the benefits that could be earned, other than those resulting from market access, from compliance with regulations. However, there are currently no specific methods for analyzing for these additional benefits.

Cost-benefit analysis cannot be extended from developed to developing countries. There is a need for developing countries to develop their own capability in relation to regulatory measures, both to assist the introduction of relevant safety regulations at national level as well as to improve their position in international trade. There is a need for further analysis of the impact of food safety regulatory measures on international fish trade.

A conscious cost-benefit analysis of regulatory measures by industry could lead to proactive measures to mitigate the potential risks to consumers of unsafe products. In the particular case of developing countries exporting fish and fish products, such an approach could also improve the safety of fish and fish products destined for the internal market, even where there is an absence of HACCP-based regulations applying to production for local consumption.

REFERENCES:


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3 Initially issued by the Clinton Administration it was reaffirmed by the Bush Administration. The Executive Order lays out the principles and procedures that govern centralized regulatory oversight in the USA.

4 Chapter 8 is devoted to Quality and Safety Economics in the context of the fishery industry.
Fish and fish products are among the most traded food commodities: close to 40 percent by volume ends up in international markets. Yet around three-quarters of fish exports finish up in just three markets: the European Union, Japan and the United States of America. China is an increasingly important player both as an exporter and an importer. Consumers expect that the fish they have access to will be safe and of acceptable quality, regardless of where they are produced or ultimately consumed. This has given rise to issues regarding fish quality and safety, international trade, risk analysis and harmonization of standards. These and other issues are addressed in this document, which represents the proceedings of the Sixth World Congress on Seafood Safety, Quality and Trade held in Sydney, Australia from 14 to 16 September 2005. The Congress was held under the auspices of the International Association of Fish Inspectors, in collaboration with FAO and the United Nations Industrial Development Organization.