

**PRESENT AND FUTURE MARKETS FOR FISH AND FISH PRODUCTS
FROM SMALL-SCALE FISHERIES – CASE STUDIES FROM ASIA,
AFRICA AND LATIN AMERICA**



**PRESENT AND FUTURE MARKETS FOR FISH AND FISH PRODUCTS
FROM SMALL-SCALE FISHERIES – CASE STUDIES FROM ASIA,
AFRICA AND LATIN AMERICA**

by

**INFOFISH – Intergovernmental Organization for Marketing Information and Technical Advisory Services
for Fishery Products in the Asia and Pacific Region**

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Fish Products in Africa**

**INFOSA – Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern
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**INFOPECA – Centre for Marketing Information and Advisory Services for Fish Products in Latin America
and the Caribbean**

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PREPARATION OF THIS DOCUMENT

During the twenty-sixth session of the FAO Committee on Fisheries, Members noted the importance of small-scale fisheries trade and requested FAO to continue its work on identifying how trade could benefit small-scale fisheries and help in generating employment and income. Following this recommendation, ten case studies on fish trade and small-scale fisheries were undertaken in Latin America, Africa and Asia. The findings of these studies are summarized in this Fisheries Circular. The studies were carried out by INFOPECA, the Centre for Marketing Information and Advisory Services for Fish Products in Latin America and the Caribbean; INFOPÊCHE, the Intergovernmental Organization for Marketing Information and Cooperation Services for Fish Products in Africa; INFOSA, the Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern Africa and by INFOFISH, the Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fish Products in the Asia Pacific Region. These organizations also prepared the study reports.

A summary of the findings of the study reports was incorporated in a paper on fish trade and small-scale fisheries, which was presented at the tenth session of the FAO Sub-Committee on Fish Trade, held in Santiago de Compostela, Spain, from 30 May to 2 June 2006. The paper was written by Dr Susana V. Siar, Fishery Industry Officer, FAO Rome. Its findings and recommendations are incorporated in the introductory chapter of this Fisheries Circular. The Fisheries Circular was edited by Dr Uwe Tietze, consultant.

INFOFISH, INFOPÊCHE, INFOSA, INFOPECA.

Present and future markets for fish and fish products from small-scale fisheries – case studies from Asia, Africa and Latin America.

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ABSTRACT

At the twenty-sixth session of the FAO Committee on Fisheries, FAO was requested to identify how trade in fish and fish products could further benefit small-scale fisheries and generate additional income and employment within the sector. Following this request, case studies were carried out in selected Latin American, African and Asian countries to study the importance of small-scale fisheries trade and identify opportunities for better integration into regional and international fish trade. The findings and recommendations of the case studies were presented and discussed at the tenth session of the FAO Sub-Committee on Fish Trade, held in Santiago de Compostela, Spain, from 30 May to 2 June 2006.

In the countries studied, the contribution of the small-scale fisheries sector to the total marine catch was significant and ranged from 70 to 95 percent. The studies show that products from small-scale fisheries are largely focused on the domestic market. In Africa regional trade in small-scale fisheries products was found to be very important for meeting the protein requirements of poor people. Women are actively involved in fish processing and marketing and also participate in capture fisheries in coastal areas and estuaries as well as in other forms of harvesting of aquatic organisms. Their involvement results in increased well-being of their households since women's income is largely spent on food and children's education. Study findings suggest that women can gain from increasing trade opportunities through their involvement in value adding activities and enterprises.

The studies identified several avenues for better integration of small-scale fisheries into regional and international fish trade. Among them are product diversification, value addition, improvement of product quality and the access to new markets. However, a number of constraints need to be overcome before this can be achieved. Post-harvest losses due to poor infrastructure and lack of storage and transportation facilities need to be reduced and knowledge of proper fish handling methods needs to be improved. While products for export are meeting high quality standards, products for domestic and regional markets are often processed using substandard hygienic methods. Small-scale fisheries are also excluded from international markets because of the costs and difficulties encountered when trying to comply with international standards and those imposed by supermarket chains and other customers.

The studies suggest that efforts should be aimed at improving facilities for preserving fish onboard, at the establishment of hygienic fish landing sites, increasing storage facilities and the supply of ice as well as improving roads, which connect fishing communities to markets. Equally important are the improvement of technical support and extension services to enable fishing communities to access appropriate technologies and information and training on quality improvement, proper fish handling procedures and storage, product diversification, value addition as well as on packaging. Fishing communities should also be assisted in assessing their fisheries and aquatic resources and identifying those that have potential for trade in the domestic, regional and international markets.

Small-scale fishers and processors can get better prices for their products by shortening the fish supply chain and increasing their bargaining and lobbying power. In this regard, the formation of marketing cooperatives should be encouraged and existing associations of small-scale fishers and processors should be strengthened by providing support for institution building. There is also a need to raise awareness among microfinance institutions regarding the needs of the small-scale fisheries sector for credit and savings services.

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ACRONYMS AND ABBREVIATIONS

ACOREMA	Peruvian institution dedicated to the conservation of coastal areas and marine resources
ANACOOP	National Association of Fisheries Cooperatives of Brazil
BPM	Bank Pertanian Malaysia - Agriculture Bank of Malaysia
BRL	Brazilian Real, currency symbol: R\$
CEAGESP	Companhia de Entrepósitos e Armazéns Gerais de São Paulo (wholesale market in São Paulo, Brazil)
CEMAC	Central African Economic and Monetary Community
CFAF	CFA Franc of the African Financial Community
CODEVASF	Companhia de Desenvolvimento dos Vales de São Francisco e Parnaíba (Brazilian State enterprise for the development of the valleys of São Francisco and Parnaíba)
COFI	FAO Committee on Fisheries
ECOWAS	Economic Community of West African States
EEZ	Exclusive economic zone
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FISHSTAT	FAO Fisheries Statistics
FMO	Fish Marketing Organization
GDP	Gross domestic product
GHC	Ghanaian cedi, currency symbol: ¢
GT	Gross tonnage
HACCP	Hazard Analysis Critical Control Point
ICCAT	International Commission for the Conservation of Atlantic Tunas
IDPPE	Institute for Small-Scale Fisheries Development
INFOFISH	Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fish Products in the Asia Pacific Region
INFOPÊCHE	Intergovernmental Organization for Marketing Information and Cooperation Services for Fish Products in Africa
INFOPECSA	Centre for Marketing Information and Advisory Services for Fish Products in Latin America and the Caribbean
INFOSA	Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern Africa
KES	Kenyan shilling, currency symbol: K sh
LKIM	Fisheries Development Authority of Malaysia
MIPE	Vice-Ministry of Fisheries of Peru under the Ministry of Production
MXN	Mexican peso, currency symbol: Mex\$
NGO	Non-governmental Organization
OCB	Brazilian Cooperative Organization
PEN	Peruvian nuevo sol, currency symbol: S/.
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAP	Structural Adjustment Programme
SME	Small and Medium Enterprise
SSF	Small-scale fisheries
TAC	Total Allowable Catch
TEC	Reform of Tariff and Tax Policies
TZS	Tanzanian shilling, currency symbol: TSh
UEMOA	West African Economic and Monetary Union
USA	United States of America

VAT	Value-added Tax
WADAF	West African Development of Artisanal Fisheries
WAEMU	West African Economic and Monetary Union
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Note: For currency, codes instead of symbols are used in the report.

1. FINDINGS AND RECOMMENDATIONS OF STUDIES ON SMALL-SCALE FISHERIES AND FISH TRADE

1.1 Introduction

At the twenty-sixth session of the FAO Committee on Fisheries¹, FAO was requested to identify how trade in fish and fish products could further benefit small-scale fisheries and generate additional income and employment within the sector. The FAO Committee on Fisheries emphasized that sustainable trade was dependent on sustainable fisheries management practices being in place.

Following the request, case studies were carried out in selected Latin American, African and Asian countries to study the importance of small-scale fisheries trade and identify opportunities for a better integration of small-scale fisheries into regional and international fish trade. The findings and recommendations of the case studies were presented and discussed at the tenth session of the FAO Sub-Committee on Fish Trade, held in Santiago de Compostela, Spain, 30 May to 2 June 2006.

While the definition of small-scale and artisanal fisheries varies between different countries and regions, the concept is commonly used to differentiate small-scale and artisanal fisheries from industrial fisheries. The FAO Working Group on Small-scale Fisheries² characterized small-scale fisheries as “a dynamic and evolving sector employing labour intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources”. Of the 38 million people recorded by FAO globally as fishers and fish farmers, an estimated 69 percent are classified as small-scale.

Women are involved in processing and marketing of small-scale and artisanal fish products. Their involvement in productive activities leads to increased household well-being because the income is spent on food and their children’s education. Some women work for fish traders and others are employed as labourers in the fish processing industry. In India alone, it is estimated that around 700 000 women and children are employed in marine fisheries activities such as marketing, processing and net mending.

1.2 The contribution and role of small-scale fisheries

The case studies presented in this Fisheries Circular highlight that small-scale fisheries are the backbone of the fisheries sectors in many developing countries. The lack of appreciation of the socio-economic importance of small-scale fisheries, however, often results in insufficient attention being given to the needs of the sector. The processing and trade of products from small-scale fisheries are important not only because these provide income and employment for many men and women in fishing and fish farming communities but also because the nutritional status of domestic and regional populations is dependent on these activities. Thus, supporting the needs of small-scale fisheries and ensuring their sustainability is a matter of survival for many countries.

Small-scale fisheries are important for the national economy. In Tanzania, for example, the 3 percent contribution of the fisheries sector to the country’s GDP comes primarily from small-scale fisheries. As far as the contribution of small-scale fisheries to the marine fisheries production is concerned, significant differences can be observed between the Asian countries studied. While 70 percent of the Indian marine fish production can be attributed to the small-scale fisheries sector, the contribution of this sector to the marine fisheries production of Thailand and Malaysia has declined to 7.22 and 6.8 percent, respectively, because of the growth of the industrial fisheries sectors in these countries.

¹ FAO. 2005. *Report of the twenty-sixth session of the Committee on Fisheries, Rome, 7-11 March 2005*. FAO Fisheries Report No. 780. Rome, Italy.

² FAO. 2004. *Advisory Committee on Fisheries Research - report of the second session of the working party on small-scale fisheries, Bangkok, Thailand, 18-21 November 2003*. FAO Fisheries Report No. 735. Rome, Italy.

In the African countries studied, small-scale fisheries still account for the major part of the marine fisheries production, i.e. 95 percent in the case of Tanzania, 77-86 percent in the case of Senegal, 80 percent in the case of Mozambique and 70-80 percent in the case of Ghana. In Ghana, the marine fish production by canoes in 2002 was many times higher than the production from purse seine and trawling vessels.

In the case of Brazil, the artisanal fisheries sector consisting of 326 696 fishers accounted for two-thirds of the marine fisheries production of 712 143 tonnes in 2003.

The inland capture fisheries sectors of most African countries are almost entirely composed of small-scale operators. In Tanzania, the freshwater fish production in 2004, entirely from small-scale fisheries, was six times higher than the marine catches while the value was four times higher. In the three Asian countries studied, the entire inland capture fisheries production comes from the small-scale fisheries sector.

In aquaculture, the contribution of the small-scale sector can likewise be considerable. In India, the entire production from inland aquaculture is contributed by small farms. Ninety percent of the shrimp farms are smaller than 2 ha and 5 percent are between 2 to 5 ha. Ninety-five percent of the production from coastal aquaculture comes from small farms. In Thailand, 82.5 percent of the inland fish farms are small, contributing nearly 70 percent to the total inland aquaculture production. Small farms account for 45 percent of the coastal aquaculture production.

India, Thailand and Malaysia have large domestic fish markets and fish products are sold in live, fresh/chilled and processed form. Cultured marine shrimp is the main export item, over 90 percent of which is exported in various product forms. The export earnings from shrimp in 2003 were US\$847 million in India, US\$160 million in Malaysia and US\$1.2 billion in Thailand.

In India, Malaysia and Thailand, new opportunities lie in marketing more ready-to-eat products as there is an increasing trend in the consumption of seafood and an increased awareness that it is a healthy food. Products from artisanal fisheries can be marketed by giving value to the artisanal character of the product and the community, which produces it. Value-added products can also be marketed for different target groups in the domestic and regional markets. The use of different fishing gear can be an avenue for improving quality. An example is the use of longlines for catching tuna.

While the products from small-scale fisheries are presently still largely focused on the domestic market, in the African countries studied, regional trade is very important for supporting the protein requirements of poor people. In some places, the export of high value fresh fish to international markets can also be important. Small-scale fish processing and marketing are sources of employment and income for many rural households.

In the West African countries studied, a large proportion of fish from small-scale fisheries is consumed smoked and about 20 percent is consumed fresh, salted, sun-dried or fried. Cross-border trade of cured fish products is an important activity. In Tanzania, *dagaa*, the most important freshwater small pelagic species, is sun-dried after landing by women from fishing communities both for human consumption and for animal feed production. It is estimated that between 50 to 60 percent is used for animal feed production. Dried *dagaa* is marketed to neighbouring countries in the region. Nile perch, the dominant species in the export trade, is produced exclusively by small-scale fisheries and sold to processing factories. Nile perch rejected by processing factories is sun-dried, salted, smoked and fried for human consumption. The by-products are used for human consumption and also for fishmeal production. Dried trimmings, chests, maws and skins are Nile perch by-products, which are exported within the region and to Asia. Fillets are marketed to Europe, Australia, the United States of America, Asia and the Middle East.

In many African countries, women known as “fish mammies” dominate the fish trade and play the important role of providing informal credit. In Ghana, 90 percent of the artisanal fisheries production is handled by these fish mammies. In Mozambique, 20 percent of the 100 000 people in the artisanal fisheries sector are women.

Several opportunities exist for product diversification, value addition and improvement of product quality to develop and access new markets for small-scale and artisanal fish products. In Tanzania, the Fisheries Department Training Centre in Mwanza is experimenting with dried, spiced and smoked *dagaa* to improve shelf-life, quality and taste.

In Latin America, between 70 to 80 percent of the fish produced by small-scale fisheries is marketed fresh while the rest is processed, most of it for domestic consumption. The phenomenon of increasing urbanization is concentrating domestic markets in big cities, where 80 percent of the 520 million people of the region are living.

The experience of the Women's Association of Betume in the northeastern state of Sergipe in Brazil shows that women can gain from increasing trade opportunities through value adding activities. The case studies from Mexico, Peru and Brazil suggest that the improvement of the quality of artisanal fish products is the key to a better integration of the sector into regional and international trade.

1.3 Strategy for a better integration of small-scale fisheries into trade

The first step to enable small-scale fisheries to benefit from fish trade should be the reduction of post-harvest losses and improving the quality of fish products for human consumption. This would increase the supply of fish without increasing fishing effort. Post-harvest losses owing to poor infrastructure, storage facilities and transportation as well as a lack of sufficient knowledge of proper and hygienic fish handling affect as much as 40 percent of fish landings.

While products for export are meeting high quality standards, those for domestic and regional markets are often processed through substandard hygienic methods and there is lack of consideration regarding the cleanliness of the drying, salting, smoking and processing environment as well as the holding, storage and distribution facilities. The potential exclusion of small-scale producers from international markets owing to the cost, difficulties and problems in complying with international standards such as HACCP and with standards imposed by supermarket chains also need to be addressed.

The case studies further suggest that efforts should be aimed at improving facilities for preserving fish onboard vessels, at working towards clean fish landing sites, increasing storage facilities, at the supply of ice as well as at improving roads that connect fishing communities to markets. Clean water is a basic necessity for ensuring hygienic conditions at fish landing and processing sites. Equally important is the improvement of technical support and extension services to enable fishing communities to access appropriate technologies, information and training opportunities. Small-scale fishers and processors need technical assistance and training on quality, proper fish handling procedures, storage, product diversification, value addition and packaging. Fishing communities should also be assisted in assessing their resources and identifying those that have potential for increased trade in domestic, regional and international markets.

The demand for small-scale fisheries products in domestic and regional markets can also be increased by offering these products closer to inland areas, increasing the number of retail outlets in urban centres and raising awareness regarding the health benefits of eating fish. Increasing urbanization and rising incomes provide new opportunities for ready-to-eat products from small-scale fisheries. Regional fish marketing information networks such as INFOFISH, INFOPECA, INFOPÊCHE and INFOSA are important for providing information regarding demand, supply, consumption patterns, markets and prices. Thus, they should be supported and strengthened.

Small-scale fishers and processors can obtain better prices for their products by shortening the fish supply chain and increasing their bargaining and lobbying power. The formation of marketing cooperatives should be encouraged and existing associations of small-scale fishers and processors strengthened by providing support for institution building. Market surveys may be conducted and buyer-seller meetings and seminars may be organized regularly to promote trade opportunities and to help increase business contacts and information flow.

There is further a need to raise awareness among microfinance institutions regarding the needs of the small-scale fisheries sector for credit and savings services. At the same time, small-scale fishers should be informed about the existence of financial services and how these can be accessed. Such information is presently very limited or not available at all because of the geographical dispersion and remoteness of many small-scale fishing communities.

As emphasized by the twenty-sixth session of the FAO Committee on Fisheries, sustainable trade is dependent on sustainable fisheries management practices being in place. In this regard, the open access regime prevailing in many small-scale fisheries as well as the intrusion of industrial fishers into areas designated for use by small-scale fishers needs to be addressed by national governments. Experiences in many countries are demonstrating that co-management arrangements offer promising prospects for fisheries management.

Following the review of the findings and recommendations of the case studies, the tenth session of the FAO Sub-Committee on Fish Trade held in Santiago de Compostela, Spain, 30 May to 2 June 2006 noted the importance of capacity building for small-scale fisheries and aquaculture including the necessity of organizing small-scale fishers and fish farmers, their participation in fisheries planning and management and of assisting the small-scale fisheries sector in product improvement and accessing markets.

The tenth session of the FAO Sub-Committee on Fish Trade further requested FAO to provide information on the contribution of small-scale fisheries to international trade including ornamental fish trade, lessons from pilot and case studies that may be useful to other countries and to elaborate on how post-harvest activities could be improved, taking note of environmental considerations. FAO was also requested to broaden the perspective and discussion on the topic to include, among other things, how developed countries could support the integration of small-scale fisheries into international trade through standards setting, intermediation, including financing issues, increasing the bargaining power of small-scale fishers in getting fair prices for their products, promoting traceability and ecolabelling of small-scale fisheries products³ and through value chain analysis.

³ As far as ecolabelling is concerned, i.e. as the voluntary product labelling conveying environmental information to consumers that seeks to create a market-based incentive for better management of fisheries, the case study from Latin America suggests that there is a yet untapped potential in artisanal and small-scale fisheries, which could help these sectors to expand their national and international markets and realize more remunerative prices for their products. The case study highlights special characteristics of artisanal fishing communities, which could enhance the attractiveness of their products for consumers and thereby increase their value. These environmental and cultural characteristics include the close linkage of artisanal fishing communities to the fate of the living resources in their area of residence and operation and the participation of these communities in coastal and aquatic resources management in order to conserve their aquatic and natural resources, to fight sources of pollution and to ensure the sustainability of their main livelihood activities. The case study further suggests that linking a product to a particular community, which produces it, also conforms to the modern concept of traceability.

The FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO. 2005. Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries. Rome, FAO. 90 pp.) draw attention to the potential difficulties for developing countries to participate in ecolabelling schemes, especially the small-scale producers in these countries, who already have difficulties to comply with international standards such as HACCP. The guidelines state that since ecolabelling schemes are designed to certify and promote labels for products from well-managed marine capture fisheries and focus on issues related to the sustainable use of fisheries resources, special consideration needs to be given to small-scale fisheries to comply with these requirements with respect to the availability of data and with respect to the fact that management systems can differ substantially for different types and scales of fisheries. It is further acknowledged that in order to benefit from applying ecolabelling schemes, states, relevant intergovernmental and non-governmental organizations and financial institutions should provide developing countries and countries in transition with financial and technical assistance to develop and maintain appropriate management arrangements that will allow them to participate in such schemes.

2. PRESENT AND FUTURE MARKETS FOR FISH AND FISH PRODUCTS FROM SMALL-SCALE FISHERIES IN SOUTH AND SOUTHEAST ASIA – THE CASES OF INDIA, MALAYSIA AND THAILAND

**Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fish Products in the Asia Pacific Region (INFOFISH)
Kuala Lumpur, Malaysia**

2.1 The fisheries sector

The marine fisheries sector contributes 1.62 percent to the GDP of India, 1.5 percent to the GDP of Malaysia and 1.9 percent to the GDP of Thailand. The fisheries sectors of these three countries provide fish as a source of protein and employment opportunities for millions of people and are important earners of foreign exchange. In India, 1.284 million active fishers are involved in marine capture fisheries alone. In Malaysia and Thailand, 82 630 and 161 670 fishers, respectively, are involved in marine capture fisheries.

In the three countries, various types of fishing craft and gear ranging from traditional non-motorized boats to modern factory vessels are employed to harvest fishery resources. The number of fishing vessels in India is 280 491. Malaysia and Thailand have 30 751 and 118 436 fishing vessels, respectively. Most fishing craft range from 17 to 28 feet (5 to 8.5 m) in length and are powered by inboard or outboard engines as well as by sails in the case of traditional non-motorized boats. Various types of gears such as handlines, longlines, poles and lines, trawls, gillnets, purse seines and push nets are used. The majority of fishing vessels operate in coastal waters, which are fully and sometimes overexploited.

The definition of small-scale fisheries in the three countries shows much variation. Small-scale fisheries in Thailand are defined in terms of horse power, length of boat, labour employed and type of fishing gears used. Small-scale fisheries are defined as fisheries, which use traditional fishing gear and fishing boats with a maximum length of 10 m and a maximum engine horsepower of 30 hp, operate in the vicinity of the home base of the owner of the vessel and close to the coast. Small-scale fisheries in Thailand are further defined by low incomes, being a subsistence-level economic activity and by the fact that most of the labour is provided by family members and relatives. Small-scale coastal aquaculture also falls under the category of small-scale fisheries.

In Malaysia, the term small-scale fisheries is limited to fisheries using non-motorized and outboard powered fishing boats and to all inland capture fisheries. In India, more than two-thirds of the entire fishing and fish processing industries are classified as small-scale by the government.

2.2 Small-scale fisheries production

2.2.1 Capture fisheries production

The total marine fish landings in Malaysia increased by 0.86 percent from 1 272 million tonnes in 2002 to 1 283 million tonnes in 2003. As shown in Table 2.1, in India and Thailand, the total marine catch declined by 2.05 percent and 0.87 percent, respectively, over the same period. In all three countries, the bulk of the production came from inshore fisheries, which accounted for over 80 percent of the total marine fish production.

In Malaysia, traditional fishing gears operated by 23 565 fishing vessels produced 277 847 tonnes of fish valued at approximately US\$0.25 billion while gears like hooks and lines produced 586 tonnes of fish valued at US\$0.78 million. The contribution of small-scale fisheries to the marine capture fisheries production has been estimated at 6.8 percent in the case of Malaysia, 70 percent in the case of India and 7.2 percent in the case of Thailand. The contribution of small-scale fisheries to the marine capture fisheries production and its value is shown in Table 2.1.

Table 2.1: Marine capture fisheries landings in India, Malaysia and Thailand and the contribution of small-scale fisheries (SSF) in 2003

Country	Total landings (tonnes)	Share of SSF (%)	Quantity of SSF landings (tonnes)	Approximate value (US\$ million)
India*	2 977 965	70.00	2 084 575	1 373.66
Malaysia**	1 283 256	6.80	87 261	75.93
Thailand***	2 620 582	7.22	189 387	229.78

Source:* Department of Animal Husbandry, Dairying and Fisheries, Government of India (2003)

** Department of Fisheries, Malaysia (2003)

***Department of Fisheries, Thailand (2003)

The inland capture fisheries production in India and Malaysia has shown an increasing trend during 2003 while the inland capture fisheries production marginally declined in Thailand. In India and Malaysia, the production showed an increase of 15 960 tonnes (2.51 percent) and 378 tonnes (10.96 percent), respectively, while in Thailand it decreased by 1 800 tonnes (0.91 percent). The entire production of freshwater fish from capture fisheries in the three countries is contributed by small-scale fisheries exploiting rivers, lakes and reservoirs as shown in Table 2.2.

Table 2.2: Inland capture fisheries production in India, Malaysia and Thailand and the contribution of small-scale fisheries (SSF) in 2003

Country	SSF landings (tonnes)	Share of SSF (%)	Approximate value (US\$ million)
India*	651 719	100	292.90
Malaysia**	3 565	100	6.40
Thailand***	198 400	100	151.46

Source: * Department of Animal Husbandry, Dairying and Fisheries, Government of India (2003)

** Department of Fisheries, Malaysia (2003)

***Department of Fisheries, Thailand (2003)

2.2.2 Culture fisheries production

The aquaculture sectors in the countries studied have a large potential and can contribute significantly to their total fish requirements. All three countries have achieved progress in aquaculture production through careful planning and have adopted effective strategies for further growth. In all three countries studied, aquaculture production has shown an increasing trend for the last two years. It has been noted that the governments of these three countries, through their departments of fisheries, have laid emphasis on increasing output from aquaculture farms, irrespective of their sizes, whether small-scale or medium-scale.

While it is difficult to give an accurate figure of the number of aquaculture farms operating in the three countries, the number of farms in Thailand has been estimated at about 30 000. In India, the number of aquaculture farms is estimated at about 90 000 and in Malaysia the number of farms has been estimated at 10 000 to 15 000 farms. In all three countries, the aquaculture production for the year 2003 continued to consist mainly of crustaceans, molluscs and finfish varieties. The increase in production during the period 2002 to 2003 was 1.30 percent in India, 1.24 percent in Malaysia and 24.4 percent in Thailand.

Inland aquaculture

In 2003, inland freshwater aquaculture accounted for 94.9 percent of the total aquaculture production in India, 31.8 percent in Malaysia and 41 percent in Thailand.

In all three countries, the inland aquaculture production increased in 2003 compared with 2002. In India, it increased by 1.5 percent while the growth in Malaysia and Thailand was 12.4 percent and 9.7 percent, respectively. In India, the entire production from inland aquaculture comes from the small-scale fisheries

sector. In Malaysia, the small-scale fisheries sector's contribution to inland aquaculture is estimated at 10 percent while in Thailand, nearly 82.5 percent of all freshwater aquaculture farms are small-scale farms, which account for about two-thirds of the entire freshwater aquaculture production. In all three countries, freshwater pond culture spearheaded production with species like common carp, catfish, snakehead, climbing perch and freshwater prawn contributing to the bulk of the production. Tilapia, freshwater eel and barbs are also produced by aquaculture in Malaysia and Thailand. The inland aquaculture production and the contribution of small-scale fisheries are shown in Table 2.3.

Table 2.3: Inland aquaculture production in India, Malaysia and Thailand and the contribution of small-scale fisheries (SSF) in 2003

Country	Total landings (tonnes)	Share of SSF (%)	SSF landings (tonnes)	Approximate value (US\$ million)
India*	2 102 350	100.00	2 102 350	1 181.10
Malaysia**	53 211	10.00	5 321	7.17
Thailand***	361 125	68.60	247 732	217.79

Source: * Department of Animal Husbandry, Dairying and Fisheries, Government of India (2003)

** Department of Fisheries, Malaysia (2003)

*** Department of Fisheries, Thailand (2003)

Coastal and brackishwater aquaculture

In 2003, coastal and brackishwater aquaculture accounted for 5.1 percent of the total aquaculture production in India while the contribution of this sector was as high as 68.2 percent in Malaysia and 59 percent in Thailand. In Thailand, the coastal and brackishwater aquaculture production increased in 2003 compared with 2002. In Malaysia, the coastal and brackishwater aquaculture production increased from 48 375 tonnes in 2002 to 49 544 tonnes in 2003 recording a growth of 37.3 percent. Over the same period, the Indian production declined by 1.5 percent.

In India, 90 percent of all brackishwater shrimp farms have a size of 2 ha and another 5 percent of farms have a size from 2 to 5 ha. Farms of a size of 5 ha or less are classified as small-scale. These farms account for 95 percent of India's coastal and brackishwater aquaculture production. In Malaysia, only 5 percent of the coastal and brackishwater aquaculture production originates from small-scale farms while the contribution of small-scale farms to the coastal and aquaculture production in Thailand is estimated at 45 percent. In Malaysia and Thailand, coastal aquaculture and brackishwater aquaculture production focused on the farming of shrimp, marine finfish and crustaceans while in India, only giant brackishwater shrimp, i.e. black tiger shrimp and white shrimp were cultured. The production of coastal and brackishwater aquaculture in India, Malaysia and Thailand and the contribution of the small-scale sector are shown in Table 2.4.

Table 2.4: Coastal and brackishwater inland aquaculture production in India, Malaysia and Thailand and the contribution of small-scale fisheries (SSF) in 2003

Country	Total landings (tonnes)	Share of SSF (%)	Quantity of SSF (tonnes)	Approximate value (US\$ million)
India*	113 240	95.00	107 578	636.18
Malaysia**	113 949	5.00	5 698	8.45
Thailand***	454 275	45.00	204 423	983.65

Source: * Department of Animal Husbandry, Dairying and Fisheries, Government of India (2003)

** Department of Fisheries, Malaysia (2003)

*** Department of Fisheries, Thailand (2003)

2.2.3 Composition and value of small-scale fisheries production

In India, on the average, a tonne of marine fish produced by marine capture fisheries is valued at US\$658.9 while a tonne of freshwater fish is valued at US\$449.4. In Malaysia, the average value of marine fish is US\$869.8 per tonne, while inland freshwater fish is valued at US\$179.5 per tonne. In Thailand, the average value of marine fish is US\$1213.3 per tonne and US\$763.4 per tonne of freshwater fish. The

small-scale fisheries production in India, Malaysia and Thailand, its source and its value are shown in Table 2.5.

Table 2.5: Small-scale fisheries production, value and sources in India, Malaysia and Thailand in 2003

Source/country		India*	Malaysia**	Thailand***
Marine capture fisheries	Q	2 084 575	87 261	189 387
	V	1 373.66	75.93	229.78
	UV	658.96	870.15	1 213.28
Inland capture fisheries	Q	651 719	3 565	198 400
	V	292.90	6.4	151.46
	UV	449.43	1 795.23	763.41
Inland aquaculture	Q	2 102 350	5 321	247 732
	V	1 181.10	7.17	217.79
	UV	561.79	1 347.5	879.14
Coastal and brackishwater aquaculture	Q	107 578	5 698	204 423
	V	636.18	8.45	983.65
	UV	5 913.66	1 482.98	4 811.84
Total	Q	4 946 222	101 845	839 942
	V	3 483.84	97.95	1 582.68
	UV	704.34	961.76	1 884.27

Legend: Q: quantity in tonnes; V: value in US\$ million, UV: unit value per tonne

Source: * Department of Animal Husbandry, Dairying and Fisheries, Government of India (2003)

** Department of Fisheries, Malaysia (2003)

*** Department of Fisheries, Thailand (2003)

In 2003, the total value of the production of the small-scale fisheries sector of India was US\$3 483.84 million while it was US\$97.95 million in Malaysia and US\$1 582.68 million in Thailand.

The major varieties of fish landed by various sub-sectors of small-scale fisheries are shown in Table 2.6.

2.3 Small-scale fisheries products and their markets

Exports from small-scale fisheries show a similar product and market trend in all three countries studied. Products made from cultured marine shrimp were the main export items. Over 90 percent of cultured shrimp is exported in various product forms. In 2003, the export earnings from shrimp products in the three countries studied were US\$846.69 million in the case of India, US\$159.76 million in the case of Malaysia and US\$1 274.76 million in the case of Thailand.

Marine finfishes were also exported in various forms. In Malaysia and Thailand, live marine fishes, mainly grouper and seabass, were exported as well as a small quantity of cultured live tilapia from freshwater sources. Other varieties of fish like carp, striped catfish, gourami, snakehead and freshwater prawn were consumed in the domestic market while a small quantity of freshwater fish from Thailand was exported. Freshwater shrimp and some varieties of freshwater fish were also exported from India. Table 2.7 shows the fish product forms in small-scale fisheries in the three countries.

2.3.1 Domestic markets

In all three countries studied, there are large domestic markets and major portions of fish and fish products produced by small-scale fisheries are absorbed by these domestic markets either in live, fresh/chilled or in processed forms.

In India, over 95 percent of the fresh fish production is consumed within a distance of 200 km from the fish landing sites and the rest is distributed to places beyond 200 km from the coast. The distribution and product flow to cities and urban centres located far away from landing centres is increasing. It has been reported that due to inadequate facilities for preservation of fish onboard vessels, relatively poor hygienic conditions prevailing at landing centres, lack of supply and poor quality of ice and inadequate transport facilities, in most instances the fish sold in the domestic market is generally of relatively poor quality.

Table 2.6: Major varieties of fish landed by various small-scale fisheries sub-sectors in India, Malaysia and Thailand

Source/species	Finfish	Shellfish	Molluscs & others	Bycatch/mixed catch
Marine capture fisheries	Skipjack	Shrimp, crab	Squid, cuttlefish, octopus	Lizard fish, croakers
	Yellowfin tuna		Cockles	Threadfin bream
	Sharks & rays		Mussels	Goat fishes
	Sardines			
	Mackerels			
	Croakers			
	Anchovies			
	Tilapia			
	Kingfish			
	Bombay duck*			
	Grouper			
	Seabass			
	Pomfret			
	Hilsa*			
	Ornamental fish			
Marine/brackishwater aquaculture	Seabass, snapper	Shrimp, crab	Mussels, cockles	
	Grouper			
Inland capture fisheries	Carp	Freshwater prawn		Eel
	Tilapia			Snakehead*
	Catfish			Catfish**
	Ornamental fish			Barb**
Inland aquaculture	Carp	Freshwater prawn		
	Tilapia**			
	Catfish**			
	Ornamental fish			

* In India only

** In Malaysia and Thailand only

The entire inland capture fisheries production is consumed in fresh form with the exception of a negligible quantity, which is dried. About 60 percent of fish from riverine resources is consumed locally while the production from reservoirs is sold in urban markets. As the demand for freshwater fish is very high, fish caught in remote northeast Indian states is also transported to these urban markets.

Fresh fish plays an important role for Malaysian consumers. A national survey conducted during 1998-99 indicated that on the average, expenditure for fish per household ranged from US\$19 to 20 per month. In Malaysia, most of the fish and fish products from small-scale fisheries are consumed domestically either in fresh/chilled or dried form. A niche market also exists for live products from inland and coastal aquaculture such as tilapia, grouper and shrimp. Product diversification and value addition are increasing in the domestic market sector. A large portion of processed fish products such as breaded and battered products are becoming popular in the domestic market. Consumers generally prefer fresh and chilled fish products to frozen products.

Table 2.7: Fish product forms in small-scale fisheries in India, Malaysia and Thailand

Source/country	India	Malaysia	Thailand
Marine capture fisheries	Fresh/chilled, frozen, dried and traditionally processed	Fresh/chilled, frozen, dried and traditionally processed	Fresh/chilled, frozen, dried and traditionally processed
Inland capture fisheries	Fresh/chilled, dried and traditionally processed	Fresh/chilled, dried traditionally processed	Fresh/chilled, dried and traditionally processed
Inland aquaculture	Fresh/chilled	Live, fresh/chilled	Live, fresh/chilled
Coastal aquaculture	Frozen, live, fresh/chilled	Frozen, live, fresh/ chilled	Frozen, live, fresh/ chilled

In the Thai domestic market, fish is generally consumed in fresh form. Fish consumption in all coastal areas is high. In Thailand, most of the fish and fish products from small-scale fisheries are consumed domestically. There is also a market for live products from inland and coastal aquaculture such as tilapia, seabass, grouper and shrimp. Side by side with modern processing facilities for export, there are many small-scale processing facilities in coastal towns, which cater to the domestic market. The most common methods used for processing are sun-drying, salting, pickling, smoking and fermentation.

2.3.2 Export markets

In all three countries studied, products from small-scale fisheries are already being exported to neighbouring countries and regional markets, though in only small volumes.

The regional markets for Indian seafood products from small-scale fisheries during 2003 consisted mainly of Southeast Asia and the Middle East. Markets for Indian seafood in neighbouring countries are Sri Lanka, Maldives and Bangladesh. While traditional products like dried fish have been exported to Sri Lanka and Maldives, chilled freshwater fish has been exported to Bangladesh. Southeast Asian countries such as Thailand, Singapore and Malaysia import mostly frozen pelagic fishes and chilled demersal fishes from Indian small-scale fisheries.

In 2002, the major nearby markets for Malaysian seafood products from small-scale fisheries were Thailand and Singapore. Regional markets for seafood from Malaysia are Viet Nam; China; China, Hong Kong Special Administrative Region (China, Hong Kong SAR); Bangladesh; Brunei; Cambodia; Macau; Maldives; Myanmar; Pakistan; Philippines; Sri Lanka and Taiwan Province of China (Taiwan PC).

In 2003, the major regional and nearby markets for Thai products were China, Hong Kong SAR, Malaysia, South Korea, Singapore and Taiwan PC.

2.4 Marketing channels

Marketing channels for small-scale fisheries products varied significantly in the three countries studied.

India

In India, the marketing channels for marketing fresh fish from marine sources involve several intermediaries with different functions such as auctioneers, commission agents, wholesalers, retailers and fish vendors. Some intermediaries undertake multiple functions. The number of intermediaries and channels of distribution vary from region to region, state to state and district to district within a state. Depending on the distance of the markets and type of consumers, i.e. individual or institutional, the number of intermediaries increases or decreases. Fresh fish from marine sources often passes through one to eight hands before reaching consumers located in rural, urban and metropolitan centres. The bulk of the fresh fish, i.e. 70 percent passes through only one to three hands. In the case of institutional customers such

as restaurants and hotels, not more than three intermediaries are involved. While the bulk of sales are carried out through auctioneers, about 40 percent of fresh fish is sold through commission agents or wholesalers.

As a result of the involvement of intermediaries in marketing, the net share of fishermen of the prices paid by the final consumers varies from 25 to 56 percent, depending on the states in which fish is traded.

The bulk of the dried fish passes through one to three intermediaries before it reaches the final consumer. The number of intermediaries varies from region to region. Processing of dried fish is done by fisherfolk (in 31.8 percent of the cases) as well as by traders (50 percent) and wholesalers (18.2 percent). Over 38 percent of dried fish is sold in other Indian states. Only 10 percent of dried fish is consumed in inland states without a coastline. Most of it is consumed in the northeast region of the country. Weekly markets in rural and suburban areas are the main markets for dried fish.

Almost the entire inland freshwater fish production with the exemption of a small quantity, which is dried, is consumed in fresh form. About 60 percent of the riverine fish production is consumed locally. Fish production from reservoirs is mostly sold in urban markets. Due to eating habits and the limited purchasing power of the people living close to fish landing sites, most fish is transported for sale to urban centres. Calcutta is the major urban consumption centre for freshwater fish. Fish from landing sites in all other states is sent to this city. As demand for freshwater fish is high in all urban centres in the northeastern Indian states such as Assam and other neighbouring states, fish caught in other states is also sent to these urban markets for sale.

The marketing channels and trade flows of freshwater fish are by and large similar across the country. Fishers sell their fish to wholesalers directly or through commission agents and retail intermediaries. Wholesale intermediaries sell fish to retail intermediaries either through commission agents or directly. Fish marketing through cooperatives and public fish marketing corporations is very limited. Even in the case where fishermen sell fish to cooperatives, private intermediaries are also involved in the marketing chain. In some cases, cooperatives become additional intermediaries in the marketing channel.

In the farmed fish sector, subsistence level production is consumed locally while commercial production is invariably sent to urban centres. The market intermediaries in commercial fish farming are limited to three or four. Fish farmers sell their fish to a fish trader, who transports the fish to urban markets, where it is disposed through auction to a wholesaler. The latter sells the fish he/she procures at auctions to a retailer. Thus, fish passes through three to four hands before it reaches the final consumer.

In the case of export of fish products, only a few intermediaries such as an auctioneer, a fish trader-cum-preprocessor and the final processor are involved in the marketing channel. In some fish marketing and export centres, fish is directly delivered to the processor-cum-exporter at a predetermined price. Farmed shrimp is either bought by the processor directly from the farmer or, if intermediaries are involved, their numbers do not exceed more than two or three. Intermediaries such as auctioneers and agents are also involved in certain states such as West Bengal, where auctioneer-cum-financier-cum-preprocessor and selling agents are involved in the marketing chain between farmers and processor-cum-exporters.

Examples of marketing channels identified in the State of Karnataka are shown in Figures 2.1 to 2.3.

Malaysia

In Malaysia, three marketing levels can be distinguished, i.e. primary markets, intermediate markets and terminal markets, involving wholesalers at fish landing and production centres, wholesalers at consumption centres and retailers. The main activity at the primary markets is the assembling of catches and harvests for redistribution to other market levels with small portions of fish sold directly to local consumers.

Intermediate fish markets are involved in a number of overlapping fish trading activities. These markets operate not only as terminal wholesale markets to supply retailers but also as transit points for redirection of fish to other wholesale centres. Terminal markets are markets where fish is received from the wholesalers at fish landing sites and production centres. Here, the fish is redistributed through and to retail outlets, hotels, caterers and institutional customers as well as to final consumers.

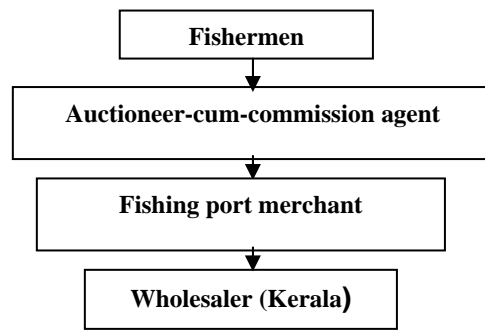


Figure 2.1: Interstate fish marketing channel in Karnataka, India

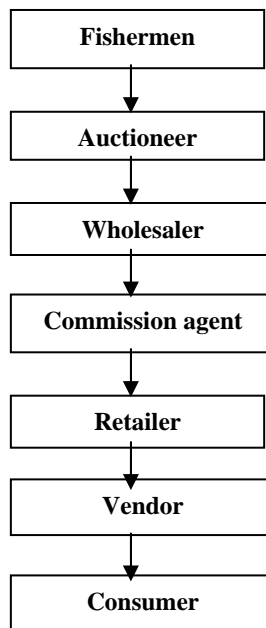


Figure 2.2: Intrastate fish marketing channel in Karnataka, India

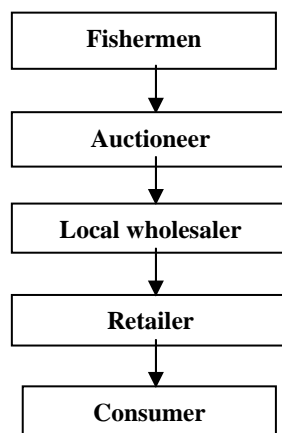


Figure 2.3: Local fish marketing channel in Karnataka, India

The majority of fish catches are landed at privately owned fish landing complexes or jetties. The collection of fish and its distribution are efficiently organized by agents at landing centres, where fish is passed on to wholesalers or wholesalers themselves procure fish. Wholesalers at consumption centres play a major role in determining the price of fish. There is a strong and exclusive link between wholesalers at fish landing and production centres and wholesalers at consumption centres. Fish designated for wholesale markets in large consumption centres is collected by wholesalers at the production and landing centres and sent to the wholesalers at the terminal markets. Products from small-scale fisheries are directly purchased from fishers, vessel operators or farmers by wholesalers at the production centres, who transport the fish to terminal wholesalers, who in turn sell it to processors or directly to retailers. Figures 2.4 to 2.6 illustrate the marketing channels for different kinds of fish and fish products in Malaysia.

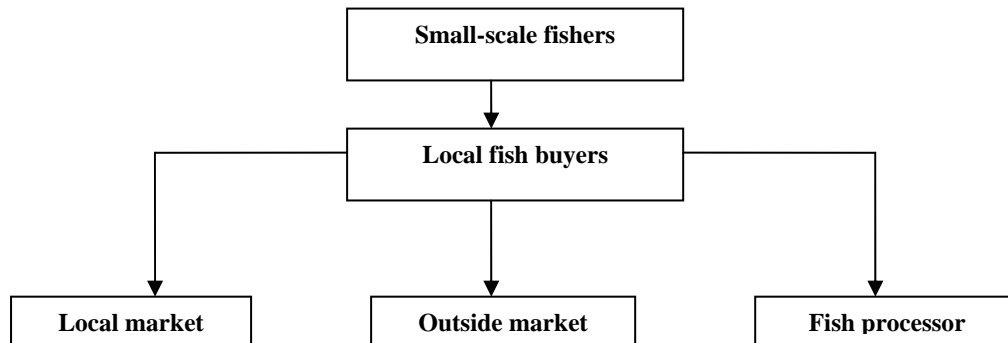


Figure 2.4: Fish marketing channel for small-scale marine capture fishery products in Malaysia

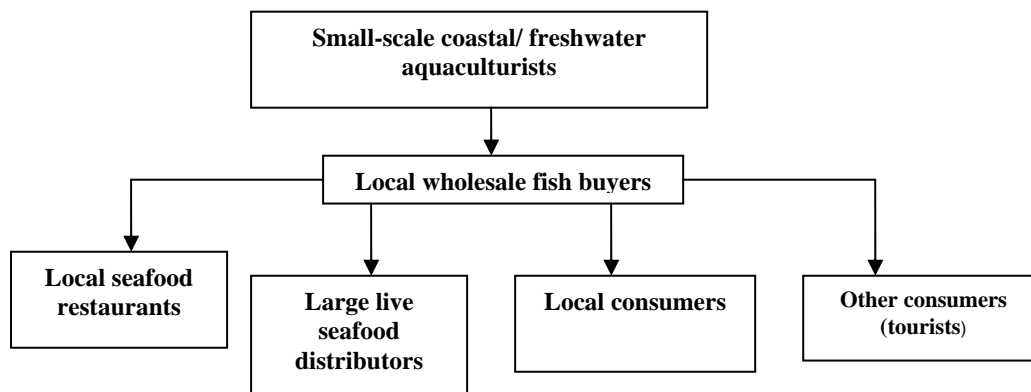


Figure 2.5: Fish marketing channel for small-scale aquaculture products in Malaysia

Thailand

The marketing channel for small-scale fisheries products in Thailand involves fishers, fish farmers, private commission agents, fish collectors, the Fish Marketing Organisation (FMO), commission agents, processing plants as well as wholesalers and retailers. Generally, fish landed at fishing ports and landing centres is channelled to local fish collectors acting on behalf of local processors and to private commission agents, who distribute their products to wholesalers and retailers in areas adjacent to landing sites and to agents or fish collectors, who arrange to transport fish to wholesale markets operated by the FMO. At these wholesale markets, most of the fish is sold by auctioning. The buyers at the wholesale markets are wholesalers, fish processors and retailers. The wholesalers sell the purchased fish to retailers at negotiated

prices or sell fish in bulk to institutional consumers including supermarkets, restaurants and hotels on a contract basis. Figure 2.7 illustrates the marketing channels for small-scale marine fish in Thailand.

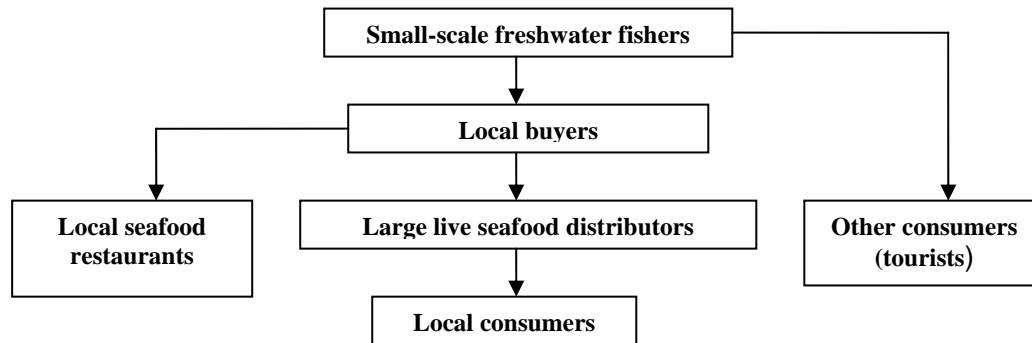


Figure 2.6: Fish marketing channel for small-scale freshwater capture fishery products in Malaysia

Traders involved in the marketing of the marine catch are fishers, fish agents, fish collectors, wholesalers and retailers. Fishers may be involved in fishing, selling and processing of fish at the same time. Fish agents receive fish from fishers and trade it by means of auction or negotiation. In remote areas, there are fish collectors, who buy from fishers or fish agents and sell to wholesalers in cities and also to retailers. Generally, fishers who land their catch at private fishing ports may have contracts with fish agents, who determine the price of fish.

In the case of cultured marine fishes, approximately 85 percent of the production is exported. The marketing system of cage cultured grouper is the same as that of live fish for export. Major intermediaries involved in marketing are fish brokers, collectors, wholesalers and exporters. The marketing process can be divided into two levels, i.e. the local level and the export level.

At the local level, the intermediaries involved are fish brokers and collectors. Most of them are large fish farmers. The roles of brokers and collectors differ with respect to marketing stages. Brokers are responsible for monitoring the movement of prices, informing farmers periodically, contacting fish collectors or wholesalers to sell fish, charging broker's fee from buyers and stand as guarantor for payments due from buyers while fish collectors are responsible for collecting fish from small-scale fish farms. In the case of export marketing, exporters function as agents and network with importing companies.

Fish farmers sell about 35 percent of their total production to fish collectors. Most small-scale fish farmers rely on fish collectors, who are experienced at selling fish and who have information and knowledge of fish market outlets. Fish that is not sold to collectors is sold at private fish assembly markets through private fish agents. After buying fish at farms, fish collectors also transport it to assembly markets for sale. Freshwater fish traded in assembly markets accounts for 72 to 75 percent of the total production. Fish agents, both FMO agents and private agents, as well as fish collectors at assembly markets distribute most of the fish to wholesalers, retailers and fish processors. Wholesalers distribute most fish directly to retailers while a small portion is sold to processors for export. Freshwater fish is exported mostly to a neighbouring country, i.e. Myanmar in fresh/chilled form. Retailers are the last link in the chain before the fish reaches consumers.

In Thailand, 93 percent of the total production of cultured freshwater fish is consumed domestically, 72 to 75 percent in fresh/live form and 18 to 19 percent in several processed forms. Export accounts for over 6 percent of the cultured freshwater fish production, mostly in fresh/chilled and frozen form. The marketing channel in rural areas involves small-scale fish wholesalers and retailers, who buy fish directly from local fish farms. Species of fish traded in rural areas are low priced species, which consumers can afford.

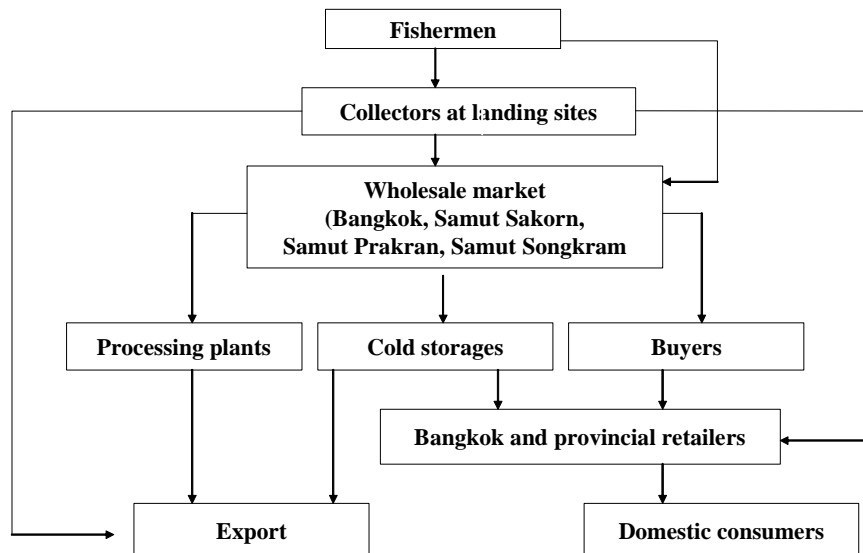


Figure 2.7: Marketing channel of marine small-scale fisheries products in Thailand

2.5 Involvement of women in small-scale fisheries

Women's involvement in fish harvesting and processing is similar in all three countries studied. Their participation in marine capture fisheries is mainly confined to shore-based activities such as fish marketing, fish handling, net making/mending and processing, i.e. sorting, grading, weighing, gutting and filleting of fish. These shore-based income generating activities undertaken by women are combined with their home making responsibilities. In general, women are at a disadvantage in comparison with men, as women tend to be given lower paid and unskilled jobs. In all three countries studied, women play various roles in fish marketing as agents, auctioneers, retail stall holders and fish mongers working individually, as a family unit or in rare cases as cooperatives.

India

Statistics on the employment of women in fisheries in India are lacking. As per the Indian Livestock Census of 1992, 533 800 women and children were employed in marine fisheries activities such as fish marketing, net mending and fish processing. It is estimated that the number of women involved in fisheries related activities has increased to 700 000 since the census was conducted. Women are involved in all aspects of post-harvest fish handling, preservation, processing and domestic marketing. They also provide an integral link between producers and consumers in the domestic marketing sector.

In India, the fisheries related activities undertaken by women vary from state to state. In the states of Andhra Pradesh, Orissa and Tamil Nadu located on the east coast of India, fish drying/curing, fish marketing including auctioning and purchasing at landing centres, retail marketing of fresh and dried fish and net making and mending are the main areas of women's involvement. Compared with these three states, the participation of fisherwomen in fisheries activities in West Bengal, also located on the east coast, is rather limited. In the fishing villages of West Bengal, even fish drying and curing are done by men or women belonging to other communities.

In the states located on the west coast of India, women are actively involved in marketing, processing, fish drying and curing as well as in net making and mending. While fewer women are involved in such activities in the state of Gujarat, a considerable number of female workers from other states are employed in the fish processing industry of Gujarat.

In India, 50 000 to 60 000 female workers are employed in the fish processing industry alone. Only few female workers employed in fish processing factories are from small-scale fishing communities. The demand for female workers in fish processing factories in the state of Kerala has led to the creation of a category of workers referred to as 'migrant women workers'. These workers are employed on a contract basis through middlemen for seasonal work in fish processing factories in other states. Migrant women

workers have been facing problems such as poor working conditions and a lack of medical benefits. The federal government has taken steps to mitigate their problems. In some states, women cooperatives have been established for organizing women for hand braiding of fishing nets, supply of twine and other functions. Commercial banks have extended loans to such societies.

Compared with Southeast Asian countries, where a considerable number of women are involved in aquaculture, involvement of women in aquaculture is very limited in India. The exceptions are family-owned and family-run small-scale fish farms. Women are, however, employed in the collection of wild shrimp and fish seeds for fish farms in some Indian states. They are also involved in shellfish as well as fossil shell collection in estuaries and coastal waters. Dozens of female women workers are employed in each of the 250 shrimp hatcheries in India for packaging of seeds. A few of the ornamental fish farms around Chennai, where ornamental fish is reared for local markets, are run by women.

The main constraints to a wider participation of women in fishery activities are a low level of literacy, social taboos concerning fishing and fisheries related activities, inadequate training and lack of skills as well as a lack of understanding of the socio-economic status of fishing communities at the policymaker level. As part of efforts to alleviate poverty, especially among women, the federal government is promoting self-help groups for fisherwomen as a nucleus for triggering development. Apart from giving training to women in low cost techniques of producing fish products such as dried fish products and fish pickles, financial assistance is extended for setting up fish vending kiosks. Training in low cost techniques for producing various products other than fish is also imparted.

Malaysia

In Malaysia, women are involved in inshore small-scale fisheries activities. In small-scale fish processing establishments as well as industrial processing facilities, women form the major part of the work force. Women are actively involved in small-scale fish processing establishments, which are usually operated at family or household level and where a wide range of traditional products are made. In industrial fish and prawn processing plants including freezing and canning plants, women are employed for dressing, processing, sorting and packaging of fish and work as technologists. Management and supervisory positions are mostly occupied by men.

Many women involved in small-scale fisheries complement their husband's work in marine or freshwater fishing. They are involved in the processing of the part of the daily catch that cannot be sold as well as in other processing and value-adding activities. In local markets, fish products traditionally processed by fisherwomen are normally regarded as specialties.

There are many success stories of women's involvement in processing of fish-based products all over Malaysia. An example is the production of a fish stick locally known as *keropok lekor*, which is eaten as a snack. More than 90 percent of the cottage industry producers of this home-made snack are women and 98 percent of the workforce involved in producing *keropok lekor* is women. These women entrepreneurs manage to upgrade their families' living status considerably and help to support their families financially.

Women are also involved in marketing of small-scale freshwater and marine catches as well as aquaculture products especially at local weekly markets and at fresh fish stalls. Few programmes and organizations in Malaysia deal specifically with improving the role of women in fishing communities. However, there are several extension programmes and training courses on improved fish processing and freshwater fish culture, which are directed at women. Women also play an active role in fish retailing.

A limited number of women is employed by fishery organizations and involved in fisheries research and extension work. Superstitions that associate women with poor catches, limited financial resources and the absence of technical support services for women are the factors that hinder a greater involvement of women in the fisheries sector. With overemployment already present in the fisheries sector, the government is planning to resettle some fishing communities and train them for employment in other sectors.

Thailand

In Thailand, women are generally involved in fisheries related activities at the subsistence level. In larger fishing villages and towns, women are also actively involved in fisheries related activities at the commercial level, i.e. in fish processing and in freshwater fish culture. Women also work as fish agents and managers of industrial fish and shrimp processing plants and as fishery technologists. Approximately 90 percent of the labour force of fish processing plants is women.

While there are presently no specific programmes for the improvement of the social and economic role of women in fishing communities in Thailand, the general policy of the Department of Fisheries is to improve the social and economic situation of fishermen and their families, to fully utilize the existing labour force including women in the small-scale fisheries sector, to increase the supply of fish, to reduce unemployment in fishing communities and to improve the efficiency and quality of fish processing and fish farming at the village level. In general, a low level of education, conventional taboos regarding women boarding fishing boats and the burden of managing the household, are the hindrances to a greater participation of women in small-scale fisheries.

2.6 Opportunities for developing innovative small-scale fisheries products

While there are several opportunities to develop new small-scale fisheries products, there are also constraints like declining profit margins, fluctuations in raw material supply and scarce storage facilities. Apart from fresh fish, the products from small-scale fisheries currently marketed in Malaysia and Thailand are dried fish products, fish jelly products, fermented fish products and fish crackers while in India, fresh and dried product forms still prevail. New opportunities lie in the marketing of ready-to-eat products in the three countries studied as there are an increasing trend in consumption of seafood and an increased awareness of it being a healthy food. Table 2.8 shows new product opportunities by source of raw material and market.

Many new and innovative products can be developed from the fishes landed by small-scale fisheries that would possibly get a better price rather than selling them fresh. Products such as sun-dried, salted and dried, fermented, boiled, marinated, ready-to-eat including breaded and battered products, fish jelly and other products can be produced with simple processing techniques and attractive packaging. These products can be marketed through fish retail outlets, supermarkets and hypermarkets.

As there is already a potential domestic market in the three countries studied, many traditional fish preparations could be reintroduced as specialties to modern consumers. With simple processing methods and attractive packaging, these products could gain popularity in the domestic market, especially with the association of sentimental value and reference to the “good old days” or “grandmother’s recipes”. Preparation of such traditional products could be done with simple and efficient equipment in order to meet high hygiene and quality standards.

2.6.1 Marketing opportunities

As a result of the growing global demand for fish and fish products, there are ample opportunities for the small-scale fisheries sectors of the three countries studied to diversify their products and markets. Even though fish landings from small-scale fisheries are scattered, small in volumes and mixed in terms of species caught, through proper coordination and interventions, many of the species landed can be channelled into domestic and export markets in more appropriate value-added forms.

In the case of finfishes, major species of economic importance produced by the small-scale capture fisheries sector in significant volumes are skipjack tuna, yellowfin tuna, sharks, rays, croakers, kingfish, Bombay duck and hilsa (in India only), ribbon fish, seabass and pomfret plus a host of fishes caught by seine nets such as sardines, mackerels and anchovies. The present product forms marketed by the small-scale fisheries sectors and potential products with improved marketing opportunities are shown in Table 2.9.

Of the finfish species, tuna species such as skipjack and yellowfin have good potential for value addition. The present range of skipjack products could be further expanded to include improved smoked/dried speciality products such as *katsuobushi* and *arabushi* for the Japanese market, dried and smoked fish flakes and fish extractives. Some of these products are already produced in countries such as Maldives and Sri Lanka for both domestic and export markets. The introduction of improved production and packaging technologies and presentation could further help the small-scale fisheries sector to improve its earnings from skipjack landings.

Table 2.8: New opportunities for fish products in India, Malaysia and Thailand

Source	Markets	Products
Marine capture fisheries	Domestic	Fresh/chilled fish in different forms such as steaks/fillets; prepared ready-to-eat fish products including breaded and battered products; traditional/fermented products and surimi-based value-added products
	Export	Value-added forms
Inland capture fisheries	Domestic	Fresh/ chilled fish in different forms such as steaks/fillets
Inland culture	Domestic	Live and fresh/chilled products
	Export	Live fish
Marine culture	Domestic	Live fish
	Export	Live, value-added products (fillets/steaks, breaded and battered products)

Yellowfin tuna also holds good potential for product and market diversification. With relatively low capital inputs, the small-scale fisheries sector can embark on producing tuna loins for export and also introduce fresh and frozen steaks and cuts for the domestic market. If proper onboard handling is employed, gilled and gutted yellowfin tuna can also be diverted to export markets as fresh or frozen sashimi tuna. The small-scale fisheries sector can efficiently improve the quality of tuna caught by changing its fishing methods to longlining. This could be achieved with relatively low investments by using smaller fishing boats. Longlining with small boats is increasing in Asia as a result of fuel price hikes and the good quality of tuna landed by these boats, which is in great demand by export processors.

Sharks and rays have good potential for product development as well as for domestic and export marketing. Sharks are the only fishes that can be utilized fully. Fins, skin, meat, teeth, bones and liver are being used for the production of various products. If sharks are properly processed by bleeding the fish onboard, the meat could be marketed domestically in chilled form and exported in frozen form. Though there is a domestic demand for shark fins in Thailand and Malaysia, which caters to Chinese restaurants, most of the local production is exported. Ray wings in frozen and dried form have a potential market in China, Hong Kong SAR and China.

Pelagic fishes like sardines, mackerels and anchovies are caught by traditional fishermen using local gears. These fishes could be processed into different products, which have a ready market both domestically and for export. Dressed and marinated mackerels and sardines have a potential market in the Middle East while boiled mackerels have a ready market in Singapore, Brunei and the Philippines. If anchovies could be better handled onboard, they could be used for the production of boiled dried anchovies, which have a ready market in Japan and South Korea.

Table 2.9: Present fish product forms in small-scale fisheries and opportunities for product/market diversification in India, Malaysia and Thailand

Fish species	Present major product forms	New opportunities
FINFISH		
Skipjack	Fresh whole, retail marketing, sun drying, dried and smoked loins, raw material for canning	Frozen retail packs, improved smoked/dried products (<i>katsuobushi/arabushi</i>), retail packs of smoked-dried chips, “sambals”, dried fish, flavour enhancers
Yellowfin tuna	Fresh whole, retail marketing, frozen whole	Sashimi (prime quality), loins, steaks, treated products, fresh/frozen retail packs, minced products (sausages, burgers)
Sharks and rays	Fresh whole, retail packaging, dried products	Fresh/frozen steaks in retail packs, mixed minced products
Sardines & mackerels	Fresh whole retail packaging, dried and boiled products, raw material for canning	Whole fresh/frozen products, dressed and marinated products
Croakers	Fresh whole retail packaging, raw material for surimi plants	Fresh /frozen products, surimi-based fabricated products
Anchovy	Unsalted /dried, fish sauce	Improved salted products, retail packs (fresh, frozen, dried), boiled products
Bombay duck*	Dried and salted, retail packaging	Improved dried products (laminated)
Tilapia	Fresh/whole and live, retail marketing	Fresh/frozen dressed fish (retail packs), fresh/frozen fillets (retail packs), live fish marketing, improved species
Kingfish	Fresh whole, retail marketing, dried products	Fresh/frozen steaks/fillets (retail packs)
Grouper	Fresh whole, retail marketing	Fresh/frozen slices/steaks/fillets (retail packaging)
Seabass	Fresh whole, retail marketing	Fresh/frozen slices/steaks/fillets (retail packaging)
Pomfret	Fresh whole, retail marketing	Fresh/frozen slices (retail packaging)
Hilsa*	Fresh whole, retail marketing	Fresh/frozen slices (retail packaging)
Carps	Fresh whole round fish, retail marketing and a wide variety of traditional products	Fresh and frozen whole fish and value-added products for ethnic overseas market
Ornamental fish	Domestic/export market	Introduction of new species, improved export marketing
SHELLFISH		
Salt/brackishwater shrimp	Fresh/frozen/live domestic retail and export processing	Export processing, value addition such as head-on, peeled tail-on, seafood mix, domestic marketing of retail packs, value-added breaded products
Freshwater prawn	Fresh domestic retail, limited export processing**	Export processing large head- on and deep-cut prawns
Crabs	Fresh/frozen domestic marketing and export processing	Domestic marketing of cut-crabs and value-added retail packs, picked crab meat and minced products (stuffed crab)
MOLLUSCS		
Squid/cuttlefish	Fresh domestic retail market, dried products** and export processing	Domestic marketing and export marketing of value-added products (fillets, pine-cut/shell-cut fillets)
Octopus	Fresh domestic retail market, dried products** and export processing	Export marketing
Mussels & cockles	Fresh domestic retail market, dried products** and export processing	Domestic marketing and export marketing of live products
BYCATCH/WASTE/MIXED CATCH		
	Fishmeal	Improved fishmeal, fish extractives, minced products, formulated feed
MULTISPECIES		
Croakers, threadfin bream, goat fishes	Fresh domestic retail market, dried products and raw material for surimi-based products	Improved utilization by making surimi-based value-added products for domestic and export markets

* In India only

** In Thailand and Malaysia

Tilapia is produced by both capture and culture fisheries in inland areas. Tilapia is one of the most sought after fishes both in the international and domestic market, especially in Malaysia and Thailand. The demand for tilapia products picked up in Thailand and Malaysia after the economic recession of 1997 and 1998. Currently, tilapia is being marketed domestically in live and fresh/chilled form in Thailand and Malaysia and a small portion of the production is being exported to nearby markets like Singapore in live form. There is an opportunity to market fresh/chilled and gutted whole tilapia with improved packaging like tray packs in these markets through super- and hypermarkets as the price difference between wet markets and super- and hypermarkets is more than 20 percent. Chilled and frozen tilapia fillets also hold good market potential in both the domestic and export market. With small capital investments, chilled whole tilapia and fillets could be produced by the small-scale fisheries sector for export. Marinated tilapia fillets also have a ready domestic market.

Other commercially important finfish varieties landed by the small-scale fisheries sector in the three countries studied are kingfish or Spanish mackerel, seabass, grouper and pomfret, which have a ready domestic and export market. These fishes are currently marketed domestically in fresh/chilled form. There is a good export market for products such as slices, steaks and fillets of these fishes in fresh/chilled and frozen form.

Annually, about 44 000 tonnes of hilsa (*Hilsa ilisha*) are landed in India. The entire production is consumed locally in fresh form. There is a potential for marketing dressed or sliced hilsa with improved packaging domestically and there is a ready market for frozen hilsa in markets like the Middle East and Malaysia. As regards Bombay duck (*Harpodon nehrerus*), a unique fish occurring in Indian waters, about 165 000 tonnes are landed annually. Almost the entire catch is consumed domestically in dried form. There is an opportunity to market dried and laminated Bombay duck in Europe, especially in the UK. The dried and laminated Bombay duck could also fetch a much better price than the normal dried product in the domestic market as the product has a much longer shelf-life and a better appearance.

Significantly large quantities of carps are produced in all three countries studied. Currently, all carps are marketed domestically in fresh or chilled form except for some quantities exported from India to nearby export markets. There is a promising market for fresh/chilled and frozen carps and value-added carp products such as carp cooked in traditional curry sauces.

All three countries studied produce ornamental fishes through marine and freshwater capture fisheries and aquaculture. India and Malaysia presently do not export ornamental marine fishes. Their exports mainly consist of freshwater fishes both from aquaculture and capture fisheries. The fishing methods used are entirely artisanal. The ornamental fish culture sector consists exclusively of small-scale enterprises. Ornamental fishes cater to both the domestic and export markets. Opportunities for this sector lie in the introduction of new species from capture fisheries and modified species from the aquaculture sector. Most of the ornamental fishes produced by capture fisheries and aquaculture have export potential.

The small-scale fisheries sector produces large volumes of shellfish such as shrimp, crab and freshwater prawn both through capture fisheries and aquaculture. About 85 to 90 percent of the shrimp produced by shrimp farming is being exported by India, Malaysia and Thailand. The present range of shrimp products could be further expanded to include value-added products such as head-on shrimp, peeled tail-on shrimp, seafood mix composed of squid, cuttlefish, mussels/clam and shrimp and breaded and battered products both for domestic and export markets. Value-added shrimp products have a very good potential in international markets. While freshwater prawn from Thailand and Malaysia is marketed in fresh/chilled whole form in the domestic market leaving only a limited quantity for export, almost the entire production from India is exported. There is a potential for processing of freshwater prawn in head-on and headless deep-cut forms for the export market, which would have price advantages.

Crab is marketed domestically in live and fresh/chilled form. There is a large potential for value-added crab products both for the domestic and export markets. The products identified for value-added production are cut crab (half-cut and quarter-cut crab), stuffed crab, crab balls, stuffed claws, picked meat and crab mince meat products. These products have also potential in the domestic market, particularly when marketed in retail packs.

A large quantity of molluscs of economic importance is produced by the small-scale capture fishery sector such as squid, cuttlefish and octopus, which are harvested mainly by artisanal fishers using hook and line. Bivalves such as cockles, mussels and clams are also harvested by small-scale fishers by dredging. The present product forms of squid, cuttlefish and octopus marketed by the small-scale fisheries sectors in the domestic markets of Thailand and Malaysia are fresh/chilled whole products and dried products while there is only a small demand for cephalopod products in the Indian domestic market. The potential products that could be developed with improved packaging are fillets (pine-cut, shell-cut and double-skinned), squid rings and cuttlefish strips, which have a potential market both domestically and for export.

Bivalve products such as cockles, mussels and clams have a good potential for value addition. Currently, bivalve products are marketed in the form of boiled and chunked meat. This could be further expanded to include improved smoked/dried specialty products and live products for export to Japan and Singapore. Introduction of improved production methods with innovative packaging and presentation could also improve earnings.

In India, Thailand and Malaysia, bycatch constitutes a sizable portion of the total catch, i.e. 20 to 40 percent. Much of the bycatch consists of low value pelagic fishes. Most of these are currently utilized for the production of fishmeal. Fishmeal is used as poultry feed and the production of aquaculture feed. Almost all so-called trash fish landed at present is used for this purpose.

A smaller portion of bycatch is used for the preparation of dried, salted and fermented fish products. In Malaysia and Thailand, bycatch is also used to prepare fish jelly products and fish and shrimp crackers. In Thailand and Malaysia, there are 1 215 and 136 processing plants, respectively, which produce these types of products. In India, selected bycatch species such as croakers, threadfin breams and goat fishes, which have white meat, are used by nine commercial surimi processing plants.

With regard to traditional products, dried fish processing is one of the most widespread small-scale industries in the countries studied. Depending on seasonal availability, a large amount of species are used for the production of dried fish. Among these, the most commonly used species are sardines, mackerels, ribbon fish, lizard fish, sharks, threadfin bream and snappers. Most of these fishes are either sun or kiln dried with a moisture content of up to 40 percent. The polyethylene bag packed products are marketed through retail stores, open markets and night markets in urban and suburban areas. Improved product processing and presentation are the opportunities available for this sector.

Fish and shrimp crackers are one of the most popular snack foods in Malaysia and Thailand. Fish or shrimp crackers are not produced in India yet. Most of the fish and shrimp crackers are produced by small-scale operators from low value fish species or small shrimp. Species like Japanese threadfin bream, bigeye tuna and goat fish are commonly used. The main ingredients are fish and shrimp mince, tapioca flour, salt and spices. There are good opportunities to produce fish and shrimp crackers with improved technologies and innovative packaging and presentation as there is a great demand for this product in domestic and export markets.

Minced fish products such as surimi, fish balls and fish cakes are favourite snack foods in Thailand and Malaysia. Fish balls are one of the ingredients in soup preparations and other dishes in these two countries. The ingredients of fish balls and fish cakes are fish mince, tapioca, corn starch, salt, baking powder and various seasonings. In Malaysia, there are over 28 fish ball, fish cake and surimi processing facilities. Thailand has 95 facilities. While the majority of these facilities are operated by the small-scale sector, there are also a few commercial establishments with sophisticated machinery. The products are marketed chilled and sold in wet markets, super- and hypermarkets. There are opportunities for export of these products to regional markets.

In Malaysia and Thailand, fish sauce products are traditionally produced in small-scale operations. Fish sauce is an indispensable part of many Thai and Malaysian dishes. The basic process of fish sauce production involves fermentation of pelagic fish species such as anchovies, sardines and mackerels in salt. Fish sauce made of anchovies generally commands higher prices than fish sauces made from other fishes. Freshwater finfish varieties such as eel, catfish, snakehead and barbs are currently being used for the

preparation of a number of traditional fish products. With low capital inputs, the small-scale fisheries sector can embark on the production of traditional fish products from freshwater fishes for export to regional and ethnic markets.

2.6.2 Improved utilization of catch, bycatch and waste

Very little bycatch is discarded by the small-scale fisheries sector in Asia. Most of the marine and freshwater species caught by small-scale fisheries are traditionally consumed in fresh form in all three countries studied including bycatch species. These species have been used for centuries for the preparation of a wide range of traditional fish products such as salted and dried fish, fish sauce and fish paste. The introduction of modern technologies has significantly increased the quality and widened the range of products. This has resulted not only in the rapid commercialization of the traditional processing sector but also in the introduction of new products based on bycatch species such as surimi, a wide range of fish jelly products, fish cake and fish floss.

With a view to promote a sustainable use of fishery resources, it is important to preserve the quality of fish and bycatch on board small-scale fishing vessels to facilitate an improved utilization of catches for human consumption. It might not always be possible to achieve improved onboard preservation and handling of catches due to various limitations such as a lack of storage space for ice and bycatch. In Thailand, attempts have been made to convince fishers to use ice for the preservation of bycatch and trash fish with the purpose of assuring them of a better price for these products. Infrastructure at landing sites also plays an important role in improved bycatch utilization. Availability of clean water, ice for re-icing of catch if necessary, storage space, mechanical facilities for unloading bycatch without damaging it, transportation facilities as well as wholesale and retail facilities and services are important in this respect.

Much progress has been made in the region with the utilization and marketing of fish waste, especially shrimp waste. Production of chitin and chitosan and extraction of astaxanthin and other pigments and feed additives have become an integral part of the shrimp industry in most countries in the region. Government-industry cooperation in promoting such activities by way of technology transfer, market promotion and streamlining the collection of waste from processing centres would be helpful in promoting waste utilization further.

Product and market diversification is another important aspect to be addressed for improving the utilization of bycatch and mixed catch. The fish products, which are presently being marketed could be further improved by extending their shelf-life, safety and quality. Modern methods of packaging, transportation and storage could be used to market some species of bycatch in dressed forms and in consumer packs or in a ready-to-eat/prepare form. Over the last decade, the number of small-scale bycatch processing enterprises has declined due to competition from large-scale operators with capital and advanced technological know-how. Transfer of such technologies to the small-scale fish processing sector, related training and improving entrepreneurship could be considered as important steps to improve bycatch utilization and marketability in the small-scale fisheries sector.

Assurance of product quality and safety is a vital step in the marketing of fish products. Considering the diffused nature of raw material supply in the bycatch processing sector and the traditional nature of the production technologies involved, it is important to have HACCP based production systems in place to ensure that fish products gain consumer confidence. In this respect, support and assistance to the small-scale fisheries sector should be provided by regulatory authorities and governments. Governments in the three countries studied have a general policy to promote small-scale entrepreneurship by providing credit and financing facilities for the agriculture and fisheries sector through agricultural banks. In many cases, banks offer favourable terms and conditions through government assisted schemes. Many small-scale operators, however, prefer to obtain funding from sources outside the formal banking system, even though higher interest rates are being charged as they find the government assisted financing schemes operated through the banking system too complicated because of the paperwork involved and the collateral required. It would be prudent to simplify such assistance packages and, wherever possible, to channel them through specialized fisheries and cooperative banks, which are able to offer user-friendly schemes.

Even though the demand for bycatch is expected to continue in the years to come, many doubt the long-term availability of fishery resources for this purpose as all governments in the region have initiated action to minimize the catch of non-target species. Considering conflicting interests among stakeholders, a successful implementation of these measures becomes difficult. Traditional approaches to improve bycatch utilization need to be reassessed in the light of new developments in the global market. In the past, most traditional products, which are the key bycatch based products of today, were processed by small-scale cottage industries with very little mechanization. Present-day product processing and marketing has to address special criteria not only with respect to quality and safety of products but also with respect to packaging, labelling including ecolabelling, presentation and resource sustainability. It is also important to have a good knowledge of market requirements and consumer expectations including ready access to market and price information. In such a scenario, human and material requirements and costs of fish processing and marketing are increasing in terms of trained labour, market and product information, upgraded processing facilities, quality control and monitoring.

2.7 Strategies for overcoming constraints to the development of small-scale fisheries

2.7.1 Constraints to the development of small-scale fisheries

The following constraints to the development of small-scale fisheries and the full integration of the sector into fish trade prevail in India, Thailand and Malaysia.

India

Boats typically used in the small-scale fisheries sector, especially non-powered small boats and boats used for single day fishing, are not equipped with facilities for preserving fish. Inadequate facilities for preservation of fish, unhygienic conditions at landing centres, lack of supply of quality ice, inadequate transport facilities, lack of cold chains, lack of modern fish markets and a large number of intermediaries involved in marketing are the major constraints.

Another constraint is the fact that carp dominates the bulk of production from freshwater aquaculture while shrimp is the only item produced by brackishwater aquaculture. As far as product development is concerned, no significant efforts are being made to develop value-added products for domestic or export markets.

Government taxes and duties pose a further constraint. Processed or frozen seafood products attract excise duty of 8 percent plus value-added tax. This system imposes higher charges on the fish processing sector in India, which is not seen in other countries in the region.

There is a lack of participation of women in fish marketing and processing caused by low levels of literacy, social taboos, inadequate training in skills development, a low socio-economic status of traditional fishing communities and underemployment of fisherfolk due to fishery resource limitations.

While there is a huge potential for the development of the domestic fish marketing in India, efforts are not made to tap this potential. Emphasis is given to export marketing instead. The nutritional value and health benefits of fish are not widely known. Consumers are sceptical of frozen fish products and do not know how to use them.

Malaysia

As the volume of fish handled by the small-scale fisheries sector is relatively small compared with the commercial sector, the maintenance of regular supplies of raw materials to plan fish processing activities is a major constraint. Small-scale fisheries operators also need help to acquire appropriate and low cost fish processing technologies suited to their production levels and standards and to their desired products.

Another constraint is posed by inadequate storage facilities and a lack of knowledge of new fish products. Small-scale fishers have limited storage facilities onboard their vessels as well as onshore for preserving

their catches properly. They further lack knowledge on the development of new products and on quality and safety aspects of fish products.

Lack of finance is another crucial constraint faced by the small-scale fisheries sector in Malaysia. Although there is an exclusive financial institution with the objective of financially assisting small-scale entrepreneurs including fishers, the institution is inefficient in reaching small-scale fishers, who are often not aware of the services and facilities offered by the institution.

Thailand

The coastal waters of Thailand are overfished and conflicts between different groups of resource users for scarce fishery resources are common. Fishery resources depletion and a rapid urbanization and industrialization in coastal areas causes changes in the patterns of land use, pollution of coastal waters and the degradation of the coastal and aquatic environment. These changes particularly affect the small-scale fisheries sector negatively. The same applies to inland fisheries. The problems are amplified by the increasing costs of production particularly due to increases in fuel costs and a low price realization with regard to some species caught. Shortage of labour in commercial fisheries is another problem.

Regarding aquaculture, the problems encountered by shrimp farmers include many types of diseases, which affect cultured fish and shrimp species, environmental degradation caused by inefficient farm management, mangrove area encroachment, insufficient natural broodstock and increasing costs of farming operations. Other constraints encountered by small-scale fishers, fish and shrimp farmers and fish processors are a lack of capital, a lack of fish and shrimp farming and fish processing experience and a lack of knowledge of suitable fish and shrimp farming and fish processing technologies and methods. Small-scale fishers and fish and shrimp farmers have limited bargaining power and face stiff competition from fish producers in neighbouring countries.

2.7.2 Steps for the development of small-scale fisheries

To overcome the abovementioned constraints and problems, the following steps can be taken.

India

To improve infrastructure facilities and the effectiveness of marketing channels, efforts should focus on improving facilities for preserving fish onboard vessels and hygienic conditions at fish landing centres, increasing the supply of quality ice, establishing cold chains and marketing systems, streamlining marketing channels by strengthening the role of wholesalers and reducing the number of intermediaries. A proper management system for fish landing centres should be introduced for their day-to-day maintenance and generation of income to meet maintenance expenditure. The management of such facilities could be handed over to fishermen cooperative societies or *panchayats* in villages. All major landing centres in inland areas should be provided with the necessary infrastructure for auctioning and packaging of fish.

Fishermen cooperatives should be strengthened to undertake marketing of fish so that the share of fishers of the price paid by the final consumer is maximized. Private associations of fishermen should be encouraged to undertake marketing of their products on a larger scale. Modern fish markets should be established in major urban centres. This will not only provide ideal conditions for selling fish but also boost the image of fish as a quality food among consumers. Development of a legal framework for the establishment and management of fish markets is necessary to supply safe and quality fish products to consumers.

Culture of suitable new species of fish such as Nile tilapia should be encouraged to meet the demand for fish among consumers. The development of value-added products from low value fish species should be urgently promoted. If necessary, foreign expertise should be sought. In order to promote the marketing of frozen fish products, the excise duty on these products should be waived. Value-added tax (VAT) should also be reduced.

Women self-help groups should be promoted to encourage women to engage in income generating fisheries activities such as the preparation of value-added fish products and their marketing. Proper training in the techniques of production and marketing should be provided.

Fish as a healthy food needs to be popularized among consumers. A special campaign to promote eating of fish is necessary similar to the campaign currently undertaken for dairy products and poultry. It is necessary to formulate a nation-wide fish marketing strategy with the specific objectives of helping fishers to market their products at a remunerative price and to supply safe and quality fish and fish products to consumers. The example of the cooperative structure of the small-scale dairy industry in India should be followed.

Last but not least, the improvement of fishery statistics, especially statistics regarding inland fisheries landings and marketing of fish from various sources, is necessary for better planning and management of the use of fishery resources and fish marketing.

Malaysia

The inconsistency of supply of raw material for small-scale fish processing should be addressed by identifying proper storage methods to ensure more regular and higher incomes for small-scale fish processors. In addition, seasonal products should be introduced, which would fetch higher prices.

Storage facilities to suit the scale of fish handling, preservation and processing operations should be promoted such as the use of insulated fish boxes for preserving catch onboard vessels and the use of chest freezers to store and preserve fish onshore before it is processed. Small-scale fishers, fish farmers and fish processors should also be provided with knowledge of quality aspects of fish and fish products and of the development of new products and a more hygienic production of traditional products.

Financial assistance and credit facilities should be extended through local area fishermen associations of the LKIM (Fisheries Development Authority of Malaysia), the Department of Fisheries or through the Bank Pertanian Malaysia – Agriculture Bank of Malaysia (BMP) as appropriate.

Thailand

In order to overcome the conflicts among the different users of Thailand's coastal fishery resources, clearly demarcated fishing areas or zones should be allocated to different resource users and the government should strictly implement its regulations in this respect.

In addition to a general shortage of raw material, other problems in the fish processing sector are the limited volume of products available for local consumption and the high marketing costs. Government agencies should study this problem and formulate an action plan to address it. Government agencies should further assist in identifying the problems in the aquaculture sector mentioned above and suggest remedial measures. Government agencies and training institutes should also impart training on various aspects of fish and shrimp farming including modern farming techniques. Financial institutions should work hand in hand with the Department of Fisheries of Thailand and other related agencies to extend credit and microfinance and other financial assistance to the small-scale fisheries sector.

The export of traditional fish products from Thailand is increasing and has a very good further potential. In 2004, Thailand exported over 55 000 tonnes of traditional products valued at US\$54.7 million. Ways and means of further increasing these exports of traditional fish products should be explored.

3. SMALL-SCALE FISHERIES AND FISH TRADE IN WESTERN AFRICA – THE CASES OF GHANA AND SENEGAL

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3.1 Small-scale fisheries and fish trade – the case of Ghana

Ghana has a coastline of about 550 km. The Exclusive Economic Zone (EEZ) waters extend up to 200 nautical miles from the shore. The fishery industry of Ghana comprises the marine sector and the inland sector. The marine fisheries sector is the main source of fish producing 85 percent of the total catch. The inland sector accounts for the remaining 15 percent of Ghana's fisheries production exploiting a large number of rivers, irrigation dams, ponds and lakes including Lake Volta, one of the largest man-made lakes in the world, with a total surface area of 8 700 km².

3.1.1 Marine capture fisheries production and resources

In 2001, about 123 000 artisanal marine fishermen operated 10 000 dugout canoes from 304 landing centres located in 189 fishing villages. In addition, there were 296 beach landing sites located outside of villages. The semi-industrial inshore fishing fleet consists of locally built wooden vessels of 8 to 37 m in length. These vessels are primarily used for sardinella fishing and trawling. The number of vessels has been decreasing over the past 15 years due to a decline of target species and increasing costs of operation and maintenance.

In the artisanal fishery sector, several types of fishing gears are used including a wide variety of gillnets, entangling nets, purse seines, beach seines, handlines and castnets. There are fisheries for small pelagic species of the families Clupeidae (sardinellas), Scombridae (mackerels) and Engraulidae (anchovies) and for large pelagic species of the family Thunnidae (tunas). Fishing for sardinella (*Sardinella aurita* and *Sardinella maderensis*) is one of the most important economic activities in the Ghanaian fishing industry. Large variations in landings of sardinella are experienced from year to year due to changes in both anthropogenic and natural factors. The former are exemplified by changes in fishing effort and fishing strategies and the latter by changes in the duration and intensity of the seasonal coastal upwelling. The abundance of chub mackerel (*Scomber japonicus*) also varies from year to year. The potential yield of the four most important small pelagic species, i.e. round sardinella, flat sardinella, chub mackerel and anchovy is about 200 000 tonnes per annum.

The main commercial tuna species, which occur in Ghanaian waters, are yellowfin tuna (*Thunnus albacares*), skipjack (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*). Recent assessments undertaken by the International Commission for the Conservation of Atlantic Tunas (ICCAT) indicate that yellowfin and bigeye tuna resources in the Atlantic are being optimally exploited while skipjack tuna is underexploited. The total landings of the three major tuna species by Ghanaian fishing vessels are about 60 000 to 80 000 tonnes per annum.

There are also important fisheries for demersal species of the families Sparidae, Lutjanidae, Mulidae, Pomadasysidae, Serranidae, Polynemidae and Penaeidae. The potential yield of demersal fishes on Ghana's continental shelf is estimated to be about 55 000 tonnes per annum. During the last decade, annual landings averaged about 50 000 tonnes.

Tables 3.1 to 3.4 show the catches of the artisanal and semi-industrial fishing fleets, i.e. inshore purse seiners and trawlers. While the catch of the artisanal marine fishing fleet in 2002 was 200 769.19 tonnes, the semi-industrial fleets only caught 7 784.55 tonnes.

Table 3.1: Artisanal marine fisheries production by canoes in Ghana, 1996-2002 (in tonnes)

Species/year	1996	1997	1998	1999	2000	2001	2002
Round sardinella	115 069.8	46 383.93	54 595.63	39 123.91	98 864.69	64 103.56	59 399.56
Flat sardinella	13 501.30	14 069.74	14 770.28	12 055.71	14 934.93	15 853.37	13 693.40
Chub mackerel	6 855.80	7 086.09	1 971.95	5 240.61	14 835.38	9 574.30	5 428.90
Anchovy	98 340.50	82 723.60	44 643.66	32 107.15	83 500.79	68 174.57	57 639.10
Frigate mackerel	7 952.60	5 655.37	7 326.36	4 209.42	3 627.66	7 323.50	3 635.90
Seabream	9 571.70	8 408.28	13 548.46	19 298.76	1 059.24	7 024.76	4 741.05
Burrigo	9 706.00	17 388.10	9 773.44	11 389.08	8 864.77	12 413.54	7 573.20
Others	37 251.30	33 410.33	42 828.82	5 2812.4	50 277.23	51 887.66	48 658.08
Total artisanal production	298 249.0	215 125.44	189 458.60	176 236.88	275 964.69	236 355.26	200 769.19

Source: Directorate of Fisheries, Ghana, April 2004

Table 3.2: Marine fisheries production by semi-industrial inshore purse seine vessels in Ghana, 1996-2002 (in tonnes)

Species/year	1996	1997	1998	1999	2000	2001	2002
Round sardine	3 330.50	3 009.65	1 369.41	1 255.51	3 177.99	3 208.81	3 449.14
Flat sardine	117.81	113.32	697.84	49.09	34.97	529.79	80.91
Chub mackerel	1 115.00	1 054.88	773.32	1 369.64	3 630.21	971.81	891.06
Scad mackerel	45.00	4.04	334.64	42.58	5.14	119.46	149.93
Others	1 243.00	738.44	399.15	785.54	368.21	381.89	403.26
Total	5 851.31	4 920.33	3 574.36	3 502.36	7 216.52	5 211.76	4 974.30

Source: Directorate of Fisheries, Ghana, April 2004

Table 3.3: Marine fisheries production by semi-industrial inshore trawlers in Ghana, 1996-2002 (in tonnes)

Species/year	1996	1997	1998	1999	2000	2001	2002
Seabream	30.20	33.39	37.62	19.90	27.47	266.29	70.80
Cassava fish	293.90	330.30	392.69	303.46	255.03	425.76	524.48
Burrigo	1 196.80	900.52	564.17	518.72	450.35	632.08	679.38
Trigger fish	0.20	0.22	0.00	0.18	-	-	-
Red mullet	2.80	2.14	40.15	0.27	0.12	2.35	3.02
Flying Gurnard	67.70	67.71	0.40	0.06	-	-	-
Cuttlefish	13.20	14.05	35.29	62.47	63.15	56.89	40.21
Others	896.70	1 024.62	1 532.71	741.95	655.42	1 010.41	1 492.36
Total	2 501.50	2 372.95	2 603.03	1 647.01	1 451.54	2 393.78	2 810.25

Source: Directorate of Fisheries, Ghana, April 2004

3.1.2 Inland capture fisheries production and resources

Fishing in Lake Volta accounts for about 90 percent of the total inland fish production in Ghana. Formed about 40 years ago, Lake Volta with a shoreline of about 5 200 km is the largest man-made lake in Africa. After the creation of the lake, fishers from various parts of Ghana moved to the lake area. At present, 80 000 fishers and 20 000 fish processors and traders are engaged in the Lake Volta fishery, which is of an artisanal nature. The fishing gears used are castnets, gillnets, hooks and lines and traps operated by 17 500 planked canoes. During the initial years, over 100 fish species were found to inhabit the lake. Perch species

(*Cichlids*) accounted for about 50 percent of the catch. Perch species are still the most common fish species landed.

The top ten freshwater species in terms of landings are *Tilapias* (38.1 percent), *Chrysichthys* spp. (34.4 percent), *Synodontis* spp. (11.4 percent), *Labeo* spp. (3.4 percent), *Mormyrids* (2 percent) and *Heterotis* spp. (1.5 percent). Other species of commercial importance are *Clarias* spp. and *Bagrus* spp. Significant seasonal and annual variations are recorded in the fish production from inland sources.

There are more than 50 lagoons of various sizes located in the coastal areas of Ghana. These lagoons provide an important source of protein and other resources for the communities that live around them. The lagoons also contribute significantly to the biodiversity and status of fish stocks in coastal waters as many fish species spend a part of their life cycle in these lagoons. Currently, these lagoons and their ecology and environment are degraded by human activities, i.e. physical alterations and destruction of habitat as a result of changing land use patterns and pollution. The mangrove forests that once fringed many of the lagoons have been lost. Consequently, fisheries in the lagoons are threatened by environmental degradation and destructive fishing practices.

Fisheries in the lagoons are solely artisanal and play an important role in the economy of some coastal communities. The fishing gears used in lagoon fisheries include castnets, dragnets and various types of traps. Tilapias are the most abundant species in all lagoons while a number of freshwater and marine fish species are also caught. These include mud fish, bonga and sole. Some marine species like *Lutjanus fulgens* (snapper), *Caranx hippos* (jack mackerel) and *Epinephelus aeneus* (groupers) only make short incursions into the lagoons.

3.1.3 Aquaculture

Even though fish farming is new to Ghanaians, its practice is becoming more widespread in the country, especially in the Ashanti, Brong Ahafo, central, eastern, Volta and western regions. Fish farming has become an option for increasing the fish production in Ghana since the marine and inland capture fisheries production has reached its maximum sustainable level.

Table 3.4: Inland fish farming production in Ghana, 1998-2000 (quantity in tonnes, value in US\$1 000)

Species	1998		1999		2000	
	Quantity	Value	Quantity	Value	Quantity	Value
<i>Heterotis niloticus</i>	n/a	n/a	n/a	n/a	19	30.1
Catfish	105	210	110	220	76	120.4
Nile tilapia	315	519.8	320	528	347	687.1

Source: FAO FISHSTAT, 2000

There are about 1 000 fish farmers in Ghana working on over 2 000 ponds with a total surface area of 350 ha. Both extensive and semi-intensive aquaculture methods are practised. Extensive aquaculture is associated with the use of dugout canoes and small reservoirs, which are fished and restocked. Fish is cultured semi-intensively in earthen ponds either as monoculture or polyculture of tilapia (especially *Oreochromis niloticus*) and catfish. Cage and pen culture are practised in lakes, lagoons and rivers.

3.1.4 Fish handling and preservation

Smoking, salting, drying, icing, cold storage and canning are used for preserving fish in Ghana. The traditional methods of smoking, salting and drying are used to preserve most of the fish from the artisanal sector and the semi-industrial inshore fleet. In Ghana, as in other parts of West Africa, about 80 percent of the fish is consumed smoked and the remaining 20 percent is consumed either fresh, salted, sun dried or fried. The type of fish determines to a large extent the method used to preserve it. This is again related to the preference of consumers.

Smoking is used for most fish species and is carried out in almost all fishing villages. Wood is therefore an important requirement in these areas. Traditional smoking equipment such as the round mud oven has been replaced in most fishing villages by rectangular ovens with smoking trays. These so-called Chorkor smoking ovens have a higher smoking capacity because they use stacks of smoking trays. They also consume less fuel than the traditional ovens for the same quantity of fish.

Sun-drying is used to dry small-size species like anchovies. Generally, fish is dried on mats, cemented floors, grass, old fishing nets and sometimes directly on the ground.

Ice is used to extend the shelf-life of fish landed by the semi-industrial inshore vessels, which mostly carry ice on board. Some canoe fishermen called *Lagas*, who use hook and line for high value demersal species, also carry ice to sea in insulated containers stored in special compartments in their canoes. Keeping certain fish species in ice after capture can be logistically difficult and uneconomical for artisanal fishermen. Pelagic species such as sardinella and mackerels do not command high prices and therefore will not attract higher prices when kept in ice.

3.1.5 Fish marketing

Pricing

Prices of small pelagics fluctuate widely throughout the year and across the country. During the peak fishing season when supply increases, prices are lower than during the lean season when supply is lower than demand. Fish prices also increase as the distances from the landing sites and catch areas increase.

Table 3.5: Prices of smoked and dried fish by species, Accra, Ghana, 2001 (in GHC)

Product forms	Average wholesale prices in GHC ⁴ /kg
Smoked sardinella	400
Smoked anchovy	200
Smoked tilapia	1000
Smoked African perch	1200
Dried anchovy	200
Salted and dried tilapia	750
Fermented tilapia	800

Source: Salago Market, Accra, 2001

The prices shown in Table 3.5 were recorded at the Salaga market in Accra from semi-wholesalers, who sell their products to retailers. When smoked fish products are destined for foreign countries, prices are set according to the size of the traditional baskets made with fresh palm leaves. The quantity varies from 30 to 60 kg. Smoked fish products are also exported in plastic sacks, which weigh up to 100 kg. Table 3.6 shows the average prices of smoked, salted and dried fish products in Ghana.

A modern domestic market for fish products in Ghana is not yet developed. Ghana supplies its eastern neighbours, i.e. Togo and Benin with considerable volumes of freshwater fish, especially smoked tilapia, smoked catfish and salted and dried tilapia from Lake Volta.

Trade in processed small pelagic species such as smoked sardinella, smoked anchovy and dried anchovy is gaining prominence. Even outside the main fishing seasons, 400 to 600 baskets of cured small pelagics weighing about 60 kg each cross the Ghana-Togo border each week originating from supply centres such as Mamprobi (Tuesday Market, Tema, Keta, and Denu). During the peak season for small pelagics from June to October, trade volumes double or even triple making the Ghanaian trade in cured small pelagics one of the most important cured fish trade activities in the region. The volume of Ghana's cured small

⁴ On 19.6.2001, US\$1 was equivalent to 7 250 Ghanaian cedis.

pelagic trade is estimated between 1 500 and 3 000 tonnes per year with smoked sardinella constituting the bulk of the trade. The main supply source is the Tuesday Market in Mamprobi, Accra.

As the name implies, markets are held every Tuesday on a weekly basis, with buyers and sellers converging from within and outside Ghana to transact business. The buyers come from Togo, mainly from the Hutokpamé market, and from Benin, mainly from the Dantopka market, as well as from other parts of Ghana. The sellers bring their stocks of cured fish from the vicinity of the Accra metropolitan area including supply centres such as Akplabanya, Botianor, Chorkor, Nyanyano and Teshie.

Table 3.6: Average prices of smoked, salted and dried fish products in Ghana (packed in traditional baskets of 60 kg and plastic sacks of 80 kg, in GHC)

Product forms	Average prices
Smoked fish products	
Smoked sardinella	33 000 GHC/basket of 60 kg
Smoked anchovies	24 000 GHC/sack of 80 kg
Smoked tilapia	51 000 GHC/basket of 60 kg
Salted & dried fish products	
Salted & dried tilapia	68 000 GHC/sack of 80 kg
Fermented tilapia	40 000 GHC/sack of 80 kg

Source: Tuesday Market, Bonga N° 25; GHC (Ghanaian cedis)

Apparently, most of the transport operators engaged in this activity are based in Dzodze and therefore prefer to use the following trade route: Mamprobi/Accra – Sogakofe – Dzodze/Ghana – Noépé – Sanguera – Lomé/Togo. Another convincing explanation for the choice of this trade route is that the Dzodze border post is less busy than other border posts and customs formalities proceed much faster. Some transport operators use the more direct route through Denu and Aflao but they constitute a minority since the Aflao border post is very busy. Few traders supply the interior markets in Togo notably Atakpamé. Such traders use the following trade route: Mamprobi/Accra – Hohoe – Kedjebi/Ghana – Badou – Atakpamé/Togo.

3.1.6 Women's contribution to fish trade

Throughout the world, the fishing industry has long been considered a male occupation and many international agencies and business development programmes are solely focussing on fishermen. But in Ghana, women play an important role in small-scale fisheries. The wholesalers, locally called fish mummies, handle distribution and sales of 90 percent of the artisanal fish production as well as part of the catch of the commercial fishing companies. Most of the fish mummies operate as selling agents paying fishermen on the basis of the revenues they receive from their sales. Fish mummies also provide informal credit to fishermen and are involved in processing, i.e. smoking, drying and salting of fish for the domestic market as well as for regional markets. Figure 3.1 shows the role of women in fisheries in Ghana.

3.2 Small-scale fisheries and fish trade – the case of Senegal

Since 1994, when the CFA Franc (CFAF) was devaluated, fish products became the main export product and foreign exchange earner in Senegal replacing groundnuts, phosphates and tourism. At present, the fishing industry accounts for 30 percent of Senegal's export earnings and is the most important foreign currency earner. Within the fishery sector, the small-scale or artisanal fisheries sector plays an important role.

The artisanal fisheries sector, including those involved in fish processing, marketing, net making, boatbuilding and similar activities, employs 600 000 Senegalese or 17 percent of the working population of Senegal. The artisanal fisheries production contributes nearly 70 percent to the domestic fish consumption.

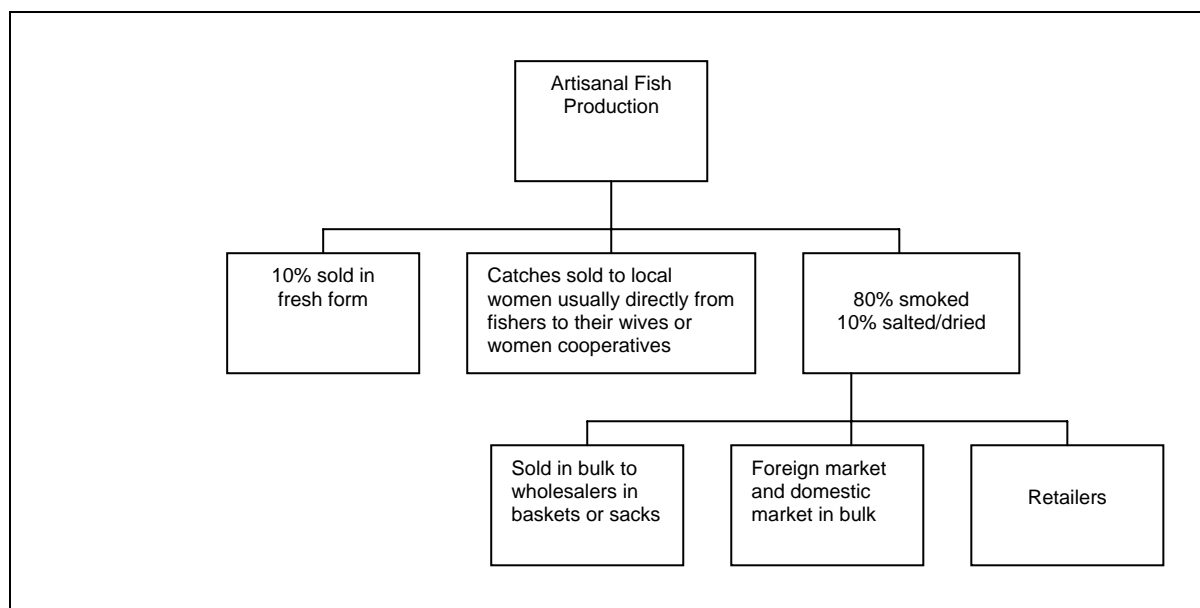


Figure 3.1: Role of women in fisheries in Ghana

3.2.1 Small-scale marine and inland capture fisheries production and resources

Small-scale fishing is done with small motorized and non-motorized wooden boats and dugout canoes. Ninety-one percent of the fishing canoes are motorized. Seventy-three percent of the motorized fishing canoes operate from Thiès and 9 percent from Dakar. Table 3.7 shows the number of canoes during the period 2000 to 2004.

Table 3.7: Canoes operating in Senegalese territorial waters

Year	Number of canoes
2000	6 329
2001	7 910
2002	8 351
2003	8 557
2004	6 050

Source: Annual Report, Directorate of Marine Fisheries (DPM), 2000

In 1997, 186 fish landing sites were recorded. The registered number of marine and inland fishermen was 53 000. In 2000, the total production of the small-scale fisheries sector was 338 209 tonnes.

The main species exploited by the small-scale fisheries sector are two types of sardinella, i.e. *Sardinella aurita* and *Sardinella maderenis* and horse mackerels. The total small pelagic resources of the Senegalese EEZ are fully exploited and overexploited even though there seem to be some regional differences. In the Casamance region in the south, there may be potential for a slight increase of production of sardinella as well as potential for catching of bigeye grunt (*Brachydeuterus auritus*), which is presently hardly exploited, whereas fishery resources off the Petite Côte region are overexploited.

Artisanal inland capture fisheries is mainly carried out in rivers using canoes, gillnets, castnets, traps and hook and lines. The artisanal marine and inland fisheries production during the period 1997-2002 is shown in Table 3.8 and 3.9 and in Figure 3.2.

As can be seen from Table 3.8, the artisanal marine capture fisheries production in Senegal shows an overall decline, which is probably due to overfishing of the available resources.

Table 3.8: Small-scale marine fisheries production of Senegal, 1997-2002 (in tonnes)

Year	1997	1998	1999	2000	2001	2002
Quantity	345 600	317 100	302 300	328 800	320 400	292 000

Source: Ministry of Maritime Economic Affairs (MEM) & Directorate of Statistics (DPS), 2000

Table 3.9: Small-scale inland fisheries production of Senegal, 1997-2002 (in tonnes)

Year	1997	1998	1999	2000	2001	2002
Quantity	23 800	23 600	27 400	25 300	27 700	35 200

Source: Ministry of Maritime Economic Affairs (MEM) & Directorate of Statistics (DPS), Ministry of Economic Affairs and Finance (MEF), 2000

Inland capture fisheries landings in Senegal show an overall increase even though at a low level. The situation is mainly due to the economic recession in Senegal as well as successive years of draught, the drying up of several rivers and the modification of other rivers for irrigation schemes.

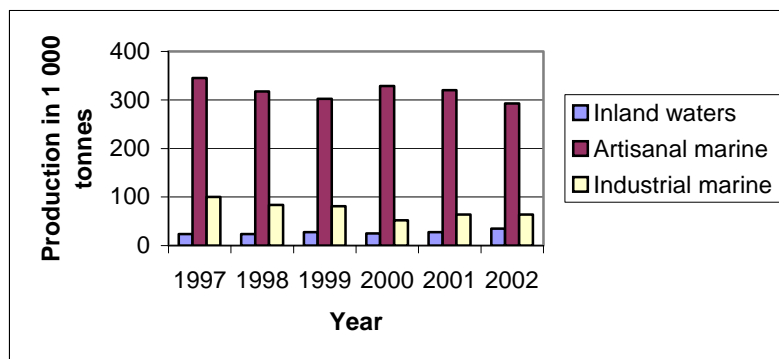


Figure 3.2: Marine and inland capture fisheries production of Senegal, 1997-2002

3.2.2 Aquaculture

Fish farming in the form of Nile tilapia freshwater culture was introduced in Senegal in 1980. In 2000, the production was 204.8 tonnes valued at US\$50 000. The production is destined for the domestic market in fresh form. The price is set according to the size of the fish and the period of production.

3.2.3 Fish handling and preservation

As in the case of Ghana, smoking, salting, drying, icing, cold storage and canning are used for preserving fish in Senegal. The traditional methods of smoking, salting and drying are used to preserve most of the fish from the artisanal sector and the semi-industrial inshore fleet. In Senegal as in other parts of West Africa, about 80 percent of fish is consumed smoked and the remaining 20 percent is consumed either fresh, salted, sun dried or fried. The type of fish determines to a large extent the method used to preserve it and this again is related to the preference of consumers.

Smoking is used for most fish species and is carried out in almost all fishing villages. Wood is therefore an important requirement in these areas. Traditional smoking equipment such as the round mud oven has been replaced in most fishing villages by rectangular ovens with smoking trays. The so-called Chorkor smoking oven has a higher smoking capacity because it uses stacks of smoking trays. It also consumes less fuel than the traditional ovens for the same quantity of fish. Most of the fishing villages have adopted the use of the Chorkor oven, especially in areas where wood is scarce. At the domestic market level, the Petite Côte

region possesses the largest number of artisanal fish smoking centres such as Mbour and Joal. About 400 women accounting for 96 percent of all artisanal fish processors are involved in this activity.

Senegal is a major fish drying centre for West and Central African countries. Generally, fish is dried on mats, cement floors, old fishing nets and sometimes directly on the ground.

As in the case of Ghana, inshore fishing vessels usually carry ice onboard to preserve their catch. Some canoe fishermen, who use hook and line for high value demersal species, also carry ice to sea in insulated containers kept in special compartments in their canoes. Icing certain fish species after capture can be logistically difficult and uneconomic for artisanal fishermen. Pelagic species such as sardinella and mackerels do not command high prices and therefore will not attract higher prices when kept in ice.

There are a number of traditionally processed fish products in Senegal. The most common ones are locally called *Guedj* (fermented and dried fish), *Kethiak* (roasted, salted and dried cardinals and *Ethmalosa*), *Yosso* (smoked juveniles fish), *Sali* (salted and dried fish), *Tambadiang* (small fish salted and dried fermented or not, in bulk), *Yeti* (fermented salted *Murex*) and *Yoss* (dried juvenile fish).

3.2.4 Fish marketing

As in the case of Ghana, during the major fishing season when supply increases, prices are lower than during the lean season when supply is lower than demand. Fish prices also increase as distances from the landing sites and catch areas increase. Prices for salted and dried fish paid by semi-wholesalers at the Kafountine market in Senegal in 2001 ranged from 300 to 550 CFAF per kg of fish depending on the product. The price of smoked bonga paid by semi-wholesalers at the same market in 2001 was CFAF 150 per kg of fish. The semi-wholesalers sell the fish to retailers, who then sell it to the final consumer.

When smoked fish products are destined to foreign countries, prices are set according to the size and quantity of the traditional baskets made with fresh palm tree leaves. The quantity varies from 30 to 65kg. Smoked fish products are also exported in plastic sacks, which weigh up to 100 kg. Table 3.10 shows the average fresh fish prices paid at the Dakar Central Fish Market.

The traditional fish market in Senegal is dominated by smoked and dried fish products destined for inland markets and neighbouring countries. Fish is transported with trucks via interstate roads and in some instances with canoes or small passenger boats by water.

Table 3.10: Fish prices at Dakar Central Fish Market, Senegal, 2001

Species	Average price (in CFAF)
Round sardinella	100.0
Flat sardinella	75
Horse mackerel	175.9
Grunt	337.3
Pandora	264.4
Sea catfish	190.0
Seabream	297.9
Jack mackerel	122.0

Source: Dakar Central Fish Market, 2001

Senegal is a major supplier of both frozen and cured fish products to West and Central African countries. The main export markets for Senegal's cured fish products, particularly for sardinella, are Kayes, Mali and Nzérékoré, Guinea. Senegalese women processors in and around Ziguinchor, Senegal, market their own products by accompanying them as far as Kayes and during the peak period even as far as Bamako, Mali. In other instances, traders from Mali travel to Casamance, Senegal, to buy fish, which they transport via

Dakar to Bamako by motorised canoe. The trade with Nzérékoré, Guinea, is dominated by Guinean men, who procure the fish at the processing centres in Senegal and transport it by road to Guinea.

3.2.5 Women's contribution to fish trade

In Senegal, 97 percent of artisanal fish processing and marketing is carried out by women. They operate in small markets located in villages as well as in big central markets such as the central market of Dakar, M'Bour and the Kafountine fish market. Women fish processors and traders are organized in local associations, some of whom are federated in regions such as the Association Santa Yalla in the Casamance region, the Women Association of Mbelling and the Women Association of Mbour.

3.3 Strategy for overcoming constraints to a better integration of small-scale fisheries into fish trade in Ghana and Senegal

3.3.1 Constraints to the development of small-scale fisheries

The major constraints, which hamper the development of small-scale aquaculture in Ghana and Senegal, are weak extension services, inadequate supply of good quality fingerlings, lack of knowledge of fish pond management and the high cost of pond construction.

Artisanal fisheries development and efficient distribution and trade of fish is constrained by a lack of infrastructure for fish handling, storage, transport facilities, interstate roads and border posts and controls. There is also lack of information in fishing communities as they live in small isolated settlements along the shores of coastal and inland waters and are rarely visited by extension officers. This situation coupled with high illiteracy, hampers their access to appropriate technologies for fish preservation as well as access to information on resources and markets.

Political and civil unrest including military coups in the countries of the West African sub-region also affect fish trade. In most cases, when a military junta or a rebel group overthrows a government, existing trade arrangements are negatively affected.

The economic situation in many countries of the region is alarming and not conducive to the development of fisheries and fish trade. The introduction of Structural Adjustment Programmes (SAPs) in Ghana in the 1980s, for example, adversely affected all sectors of the economy including the artisanal fisheries sector. As a result of these programmes, the purchasing power, especially of the rural population, is still very low. The lack of foreign currency to import fishery inputs such as petrol, fishing gears, outboards engines and canoes resulted in reduced fish landings, which caused increases of fish prices.

All countries that make up the Economic Community of West African States (ECOWAS), have their own fishery policies, many of which are ineffective either due to bureaucracy and lack of willpower on the part of those responsible. An example is the ECOWAS initiative on streamlining fish trade policy in West Africa. The initiative started in the 1970s and no concrete results have yet emerged.

Tariff and non-tariff barriers to regional fish trade pose further constraints to the development of fisheries and fish trade in the region. Malpractices at check points at the borders between States are obstacles to trade in the region. Also, traders and transporters of fish are mostly illiterate and not able to fulfil the requirements of customs, health and police officers.

As far as taxes and import duties are concerned, efforts were made by a number of regional and sub-regional organisations to identify a common trade policy for their respective member countries. So far, very little has been achieved. Member countries failed to enforce regional trade initiative rules. Another effort by ECOWAS to streamline fish trade policy in West Africa was the introduction of a common duty and tax schedule in 1979, but Member States failed to incorporate these special provisions, preferring to

apply their own regulations. Under the stipulated common policy, non-tariff barriers were to be removed within four years from May 1981. The West African Economic and Monetary Union (UEMOA) and ECOWAS had decided that import duties were to be reduced and to be eliminated or harmonised in conformity with the provisions of the treaty. Unfortunately, economic pressures in member states made it impossible to put the new policy into effect.

3.3.2 Improvements needed for better market integration

As mentioned above, wide-ranging improvements in the infrastructure to be used by the artisanal fisheries sector are vital for the improvement of fish trade in West Africa including onboard handling and preservation facilities, infrastructure at fish landing sites, roads, communication and fish processing and marketing infrastructure. Fish inspection services are vital prerequisites for the production of good quality and safe fish products for trade. A trade information network on sustainable management of fishery resources should be established and information on the utilization of appropriate technologies for smoking and drying fish should be disseminated.

The statistical database on West African artisanal fisheries is weak and should be improved. Awareness, education, training and information on the socio-economic importance of the artisanal fisheries sector will help improve and strengthen the livelihoods of those involved in the small-scale fisheries sector. Regional cooperation and integration offer tremendous opportunities for economic growth and would enable the countries involved to participate in and benefit from a bigger market and provide opportunities for the integration of African economies into the global economy. In the same context, there is also a need for a monetary co-operation programme, which should involve collective measures to set up a harmonised monetary system and common management institutions.

The artisanal fisheries sector is an important source of foreign exchange, employment and animal protein in the region. It has to be strengthened and interregional trade has to be stimulated and increased by creating awareness of market opportunities in the region and developing trade channels and services to support market integration. To achieve these objectives, the following measures may be considered:

- Market surveys should be undertaken in support of artisanal fish products trade in the region to identify priority needs and to formulate an appropriate programme of assistance to improve regional trade in fish and fish products.
- Buyer and seller meetings and seminars may be organised regularly on trade opportunities in the region to bring decision-makers together and help create and increase business contacts.
- Regional information networks need to be strengthened to provide data on raw materials, annual supply and demand as well as consumption patterns. Until recently, INFOPÊCHE and the West African Development for Artisanal Fisheries (WADAF) programme have jointly published *Bonga Flash*, a bi-monthly magazine on fish trade and price trends in the region. The magazine ceased activity due to lack of funds. The publication should be resumed to provide crucial information on fisheries and fish trade in West Africa.
- A directory of exporters and importers of fish and fish products from the region should be published based on data collected from different regional main markets surveys and buyer and seller meetings.
- Liberal trade policies already formulated such as the UEMOA TEC (Reform of Tariff and Tax Policies) and the ECOWAS trade programme should be implemented.
- Rules and regulations on packaging and labelling of goods should be harmonized. Losses of cured fish commonly occur on a considerable scale during transportation because of poor handling, packaging and mislabelling.

- Smoked fish product standards, quality assurance and certification standards and requirements should be developed in accordance with international requirements.
- The role of existing trade information networks such as INFOPÊCHE should be expanded to establish contacts and promote information flows among artisanal fishmongers such as the fish mammals in Ghana, to create marketing bodies in different regions and to link up with other sub-regional institutions in Africa.
- Training programmes should be organized to improve the skills of national trade promotion officials by utilising existing institutions available in the region.

4. SMALL-SCALE FISHERIES AND FISH TRADE IN SOUTHERN AND EAST AFRICA – THE CASES OF MOZAMBIQUE AND TANZANIA

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4.1 Present and future markets for fish and fish products from small-scale fisheries in Mozambique

4.1.1 Fisheries and aquaculture production and resources

Resources

Mozambique is endowed with rich fishery resources both marine and freshwater. The country has a 2 750 km long coastline bordering Tanzania in the north and South Africa in the south. The marine waters cover an area of about 100 000 km² within the exclusive economic zone (EEZ). Inland waters cover an area of about 13 000 km².

The marine fishery resources are mostly located in the two major continental shelf areas, i.e. the Sofala Bank in the central part of Mozambique and the Delagoa Bank in the south. The main fishing areas are located at the Sofala Bank, Inhambane, Vilankulo, Chiluané and Beira. The most important marine species include deep water crustaceans such as prawns, lobsters and crabs, shallow water shrimps, pelagic and demersal fishes, shellfish and marine algae and seaweed. The freshwater fisheries are located in Lake Malawi/Niassa and Lake Cahora Bassa. Freshwater fishes include tilapia and small pelagics locally known as *kapenta*.

Table 4.1: State of fishery resources in Mozambique

Stocks exploited or fisheries managed	Level of exploitation
Crustaceans	
Shallow water shrimp	Intense
Deep-water shrimp	Moderate
Line fish	Intense
Deep water lobster	Intense
Rock lobster	Low
Deep water crab	Moderate
Marine fish	
Large demersals	–
Large pelagics	Very low
Small demersals	Low
Small pelagics	Low
Molluscs and other resources	
Squid	Moderate
Sea cucumber	Intense
Cephalopods	Low
Freshwater fish	
Kapenta (in Cahora Bassa)	Intense
Demersal fish (in Cahora Bassa)	Intense
Utaka (in Lake Niassa)	Low

Source: FAO, 2005

According to the Ministry of Fisheries in Mozambique, the most valuable stocks of prawn and demersal fish targeted by the industrial and semi-industrial fishery sectors have been assessed to be highly or fully exploited while other fishery resources including large and small pelagics are only lightly exploited or underutilized in remote areas along the coast. Table 4.1 shows the current state of the fishery resources of Mozambique as assessed by FAO.

Excellent conditions exist in the country for the development of aquaculture particularly for the farming of prawns, oysters, mussels, algae and pearls. Mozambique has a considerable number of native marine species suitable for farming, the prominent ones being *Penaeid* prawns, i.e. black tiger prawn, Indian white prawn, pink prawn and *kuruma* prawn. Increased farming of prawns could reduce the pressure on stocks presently exploited by capture fisheries. Increased production of freshwater fish could also provide more fish for the local population and reduce the deficiency of the fish supply in the country.

Production

As shown in Table 4.2, the annual fish production of Mozambique was estimated at 105 000 tonnes in 2004 with the largest production segments obtained from the marine shallow water shrimp and the deep water shrimp fisheries. Over the years, the shrimp fisheries have been the economically most important fisheries in terms of national revenue earnings. The shrimp fisheries account for about 40 percent of the total exports. The freshwater small pelagic fishery for *kapenta* in Lake Cahora Bassa's Barragem is the third most important fishery in terms of exports. Freshwater fisheries for tilapia, catfish and carps are important for the small-scale fisheries sector.

The Mozambican fisheries can be divided into industrial, semi-industrial and small-scale fisheries. The industrial and semi-industrial sectors accounted for about 43 percent of the recorded catch in 2004 while the artisanal sector accounted for about 57 percent of total fish catches. More than 90 000 people are involved in the fisheries sector in fishing, gathering of aquatic organisms, processing and marketing. Seventy-thousand people are involved in the marine fisheries sector and 20 000 in freshwater fisheries. About 500 000 people depend indirectly on fishing activities for their livelihood. Thus, fisheries in Mozambique are of particular importance for the national economy as they provide employment and a source of animal protein and foreign currency earnings.

In 2004, fish caught by the industrial and semi-industrial fleets amounted to almost 30 000 tonnes, of which 65 percent were exported, resulting in net foreign earnings of about US\$94 million. The fisheries sector contributed about 4 percent to the gross domestic product (GDP) and accounted for about 10 percent of the total export earnings of Mozambique. Government revenues from licence fees and levies amounted to US\$3.8 million in 2002.

Table 4.2: Total fisheries production of Mozambique, 2000-2004 (in tonnes)

Sector/year	2000	2001	2002	2003	2004
Industrial and semi-industrial	25 915	20 501	22 185	23 112	29 878
Artisanal	63 378	55 259	47 802	67 074	60 378
Tuna fisheries	5 081	3 096	3 000	7 450	14 783
Total	94 374	78 856	72 987	97 636	105 039

Source: Ministry of Fisheries. Maputo, Mozambique, 2005

Marine fisheries

Marine fisheries account for almost 90 percent of Mozambique's total fish production. The main marine fishery resources include crustaceans such as prawns, deep water shrimp, crayfish, lobsters, crabs, marine finfish, both demersal and pelagic species such as groupers, snappers, emperors and sea breams including highly migratory tuna species like yellowfin, bigeye and albacore tuna, swordfish, sharks, cephalopods, molluscs, squid, octopus, sea cucumbers and bivalves.

Inland fisheries

Inland water bodies include Lake Niassa, the third largest lake in Africa and third deepest worldwide, the man-made Cahora Bassa Lake and a great number of rivers. Lake Cahora Bassa and the Mozambican part of Lake Malawi provide fisheries related livelihoods for about 20 000 people. A total of 10 000 tonnes of small pelagics, i.e. *kapenta* and demersal fish from Lake Cahora Bassa are caught, processed and marketed each year, of which 4 000 tonnes are caught by artisanal and small-scale fishers.

Aquaculture

The development of aquaculture of shrimp, bivalves, molluscs and tilapia is being actively promoted by the government. Both freshwater and marine aquaculture benefits from the diversity of the natural environment and the availability of suitable native species for farming. While freshwater culture is mainly focusing on integrated fish farming systems to improve the population's diet, marine aquaculture is oriented towards both low cost protein supplies and high value products for exports. Particular attention is given to marine prawn culture because of its economic importance.

Aquaculture production is still very modest in terms of volume. In 2002, the total aquaculture production of Mozambique was 855 tonnes representing a value of about US\$3 million, which included 600 tonnes of marine shrimp, 100 tonnes of freshwater fish and 155 tonnes of marine algae as shown in Table 4.3. According to the Ministry of Fisheries in Mozambique, 900 tonnes of tilapia species are produced annually at a small-scale level for subsistence purposes. Freshwater aquaculture started in the 1950s at an artisanal level while marine aquaculture started in 1995 at an industrial level. The main marine species farmed in Mozambique include black tiger prawn (*Penaeus monodon*), Indian white prawn (*P. indicus*), pink prawn (*Macrobrachium monoceros*), kuruma prawn (*Modiolus philippinarum*), bivalves (*Perna perna*, *Meretrix meretrix*, *Modiolous philippinarum*, *Eumarcia pauperkulata*, *Sacrostrea cucullata*, *Cassostrea gigas*, and *Veneruspis Japonica*) and mud crab (*Scylla serrata*).

Farming of black tiger and white prawn is oriented towards export. In 2003, the production of cultured shrimp from a 132-ha farm was reported to be 300 tonnes. Commercial shrimp farms are presently situated in Beira (a 132-ha farm), Quelimane (300 and 150-ha farms) and Pemba (a 250-ha farm). Total employment in the aquaculture industry is estimated at about 500 to 600 people. Freshwater aquaculture is dominated by the farming of native species. The popular species farmed in Mozambique include tilapia (*Oreochromis niloticus*), African catfish (*Clarias mossambicus*), freshwater shrimp (*Macrobrachium rosenbergii*) and carps (*Cyprinus carpio*).

Tilapia farming is currently carried out as small-scale cage culture with a production potential of about 80 tonnes per year. There are about 2 750 subsistence farms with an average size of about 100 m² oriented towards family consumption. Other important aquaculture species are seaweed, oysters and crabs. Seaweed (*Kappaphycus* spp.) farming involves about 5 400 people, of which 65 percent are women. The production of seaweed in 2003 was 523 tonnes.

Table 4.3: Aquaculture production of Mozambique, 2001-2002
(quantity in tonnes, value in US\$1 000)

Year	2001		2002	
	Quantity	Value	Quantity	Value
Aquaculture production	70	21	855	3 033

Source: Ministry of Fisheries, Mozambique

4.1.2 The artisanal, semi-industrial and industrial fisheries sectors

The artisanal fisheries sector

Artisanal fishing is carried out along the entire coastline of Mozambique. It is of particular importance in the provinces of Nampula, Zambézia, Sofala, Inhambane and Maputo. Artisanal marine fisheries are a source of income for about 50 000 families. The artisanal fisheries sector accounts for about 90 percent of

the 90 000 people employed in the fishery sector. The artisanal fishing fleet consists of 15 000 artisanal fishing boats and canoes. Sixty percent of the total catch in Mozambique is contributed by artisanal fisheries. This includes artisanal shallow-water shrimp fisheries, which land 5 000 to 6 000 tonnes of shrimp annually.

Fisheries at both Lake Malawi and Lake Cahora Bassa are artisanal and supply mainly small pelagic fish species for the domestic market and the regional African market. Small-scale and artisanal fisheries in Mozambique play a significant role in the national economy. They provide employment, income and a source of animal protein for the majority of coastal communities. Artisanal fishing is carried out by individual or small groups of fishermen using mostly non-motorized fishing vessels of 3 to 8 m in length. Only 3 percent of the artisanal fishing boats are motorized. Beach seines, gillnets and longlines are the most common fishing gears used to catch fish. The artisanal fisheries sector also includes fish collectors and divers. Artisanal fishermen and their families have a low socio-economic status.

Marine and freshwater fisheries are carried out from 787 fishing centres, of which more than 500 are scattered along the coast. While the industrial and semi-industrial sectors land their catches at designated fishing ports, artisanal fishers land their catches mostly at beach landing sites. The catch composition of artisanal fisheries in Mozambique is shown in Table 4.4.

Table 4.4: Semi-annual landings by artisanal fisheries in Mozambique by species, 2004-2005
(in tonnes)

Species/year	2004	2005	Percentage change in catches: 2004-2005
Crabs	130	88	-32 %
Fish	27 776	29 756	+7 %
Shrimp	1 465	2 718	+86 %
Cephalopods	107	162	+51 %
Sharks	184	175	-5 %
Others	2 853	1 139	-60 %
Total	32 515	34 038	+5 %

Source: Ministry of Fisheries, Maputo, Mozambique

In view of the importance of the artisanal sector, the government places great emphasis on the further development of this sector and has established the Institute for the Development of Small-scale Fisheries (IDPPE) for this purpose.

The industrial and semi-industrial fisheries sector

The industrial fisheries sector in Mozambique consists largely of joint ventures between the government and foreign fishing companies from Japan and Spain. Seventy percent of the Total Allowable Catch (TAC) of Mozambique for shrimp has been allocated to these joint ventures. The shrimp industry based in Beira and Quelimane is export-oriented and represents an important source of foreign exchange income for the country. Seventy percent of the production comes from two major commercial companies, i.e. PESCAMAR and EFRIPEL. The catch is frozen onboard the fishing vessels and exported directly to Japan and the European Union. Well-equipped foreign shrimp fishing fleets are active in Mozambique's waters. About 187 national industrial fishing vessels are operating also in the industrial fisheries sector. The main commercial species targeted by the industrial sector include lobster, crabs, deep water shrimp, fish, shallow water shrimp, crayfish and squid.

The semi-industrial fleet consists of about 213 vessels, of which 116 are targeting small pelagics, i.e. kapenta.

Main species exploited by the various fisheries sectors in Mozambique

The marine species exploited in Mozambique's waters include both demersal and small pelagic species such as groupers, snappers, emperor, seabass, croakers, dentex, pompano, parrotfish, flat needlefish, seabream, sardines, dorado, Spanish mackerel, shallow water shrimps, horse mackerel, barracuda, chub

mackerel, bivalves, sea cucumber, crabs, cephalopods, octopus, squid, oysters and clams. The freshwater species exploited in Mozambique are tilapia, catfish and carps.

The main marine species harvested by small-scale fishers are species found in the shallow waters of the continental shelf. Small pelagics, sardines and crabs are caught by purse seines, gillnets and beach seines while large fish such as pompano, groupers, snappers and seabream are caught with longlines. The pelagic fishes, mainly sardines and horse mackerels, dominate the catch composition and account for about 70 percent of the production.

Demersal and pelagic fishes are the principal finfish species targeted by the small-scale and artisanal fisheries. Fishes such as groupers, snappers, dentex and croakers are mostly targeted because they are bought by the industrial processing companies. A part of the catch is consumed in the domestic market. Once fish is landed on the beach, the catch is sorted according to sizes. The fishes are then divided into groups based on their size and commercial value.

The shrimp fishery has the highest commercial value and is the only fishery for which a Total Allowable Catch (TAC) limit has been set. Shrimp is harvested in deep waters by the industrial fleet and most of the catches are frozen onboard for export. The artisanal and small-scale fishing fleet targets shallow water shrimp and lands 5 000 to 6 000 tonnes of shrimp annually. Most of the catch from the small-scale fisheries sector is frozen or sold fresh and a certain part is dried. In the domestic market, fresh shrimp are mainly sold in big cities like Maputo, where customers with high purchasing power are located. Most of the catch, however, is used by commercial fish processing companies for export to international markets.

Crustaceans, bivalves, cephalopods and shellfish are harvested in small quantities. Squid and crab are of high commercial value. Because they are landed in small quantities, they are only distributed in special and limited markets. Squid is usually purchased by local restaurants and markets in Maputo and Beira and consumed both in fresh and dried form.

Oysters are caught by collectors along the coast and processed by boiling and sun-drying. Oysters have a good market in Vilankulo, Massinga, Morrumbene and Maxixe and are sold in cans and glass jars. Lobsters are caught by divers and consumed fresh. The main markets are Maputo and Beira and consist mainly of local restaurants.

Tilapia, catfish and a small quantity of carp species are among the most common freshwater fish species caught and processed exclusively by artisanal and small-scale fishers; the quantity is very limited though. The products have a ready market in local communities. Most of the catches are consumed in fresh form as the local market prefers fresh fish. Tilapia is also smoked for preservation. Fish from inland waters is caught mainly for subsistence purposes.

Fish processing

Fish processing in Mozambique traditionally involves a number of different methods often used in combination. Salting and drying of fish is practiced in the northern and central part of the country, while freezing of fish is also used in the northern and fish smoking in the southern part of Mozambique. In many parts of the country, lack of cold storage facilities forces processors to rely on traditional processing methods.

Most fish processing takes place onboard industrial and semi-industrial vessels such as the freezing of shrimp. Value-added fish processing on shore is promoted through long-term fishing rights assignments.

At present there are some 14 fish processing and freezing plants that are EU-accredited. Of these, five are located in Maputo, five in Beira and four in the northern part of the country. These plants buy their raw material from both semi-industrial and artisanal fishermen. Their main product is frozen shrimp but they also process various demersal fish species. In addition, there are some 40 smaller processing plants and operations that are not accredited by the EU. These smaller plants supply the local and regional markets with fresh, frozen, dried and salted fish.

The processing plants often provide ice and plastic boxes to artisanal fishermen in order to ensure a higher quality of raw material, which the plants procure from fishermen, and to oblige the fishermen to deliver their catch to the company, which provides them with ice and boxes.

Sun-drying without the use of salt and salting and drying are the two main processing methods for preserving fish in the small-scale fisheries sector. Salting and drying is used for squid and fish of all sizes and also for fish of second-grade quality. The process involves the following stages: for big-size and medium-size fish, the fish is split open, washed and then salted before it is sun-dried. Small-size fish is not gutted but salted and dried whole. The whole process takes about 12 to 36 hours depending on the size of the fish.

Sun-drying without salting is mostly applied to small fish and small shrimp. Fish are put directly on the ground and, to a lesser extent, on racks, plastic sacks and banana leaves. The process takes about 12 to 24 hours depending on weather conditions. Fish processors and traders try to sell fish while it is fresh, as fresh fish generally fetches a higher price. Fresh fish brings in 20 to 25 percent more revenue than dried fish locally known as *macakua*. In general, fish processed by artisanal and small-scale processors is contaminated with sand and other external agents. Most of the landing sites lack clean water to clean fish and fish products.

4.1.3 Consumption patterns and marketing channels for small-scale fisheries products

Mozambique's average fish consumption per capita is estimated at 7 kg per year. Fish consumption is higher in coastal areas, where it ranges from 10 to 12 kg per year.

The pattern of fish consumption differs between urban and rural areas and is influenced by cultural beliefs and financial status. People living along the coast prefer fresh fish while the access of those living in inland areas is often limited to dried fish products. Frozen horse mackerels and dried sardines are the staple fish foods for low-income consumers as they are cheap, readily available and have a long shelf-life.

Demand for fish products in Mozambique exceeds what the domestic fishery industry can supply. Because the major part of good quality seafood is exported to generate foreign currency, Mozambique depends on fish imports in the form of frozen small pelagics such as horse mackerels to meet domestic demand. It is estimated that 25 000 to 30 000 tonnes are annually imported from Angola and Namibia. It is expected that the demand for seafood will grow substantially until 2025 and there is a need to increase supplies. Table 4.5 shows supply targets for fish products in Mozambique set by the Ministry of Fisheries.

Table 4.5: Supply targets of fish products in Mozambique, 2000-2025

Source	Target catch for domestic consumption (tonnes)					
	2000	2005	2010	2015	2020	2025
Industrial and semi-industrial fisheries	33 631	44 421	55 211	66 001	76 791	87 581
Artisanal fisheries	84 065	101 460	118 855	136 250	153 645	171 040
Total	117 696	145 881	174 066	202 251	230 436	258 621

Source: Ministry of Fisheries, Mozambique, 2005

The small-scale fisheries production is mostly oriented to the domestic market. However, small amounts of shrimp, high quality fish and lobsters are exported through some of the fish processing companies based in Nampula, Sofala, and Cabo Delgado.

The distribution of fish products depends on their commercial value and quality. Most fresh fish from the small-scale fisheries sector is consumed by people living close to landing sites. Otherwise, fish is either

salted and sun-dried or smoked for long distance transportation. The national distribution system for fish, especially fresh, is not well developed.

The distribution chain for fish products is simple and three main distribution channels can be distinguished.

- (1) Fishermen → Consumers. This is the shortest channel in the distribution of fish. Fresh fish is sold by fishermen directly to consumers as soon as it is landed at the beach.
- (2) Fishermen → merchant retailers → consumers. This is the typical channel in the informal distribution of fish. Unlike the previous channel, this channel involves a number of informal retailers. The retailers are of both sexes and of different age groups. They buy fish from fishermen immediately after it has been landed to resell it within the vicinity of the landing site. The retailers make use of beach markets, landing points, fishing centres, informal coastal markets and municipal markets to sell their fish. The amount of fish they buy from fishermen is usually very small and rarely exceeds 50 kg. In general, the retailers buy and sell between 15 to 30 kg of fresh fish at a time.
- (3) Fishermen → processors → fish merchants → consumers. This distribution channel is mostly used for processed fish products, mainly dried and smoked products. Fishermen in the inland areas of Bazaruto, Santa Caroline, Santo Antonio and Santo Isable, for example, process their own catch. The fish is later sold to traders for reselling to consumers in local markets. Farmed fresh fish is also distributed in this way.

Fresh products are distributed in local markets of big cities. The products are kept on ice or in cold water at local markets. If kept in water, the products do not last long and deteriorate within two days. Some market centres have freezers, where traders can keep the fish overnight for a fee. The use of ice is very limited as it is only used for high value fish species and products. There is a limited number of ice-making machines in the country. In most cases, fishermen obtain ice from processing companies if they agree to sell their fish to them. If fish is not sold fresh, it is frozen or processed by drying and smoking.

Fish merchants represent the most important link in the distribution chain of fish products in local and regional markets. They can be divided into three groups based on the amount of fish they handle. Large-scale wholesale merchants, locally called *grossistas*, are agents of processing companies and managers of big enterprises that buy large volumes of fish directly from fishermen for redistribution or for processing. Most of these merchants process their fish by freezing or drying and sell it through their own enterprises or in retail markets. They purchase up to 1 000 kg of fish at a time. In addition to supplying the processing factories, these merchants also supply local retail markets, local restaurants and local fishmongers.

Medium-scale fish merchants, locally called *semi-grossistas*, buy both fresh and processed products from fishermen and small processors to resell these in local markets. The *semi-grossistas* purchase between 50 and 200 kg of fresh fish and 1 to 3 sacks of dried fish per trip to the market. They usually make two to three trips per month to collect fish at fish landing sites. Most of them have their own market space in the main market centres of Beira and Maputo.

The third group of fish merchants are merchant retailers, who are involved in petty trade. They purchase very small quantities of fish at a time to resell to street vendors in street markets and in municipal markets located in areas close to their own home. Mostly women and young children are involved in this type of trade.

The distribution of fresh fish to inland markets is hampered by poor roads and by a lack of adequate storage facilities for fresh or frozen fish throughout the country. Processed fish such as dried or salted-dried fish is usually packed in sacks and transported by bicycles or pick-up trucks to local fish markets in villages and in larger towns and cities.

The domestic market for fish and fish products

Mozambicans are traditionally fish eaters and prefer fish to red meat unlike consumers in other African countries such as Namibia, South Africa and Botswana, where red meat and chicken are the staple foods in

the traditional diet. Most of the local fish markets in Mozambique are concentrated in the more densely populated regions.

There are basically two major consumer groups in the domestic market. The first group is represented by the high-income group of European and Mozambican origin, which is concentrated in the major cities such as Maputo, Beira, Sofala and Manica. This group prefers high value fresh and frozen fish products of good quality. It also comprises hotels and restaurants, which buy much of the crustaceans and cephalopods sold in Mozambique. Most of the fish is obtained directly from fishermen, retail markets and fishmongers.

The second group of domestic consumers consist of low-income consumers both in cities and in rural areas with a traditional diet. Small pelagics, horse mackerels, sardines and juvenile fish both of demersal and pelagic species in fresh and cured form are the fish products preferred by these consumers as these products are relatively cheap. Women street vendors sell small quantities of dried small pelagics and dried shrimp together with other agricultural commodities such as beans and vegetables.

The most common markets for African products are local street markets, where women between 14 to 55 years of age and young men sell all sorts of fish products ranging from small quantities of dried fish to fresh fish. In general, fish trade in Mozambique is slow during the rainy season when vegetables are abundant.

Non-African international markets

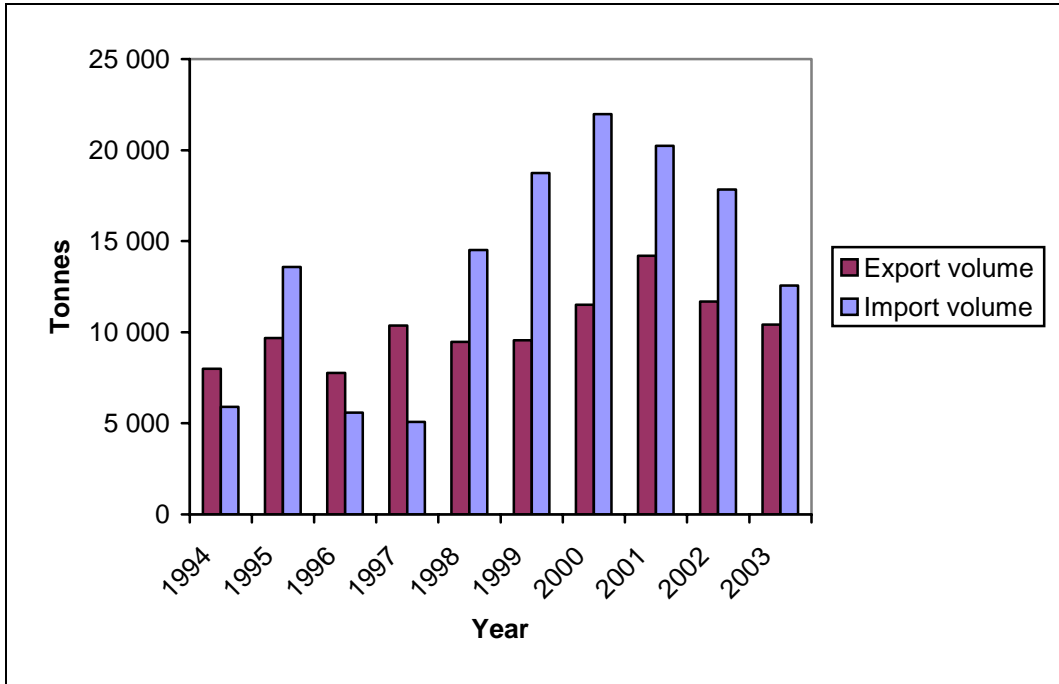
The international market for Mozambique's fish products is diverse and includes Africa (the Republic of the Congo, Malawi, South Africa, Zambia and Zimbabwe), Asia (China, Hong Kong SAR and Japan) and Europe (Italy, Portugal, Spain and the United Kingdom).

The European Union (EU) accounts for about 63 percent of Mozambique's fish exports by volume, Africa for 25 percent and Asia for 12 percent. High-value prawns are the principal product currently being exported to the EU (mainly Spain) and Japan. The value of fish exports from Mozambique to international markets was US\$98.5 million in 2002 and US\$87 million in 2003. Table 4.6 shows the destination of exports of Mozambique's fish products in 2001. Figure 4.1 shows fish exports and imports in Mozambique by volume for the period 1994–2003. Figure 4.2 shows fish exports and imports in Mozambique by value for the period 1994–2003. Table 4.7 shows volume and value of foreign trade in fish products in Mozambique for the period 1997–2003.

Table 4.6: Destination of exports of Mozambique's fish products in 2001

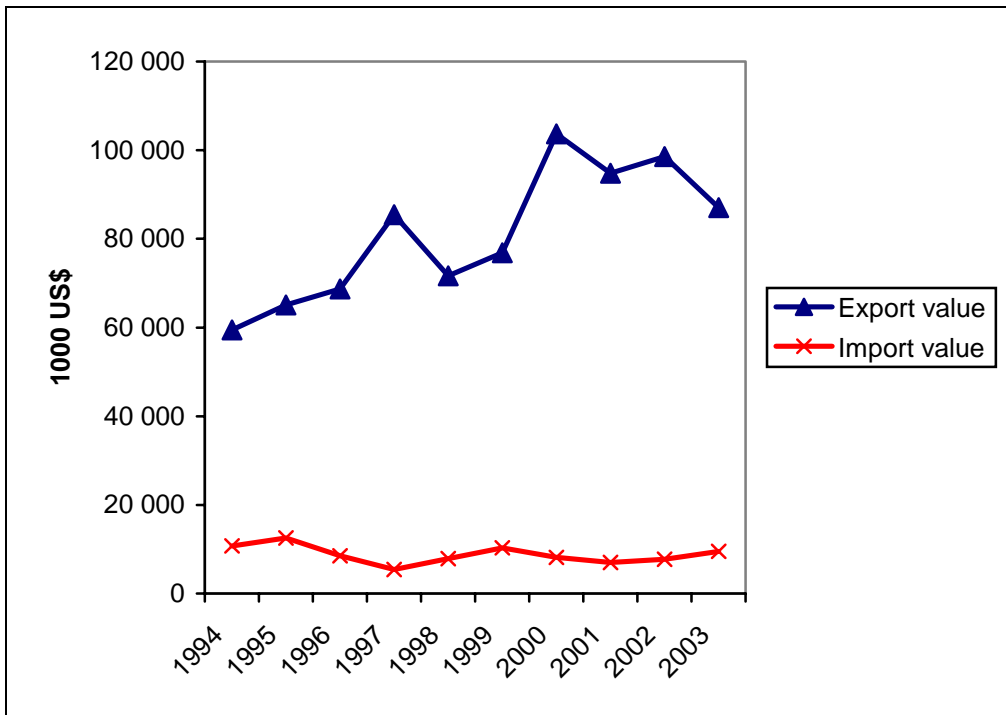
Destination	Quantity (in tonnes)	Percent
AFRICA	3 425	24.9
South Africa	1 782	13.0
Malawi	84	0.6
Congo	206	1.5
Zambia	235	1.7
Zimbabwe	1 118	8.1
ASIA	1 682	12.2
Japan	1 669	12.1
China, Hong Kong SAR	13	0.1
EUROPE	8 638	62.9
Spain	4 737	34.5
Portugal	3 658	26.6
United Kingdom	1	0.0%
Italy	242	1.8%
TOTAL	13 743	100.0

Source: Ministry of Fisheries, Maputo



Source: FAO FISHSTAT

Figure 4.1: Fish exports and imports of Mozambique by volume, 1994-2003



Source: FAO FISHSTAT, 2005

Figure 4.2: Fish exports and imports of Mozambique by value, 1994-2003

Table 4.7: Foreign trade in fish products in Mozambique, 1997-2003⁵ (quantity in tonnes, value in US\$1 000)

Year	Exports		Imports	
	Quantity	Value	Quantity	Value
1997	10 367	85 400	5 083	5 438
1998	9 463	71 626	14 518	7 866
1999	9 556	76 867	18 740	10 350
2000	11 511	103 716	21 970	8 177
2001	14 191	94 798	20 238	6 980
2002	11 663	98 559	17 835	7 749
2003	10 412	87 042	12 570	9 495

Source: FAO FISHSTAT, 2005

In summary, Mozambique's foreign trade in seafood is characterized by exports of high-value fish products and imports of low-value fish.

African export markets

The main African markets for fish and fish products from Mozambique are countries of the Southern Africa Development Community (SADC) and the Southern Africa Customs Union (SACU). The SADC and SACU markets account for about 25 percent of all Mozambican fish exports. As shown in Table 4.6, South Africa and Zimbabwe reported the highest import volumes of fish products from Mozambique in 2001. Fish processed onboard semi-industrial Mozambican fishing vessels is mainly exported to South Africa. Freshwater small pelagics (*kapenta*) caught by the semi-industrial fisheries sector are exported in large volume to Zimbabwe.

Traditionally processed, i.e. salted and dried and smoked fish is exported informally to neighbouring countries such as Tanzania, Malawi, Zimbabwe, the Republic of the Congo and Zambia. The informal border trade is done by petty traders, who transport small quantities of fish at a time, mainly to avoid taxation. There are consequently no records of this trade and it is very difficult to estimate the volume traded. Fish exports to Tanzania originate from the Cabo Delgado Province. The export to Malawi originates from Nampula, Zambezia and Beira. Fish exported to Zambia originates from Tete at the Cahora Bassa Lake. Most of the products are exported in dried and smoked form with the exception of South Africa, which imports frozen shrimps and fish.

Intraregional trade in the SADC region is currently underdeveloped. In 2001, only about 150 000 tonnes of fish products were distributed within the region. This represented only 10 percent of the 1.5 million tonnes of fish produced annually in the SADC region. Intraregional fish trade is suffering from the meat-based diet of many African countries. The lack of knowledge about fish preparation and traditional preferences for meat are hindering market penetration and expansion.

In addition, barriers to intraregional fish trade are represented by inadequate infrastructure for large trade volumes, lack of transport, storage and distribution facilities and high import taxes. Furthermore, foreign exchange is lacking and export credit facilities are poorly developed. Unrecorded cross-border trade of low volumes of fish to avoid taxation is very common. This informal intraregional trade needs to be studied through data collection and analysis to determine its impact on national economies.

4.1.4 Involvement of women in fisheries in Mozambique

In spite of fishing and fisheries being seen as a basically masculine activity, the involvement of women is on the increase. Although the exact number of women involved in fisheries related activities is not known,

⁵ There is a minor discrepancy regarding the volumes of exports in 2001 between the figure reported by FAO FISHSTAT (14 919 tonnes, see Table 4.7) and the figure reported by the Ministry of Fisheries of Mozambique (13 743 tonnes, see Table 4.6). However, both tables are retained here because Table 4.6 shows the composition of exports in 2001 while Table 4.7 shows a time series of exports and imports from 1997 to 2003.

it is estimated that of the 100 000 people working in the artisanal fisheries sector of Mozambique, 20 percent are women. In Mozambique, as in most African countries, women are mostly involved in fish processing, collection and trading while men are involved in fishing operations. Twenty-five percent of women involved in fisheries related activities are fish traders.

In some cases though, women are also participating in capture fisheries together with men. Women participate in fishing activities in coastal areas and estuaries particularly in fishing for small pelagics and small shrimp and in beach seine fishing together with fishermen. In 2005, South Africa reported that a number of women were fishing at sea as crew on trawlers. In Mozambique, it has also been observed that women have started to participate in fishing operations at sea.

Apart from fishing, women participate in other forms of harvesting of aquatic organisms. It is estimated that about 35 percent of women in Mozambique participate in the collection of shellfish, i.e. oysters and mussels. The collection of shellfish is a predominantly female activity. According to the Institute for Small-scale Fisheries Development (IDPPE), women collectors represent about 71 percent of the 23 500 registered shellfish collectors in the coastal zone. The collection of shellfish is mostly a subsistence activity for supporting the family and it involves all age groups.

There are also women, who collect molluscs for commercial purposes. Molluscs such as clams have a ready market in the south while oysters are sold in the northern part of the country. The most important problems confronting women collectors are the lack of ice and cold storage, lack of transportation for taking their products to markets and the difficulty of obtaining credit to improve their activities.

In many cases, women participate in fisheries activities as partner and support to their husbands rather than as the sole owner of the business. Commonly, women wait at landing sites for their husbands to land the catch. They then sort the fish by species and process or sell it fresh. Women, who are not involved in family based activities together with their husbands, are usually organized in groups and associations of women processors and the responsibilities are shared among the group members. Many of these women are divorced, widowed or single mothers struggling to support their families.

Women are frequently involved in selling of fresh fish, shrimp and molluscs rather than in the selling of processed fish. The latter activity is dominated by men. Fresh fish is usually marketed close to landing sites and in the main cities. Some women from fishing communities trade fish in the vicinity of their own home and move around from door to door carrying their products in baskets on their heads. Some of these women travel as far as 50 to 80 km from the landing site to the closest fish markets in the city. Normally, it takes two to three weeks to return and procure the next supply of fish. The women use their own traditional means to preserve the fresh fish from deteriorating during the transportation process.

The aquaculture industry is another sector where women play an important role. In Mozambique, the aquaculture of algae and freshwater fish are some of the activities, in which a large number of women are involved. According to the IDPPE, about 3 600 people were actively involved in aquaculture in 2004, of whom some 70 percent were women. Many seaweed farms are owned by women, who are themselves directly involved in selling and promoting their products. Women are specifically involved in seaweed farming for the purpose of generating income. With regard to freshwater fish farming, women are in most cases involved together with their husbands at a small-scale subsistence level and the production is basically used for the purpose of feeding the family.

The involvement of women in fisheries in Mozambique is very important as women serve as a bridge between producers and consumers in the processing and distribution of fish and fish products. Although women play such a crucial role in fisheries related activities, they still do not receive enough support from public and private institutions. Women traditionally are required to take care of the family while men go fishing. This practice has contributed negatively to the recognition and support of women in the fisheries sector. Women are often marginalized and ignored when it comes to financial support for their fisheries related activities. Women are also often discriminated against when it comes to credit facilities and money lending even though they usually have a higher savings rate and are generally more responsible than men.

4.1.5 Improving marketing efficiency for fish products from small-scale fisheries

A large portion of fresh and processed fish products from the small-scale fisheries sector caters to the domestic as well as to regional markets. Traditional methods of processing, i.e. sun-drying and smoking are not entirely appropriate for handling the large volumes of fish now moved commercially. Significant post-harvest losses have been incurred due to the deterioration of the quality of fish and fish products at fish markets and during transportation. The improvement of product quality would increase the value of the product and generate new income opportunities. The introduction of improved and more advanced handling and processing methods, including the use of ice at landing sites and marketing areas, and new designs for drying facilities and smoking kilns, could improve the current products of the small-scale fisheries sector and provide high quality products that could generate better returns. While the fish products for exports are meeting high quality standards, the products for the local and regional markets are not subject to any quality assurance procedures.

Target markets for improved small-scale fisheries products could be both local and regional markets. Mozambique, being a member of SADC, can take the advantage of free trade agreements to increase intraregional fish trade with other SADC member countries. A more direct link in the marketing chain should be generated. For instance, direct collaboration between fishermen and processing plants through the provision of cold storage facilities would reduce post-harvest losses and have a positive impact on distribution of fish in both local and international markets.

4.1.6 Constraints to and needs for the development of small-scale fisheries in Mozambique

Constraints and problems

The main obstacles to the development of the small-scale fisheries sector and its better integration into fish trade in Mozambique are a lack of knowledge, poor technology and equipment and difficulties in obtaining credit. There is also lack of information related to fish prices and markets. Unhygienic fish handling, preservation and processing methods used in the small-scale fisheries sector in Mozambique result in large post-harvest losses, low quality of fish products in local and regional markets and difficulties in the placement of fish products with high commercial value in competitive markets.

The problems outlined above are mainly caused by poor conditions at fish landing sites, lack of ice and cold storage at landing sites and onboard fishing boats and lack of knowledge on proper fish handling procedures by fishermen. The infrastructure for fish distribution to potential markets is unsatisfactory. The involvement of intermediaries such as marketing agents reduces the share to producers of the prices paid by the final consumers.

Needs

Improvements in product quality and marketing efficiency for small-scale fisheries products will require financial investments. IDDPE has been actively involved in the development and improvement of conditions for small-scale and artisanal fisheries in Mozambique. According to the IDDPE, the sector needs more assistance in the form of training, research and infrastructure.

More emphasis should be given to the following needs:

- support to market development initiatives including the establishment of shore infrastructure, landing facilities, auction halls, ice making and cold storage facilities and specialized and well-equipped fish markets in remote areas;
- training in improved methods of fish processing, packaging and storage to ensure better product quality;
- improvement of preservation methods and product quality control to reduce post-harvest losses;
- development of value-added products through onshore processing of products for export;

- proper marketing services for fishermen and women, information on fish prices, alternative trade opportunities and more information on market access;
- improvement of distribution and logistics in the marketing of fish products with high commercial value for competitive markets;
- improvement of quality assurance systems and compliance with national, regional and international market requirements preceded by the establishment of quality standards for fish products that have a high commercial value both in regional and local markets; development of rules of sanitary, hygiene and quality standards and methods for fish products destined for local consumption and markets;
- access for fish processors, fishermen and fish traders to credit and financial services to facilitate investment in essential facilities and services.

4.2 Present and future markets for fish and fish products from small-scale fisheries in the United Republic of Tanzania

4.2.1 Introduction

The small-scale and artisanal fisheries sector is by far the most important fisheries sector in Tanzania. The sector is characterized by small-scale fishermen operating inexpensive boats and fishing equipment. The fish caught is typically processed and marketed by women. People involved in fisheries activities are those who live in coastal communities and along the shores of lakes. Fishermen are as young as 14 years. This includes school drop-outs, who see fishing as an easy way of making quick money.

Tanzanian fisheries are important for its economy because the sector supports a large number of artisanal fishermen, who depend on fishing for their livelihood. In addition, fisheries are a vital source of food, income and employment for the local communities along the 1 450 km long stretch of the Tanzanian coastline, numerous islands and various lakes.

Table 4.8: Organisations and institutions involved in the fisheries sector of Tanzania

Name	Address	Director/Contact person
Lake Victoria Fisheries Organisation	LVFO, PO Box 1265, Jinja, Uganda maembe@lvfo.org	Thomas Maembe
Lake Victoria Fish Processors Association, Mwanza, Tanzania	PO Box 355, Mwanza lvfpat@africaonline.co.tz	L. Nhawani
Tanzania Fisheries Research Institution (TAFIRI)	PO Box 9750, Dar es Salaam	Prof P. O. J. Bwathodi
Beach Management Units (BMUs)	Each landing site has a BMU	BMU Chairpersons
Fisheries Department, Zanzibar	PO Box 774, Zanzibar mcsznz@zankink.com	S.H. Vuai, Chief Fisheries Officer
Fisheries Department, Tanzania Dar es Salaam Division	PO Box 2462 Dar es Salaam wvhaule@yahoo.com	W.V. Haule, Assistant Director of Fisheries

In recent years, Tanzania had average annual fish landings of over 290 000 tonnes while the estimated production potential is as high as 730 000 tonnes. Marine fisheries account for up to 20 percent of Tanzania's annual total landings and 80 percent of the production comes from freshwater fisheries. Small-

scale and artisanal fisheries account for about 95 percent of the total catch. Fisheries provide direct and indirect employment to about 0.5 million Tanzanians⁶.

While most of the fish catches from marine and inland waters are used for subsistence purposes, some are exported to African and non-African markets.

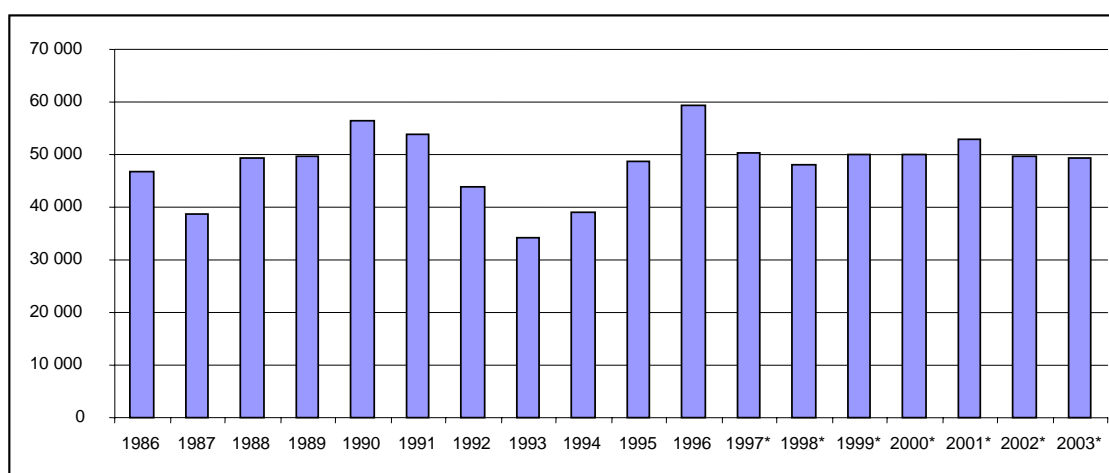
Fish products, mainly Nile perch fillets, shellfish, shrimps, lobsters, crabs and octopus are important export products of Tanzania, which account for 10 percent of the nation's foreign exchange earnings. The fisheries sector contributes about 3 percent to the country's GDP. Table 4.8 shows the organizations and institutions, which serve the fisheries sector of Tanzania.

4.2.2 Fisheries and aquaculture production and resources

Tanzania has a coastline of 1 450 km and a narrow continental shelf. The Tanzanian EEZ in the Indian Ocean has a size of about 223 000 km² and a production potential of some 730 000 tonnes of fish per year. The marine fisheries are composed of small-scale fisheries carried out by the people living in coastal areas, while the industrial fisheries are based around Dar es Salaam. Until recently, only one foreign and three local fishing vessels were licensed to fish offshore in the country's EEZ. It is estimated that over 20 000 small-scale fishermen are engaged in artisanal fisheries along the coast of the mainland alone. Another 18 600 small-scale fishermen are operating from the island of Zanzibar. Thus the main share of marine catches is landed by small-scale fishermen using traditional fishing vessels including small boats, dhows, canoes, outrigger canoes and dinghies with and some without engines.

More than 500 species of fish are utilized as food fishes. Reef fishes are the most important species. The major commercial marine species include emperors, snappers, sweetlips, parrotfish, surgeonfish, rabbitfish, grouper, goatfish, kingfish, sharks, rays, shrimp, lobster, sardines and sea cucumbers. Most of these fishes are used for subsistence purposes while some are exported.

Industrial fisheries account for about 5 percent of the total marine catch of Tanzania. The industry comprises three vessels that trawl for shrimp and use seine nets for sardines within the Tanzanian EEZ. The industrial sector is export oriented. Exports of marine products from Tanzania also comprise tuna, shells, lobsters, crabs, squids, octopus and aquarium fish.



Source: Fisheries Department, Dar es Salaam, 2004

Note: Data from 1997 to 2004 are provisional and subject to change.

Figure 4.3: Marine fish production of Tanzania, 1986-2003 (in tonnes)

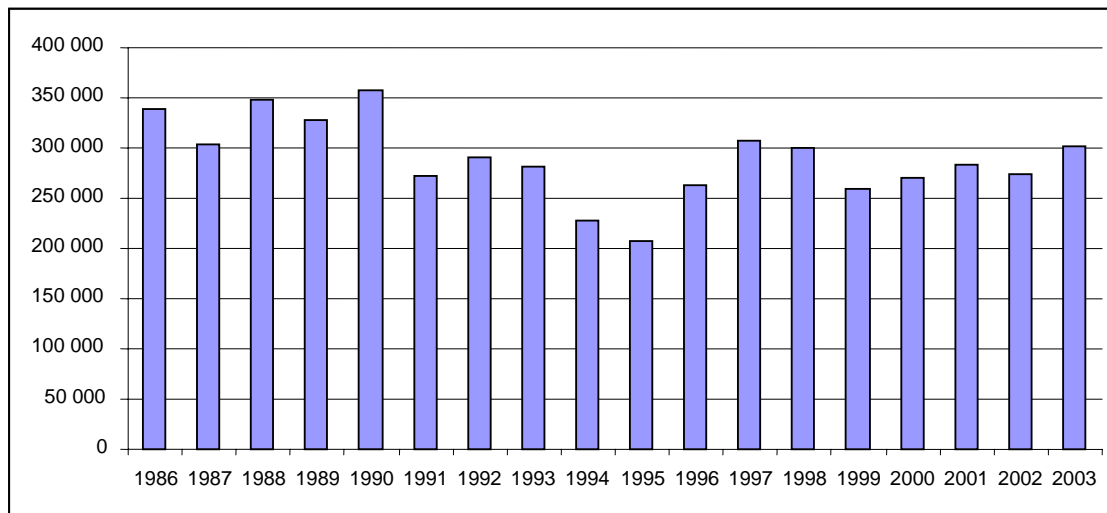
As can be seen from Figure 4.3, the marine fish production of Tanzania has been relatively stable in recent years.

⁶ Bwathondi, P.O.J., Ogutu-Ohwayo, R. & Ogari, J. 2001. *Lake Victoria Fisheries Management Plan. Technical Document No 16.*

Inland fisheries

Tanzania is well endowed with freshwater fishery resources, which are exploited by artisanal and subsistence fishermen. Inland waters cover about 6.5 percent of the total land area of the country.

The main inland fish species are Nile tilapia, Nile perch, small freshwater pelagics (*dagaa*), catfish and *cyprinids*. Lake Victoria is the second largest freshwater body in the world and the most important lake for Tanzania's inland fish production. Nile perch, which was introduced in the lake in the 1950s, is by far the most economically important species followed by endemic species, i.e. *dagaa* and Nile tilapia. Figure 4.4 shows the freshwater fish production from 1986 to 2003.



Source: Fisheries Department, Dar es Salaam, 2004

Note: Data from 1997 to 2004 are provisional and subject to change.

Figure 4.4: Freshwater fish production of Tanzania, 1986-2003 (by year, in tonnes)

Aquaculture

Tanzania has a good potential for aquaculture considering the large coastal belt, which could support brackishwater fish farming, and the existence of hundreds of water storage reservoirs and other small water bodies.

Fish farming started in Tanzania between the early 1940s and the late 1960s. The main species farmed are Nile tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*) on a small scale and rainbow trout on a medium scale. Mariculture mainly involves seaweed farming including the farming of *Kappaphycus cottonii* and *Eucheuma spinosum*. Farming of prawn is still at an infant stage and the main species farmed is black tiger prawn (*Penaeus monodon*). Fresh fish and prawns are cultured in ponds while seaweeds are farmed in the open sea within the intertidal zone.

Freshwater fish farming is carried out along rivers in the Morogoro, Arusha, Ruvuma and Mbeya regions, where farmers can divert river water to their ponds. Prawn farming is done in the Pwani region, particularly in Mafia Island. It is estimated that at least 14 000 people are involved in aquaculture activities. Tanzania does not allow aquaculture activities in Lake Victoria because of the fear that aquaculture operations might contaminate the lake. Table 4.9 shows that aquaculture production in Tanzania has exceeded an annual level of 7 000 tonnes in 1999 and remained stable.

Table 4.9: Aquaculture production of Tanzania, 1994-2003 (in tonnes)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<i>Eucheuma</i> seaweeds	3 000	4 000	3 000	3 000	5 000	7 000	7 000	7 000	7 000	7 000
Nile tilapia	150	200	200	200	200	200	210	300	630	2
Total	3 150	4 200	3 200	3 200	5 200	7 200	7 210	7 300	7 630	7 002

Source: FAO FISHSTAT Plus, 2005

Small-scale fisheries

In Tanzania, the marine small-scale fisheries sector is by far the most important sector of the marine fishery industry. Fish is landed by small-scale fishing boats at many small landing sites. In mainland Tanzania, 95 percent of the total marine catch is landed by small-scale fishers. In the island of Zanzibar, marine fisheries are exclusively artisanal. The landings consist of multiple species. Reef fishes alone such as emperors, snappers and groupers (Serranidae) make up one-third of the catches. Approximately one-third of the total marine catches comprise small pelagic fishes such as sardines (Clupeidae), anchovies (Engraulidae), small mackerels (Scombridae) and horse mackerels. Large pelagic fish species include jacks and trevallies (Carangidae), kingfish (Scomberocoridae), tunas, mullets and swordfish. Other important species are sharks and rays, crustaceans (shrimps, lobster and crabs), octopus, sea cucumber, gastropods, bivalves and shellfish.

In inland fisheries, all fish is landed by artisanal fishers. The landings consist of Nile perch, small pelagics (*R. argentea*) and Nile tilapia. The use of ice is very limited. In the case of Nile perch, the fish is iced only in the trucks, which transport the fish after being sold to agents or representatives of the processing factories. Efforts are under way to improve hygiene and quality of fish onboard during fishing and fish landing. Fish inspectors are recording landings and carry out sample controls.

With regard to fish farming, the private sector is working together with small-scale farmers. The farmers produce seaweed and finfish for family consumption and to a small extent fish for local markets. The government provides technical support and fingerlings to farmers.

Long-term production trends

Figure 4.5 shows that the highest fish production ever recorded in Tanzania both from marine and freshwater resources was recorded in 1990 at 418 600 tonnes. Fish production declined sharply to 295 200 tonnes in 1994. Fish production picked up again in 1995 and stabilized since 1997 around a level of 350 000 tonnes per year. The production trends of marine and inland fisheries in Tanzania are shown in Tables 4.10 and 4.11 and Figure 4.5. Tables 4.12 and 4.13 show marine fisheries landings in Zanzibar.

The relatively stable marine fisheries production in the mainland⁷ as well as in Zanzibar from 1997 onwards as shown in Tables 4.10 and 4.11 may indicate that the marine fishery inshore resources accessible to small-scale fisheries have reached their maximum level of exploitation. Artisanal fishermen can only increase their production if they acquire larger motorized fishing vessels, which enable them to fish in deep waters. While the quantity of the marine production remained at a similar level, the value of the production increased. As also shown in Table 4.10, the production from inland fisheries slightly declined while the value of the freshwater fish production increased over the same period.

Lake Victoria fisheries

As illustrated in Figure 4.6, the Nile perch fishery started in the early 1970s with sporadic landings. In the 1980s, this fishery became more important and the production reached 46 800 tonnes in 1984. It reached its peak in 1990 when nearly 180 000 tonnes were landed. The production then declined to about 100 000 tonnes in 1991 and increased again in 1993, 1995 and 1998. The Nile perch production stabilized between 90 000 and 100 000 tonnes between 1998 and 2003.

The production of the freshwater small pelagic species *Rastrineobola argentea*, locally known as *dagaa*, in Lake Victoria has increased in recent years concomitant with a steady increase in biomass. The population has increased significantly in spite of an intensified exploitation by fishermen, Nile perch and birds.

The Nile tilapia fishery is also experiencing intensified exploitation. There are no definitive data on stock biomass to indicate the current state of the stocks in the lake or to support the argument for overexploitation.

⁷ An exception to the stable marine fisheries production from 1997 onwards have been the increases in the landings of sardines, herrings and anchovies in mainland Tanzania and in Zanzibar as shown in Tables 4.11 and 4.13.

Table 4.10: Fish catches of Tanzania, 1994–1998 (quantity in tonnes, value in TSh)⁸

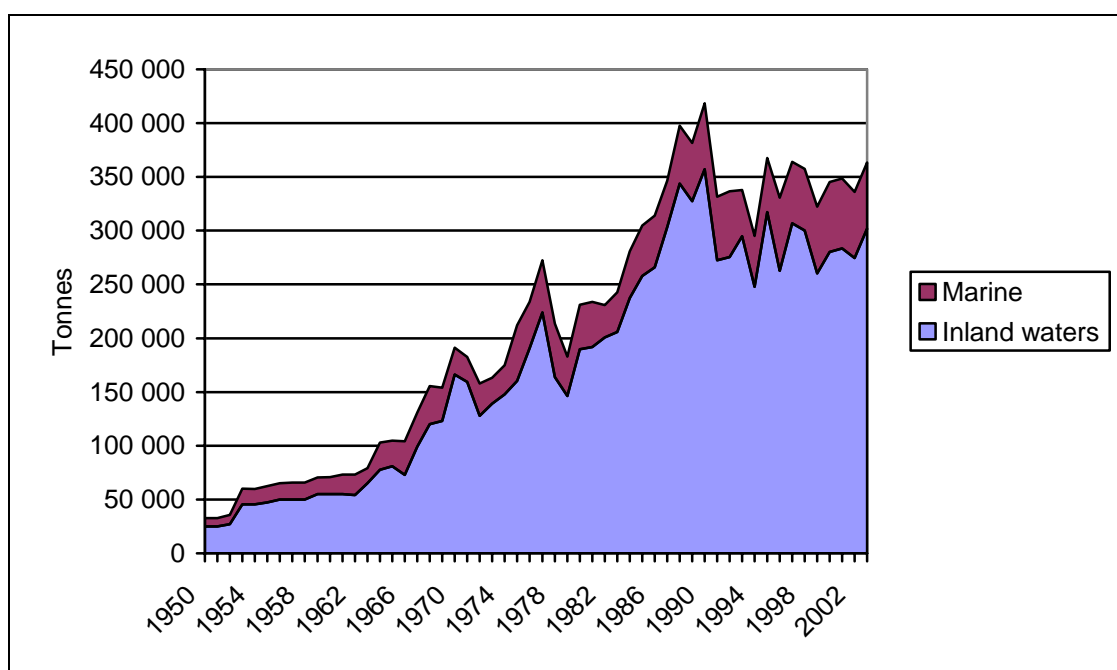
Year	Freshwater		Marine		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1994	228 003	30 949 458	39 072	14 001 152	267 076	44 950 610
1995	207 139	45 805 145	48 761	24 662 430	255 900	70 467 575
1996	262 572	81 209 665	59 508	38 052 517	322 080	119 262 182
1997	306 750	42 265 000	50 210	25 350 000	356 960	67 615 000
1998	300 000	47 486 100	48 000	29 273 500	348 000	76 759 600
1999	260 000	44 018 000	50 000	33 500 000	310 000	77 518 000
2000	271 000	45 500 000	49 900	32 180 000	320 900	77 680,000
2001	283 354	47 108 668	52 934	34 113 717	336 288	81 222 386
2002	273 856	54 771 300	49 674	33 372 136	323 530	88 143 436
2003	301 855	141 073 500	49 270	34 489 000	351 125	175 562 500
2004	312 040	147 743 000	50 470	40 376 000	362 510	188 119 000

Source: Fisheries Department, Dar es Salam, 2004

Table 4.11: Landings of herrings, sardines and anchovies in Tanzania, 1992-2002 (in tonnes)

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Production	5 000	5 472	8 563	3 750	14 323	5 000	4 450	14 000	15 000	15 500	14 000

Source: FAO FISHSTAT



Source: FAO FISHSTAT, 2005

Figure 4.5: Total fish production of Tanzania, 1950–2003 (in tonnes)

⁸ Data from 1997 to 2004 are provisional and subject to change.

Table 4.12: Fish catches of Zanzibar, 2001–2004 (quantity in tonnes, value in TSh 1 000)

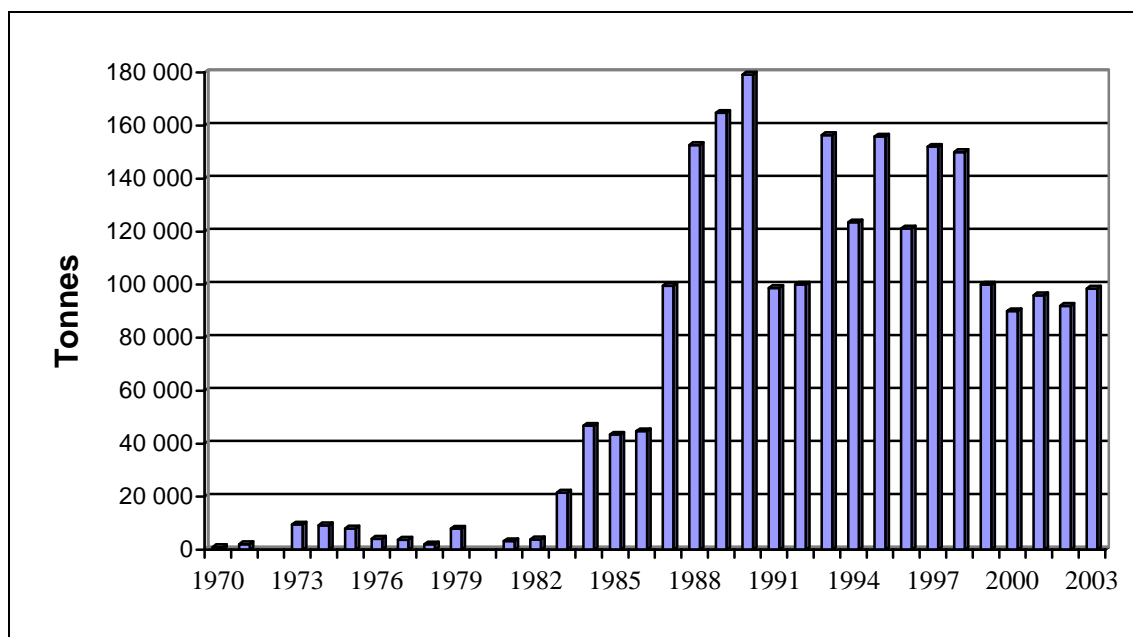
Fish	2001		2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Spine foot	1 109	748 940	1 186	978 087	710	558 549	1 112	10 438 097
Parrot fish	1 056	553 633	828	579 016	801	601 990	758	8 006 051
Emperors	2 178	1 500 477	1 958	1 347 614	1 411	1 170 831	1 713	15 707 942
Groupers	288	173 651	268	168 803	177	208 887	618	6 390 059
Goat fish	1 739	214 074	707	252 078	363	218 281	638	5 740 757
Surgeon fish	548	132 056	684	177 013	521	178 021	589	4 754 702
Mulletts	132	72 466	95	34 838	108	78 925	152	938 899
Anchovies	3 202	805 223	3 772	743 987	4 882	1 222 083	542	21 678 908
Sardine	572	184 051	899	490 124	711	241 128	1 134	9 681 659
Mackerels	1 506	900 594	1 357	966 381	1 726	1 518 491	7 047	8 771 574
Trevallys	511	405 865	742	581 738	472	457 300	299	10 571 035
Yellowfin tuna	1 217	886 153	1 102	920 848	1 069	744 041	568	12 903 102
Swordfish	734	575 641	685	490 494	2 013	506 469	526	7 429 646
Kingfish	711	548 828	1 014	851 845	450	395 217	636	7 126 805
Barracuda	685	440 564	672	497 182	649	502 876	826	7 057 271
Sharks/rays	641	312 081	870	644 689	1 245	2 067 529	833	7 525 578
Octopus/squid	1 038	661 206	980	794 821	701	386 923	965	9 904 885
Lobsters	68	70 417	30	32 813	64	57 307	81	1 035 205
Others	2 606	1 566 940	2 492	1 984 923	2 786	2 070 980	3 440	31 143 291
Total	20 542	10 752 859	20 343	12 537 293	20 861	13 185 828	22 477	186 805 467

Source: Ministry of Agriculture, Natural Resources, Environment and Co-operatives, Department of Fisheries and Marine Resources, Zanzibar, 2004

Table 4.13: Small-pelagic fish catches of Zanzibar, 1998–2004 (in tonnes)

Species/year	1998	1999	2000	2001	2002	2003	2004
Anchovies	1 711	673	1 424	3 202	3 772	4 881	541
Sardine	782	1 769	971	571	898	710	1 134
Mackerels	959	945	1 002	1 506	1 357	1 725	7 046

Source: Department of Fisheries and Marine Resources, Zanzibar, 2004



Source: FAO FISHSAT, 2005

Figure 4.6: Landings of Nile perch in Tanzania, 1970–2003 (in tonnes)

4.2.3 Species exploited by small-scale fisheries and their utilization

Marine species

The main marine species targeted by small-scale fisheries in Tanzania are those that are large in size such as emperors, snappers, groupers, jacks, trevallies, swordfish, kingfish, sharks and rays. Kingfish, tunas, anchovies, sardines, prawns, crabs, lobster, squid and octopus are also caught. Fish landed by small-scale fishers is often of poor quality. This is due to the fact that fishermen do not carry ice onboard their vessels and fish caught far from landing sites has deteriorated by the time it is landed and sold.

There are about 14 fish landing sites along the Tanzanian coast. The Ferry Integrated Fish Market Complex of Ilala Municipality, Dar es Salaam, is the leading fish market and the landing site also receives iced fish from neighbouring districts and islands such as Bagamoyo, Mafia and Zanzibar.

The marine fish caught by artisanal fishers undergoes some form of artisanal processing depending on the target markets. Some finfishes are processed by sun-drying and salting or semi-processed by gutting and cutting in traditional ways for the local markets. Commercial species such as shrimps, lobsters and octopus are usually sold to exporting companies through the companies' agents. Shrimps and octopus are usually iced and kept temporarily in insulated containers for preservation before being processed and frozen for export.

Freshwater species

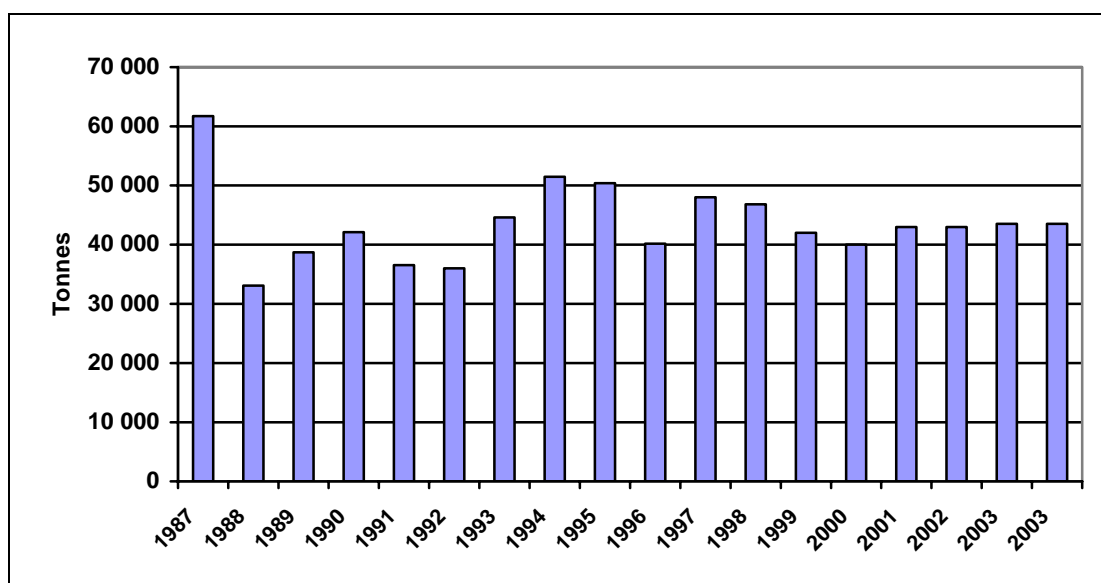
Freshwater species harvested by small-scale fishers from lakes and reservoirs in Tanzania include Nile perch, small pelagics (*dagaa*) and Nile tilapia. The main species harvested under the name of *dagaa* are *Rastrineobola argentea* and *Limnothrissa miodon*. Lake Victoria and Lake Tanganyika are the main sources of freshwater *Rastrineobola argentea*. After Nile perch, *Rastrineobola argentea* is economically the most important species supporting a major artisanal fishery. Other small pelagic species in Lake Tanganyika are the two schooling *Clupeid* sardines *Limnothrissa miodon* and *Stolothrissa tanganicae*.

Rastrineobola argentea is caught exclusively by small-scale and artisanal fishermen. A labour-intensive light fishery for *Rastrineobola argentea* was started in the 1960s and expanded rapidly during the 1980s. Fishing for *R. argentea* is carried out during moonless nights. The fish is attracted by three to five lanterns. Usually, four men are operating a boat owned by someone else, who is not part of the crew. Except for the introduction of inboard and outboard engines, no further technological development has taken place. *Dagaa* is the only endemic fish species that has remained abundant in Lake Victoria since the introduction of Nile perch and Nile tilapia.

In spite of an intensified exploitation by man and predators, the *Rastrineobola argentea* stock appears to be relatively stable. As shown in Figure 4.7 below, over the last ten years, landings have been stable at between 40 000 and 48 000 tonnes per year. There is a growing demand for the product by the local and regional population as well as an increasing demand from the fishmeal industry.

R. argentea is processed primarily with artisanal methods. Direct sun-drying is the first processing step to which *dagaa* is subjected immediately after landing. Once the catch has been landed on the beach it is dried over a period of 24 to 48 hours either on the beach itself, on rocks or on grass. Women from fishing communities usually carry out this labour-intensive process. The fish has to be turned periodically to dry properly. According to artisanal fishers, the fishing ground, where the fish has been caught, apparently has an impact on product quality. *R. argentea* from rocky bottom areas has a longer shelf-life than fish caught in muddy bottom areas.

A major problem with the traditional drying process is the contamination with sand, waste water and other external agents. In addition, the absence of drying racks and shelter facilities impedes the drying process during the rainy season. Post-harvest losses, especially during the rainy season, are very high.



Source: FAO FISHSTAT, 2005

Figure 4.7: Dagaal landings in Tanzania, 1987–2003 (in tonnes)

Box 1

Community Portraits – *Dagaal* Kabajanga Beach

Kabajanga beach is a big landing and processing site for *dagaal* in the Mwanza region. The fishing community of 1 500 people live directly on the beach. One hundred and fifty boats with four fishermen each supply the beach with *dagaal* every day. Each boat owner usually owns more than one boat and is not directly involved in the fishing activity. The nets have to be replaced every 8 to 12 months and only one net is used per boat. The landings are not weighed or recorded due to lack of scales and fisheries inspectors at the beach.

Women dry *dagaal* directly on the sand of the beach. *Dagaal* is spread on the ground for drying and women and domestic animals walk over the drying fish. The fish processed at this beach is both for human consumption and fishmeal production. There is not enough space for drying fish, especially when large volumes are landed. Customers come from Mwanza, Kenya, Malawi and Zambia to buy directly from the artisanal fish processors. Fishmeal processors are among the biggest customers but pay lower prices. The community has not enough funds to improve the fish processing conditions, which are very unhygienic and generate high post-harvest losses. There are no storage facilities available either.

The community has expressed a need for training in better processing methods. In addition, the community would like to sell fresh fish but lack of ice and knowledge about potential demand and markets make it difficult to pursue these wishes. During the rainy season, fishermen stop their activities because the road to the major markets become impossible to travel and the community switches to agricultural activities. The rainy season lasts for six months.

Fresh *dagaal* is sold at TSh3 500 per 50 kg sack while dried *dagaal* is sold at TSh4 000 to 4 500 per 50 kg sack. The price depends on the quality of the product, which is indicated by its colour. About 2 000 sacks of *dagaal* are sold per month at Kabajanga beach.

Once the product has been dried, it is packed in 50 kg bags. *Dagaal* is dried for human consumption and for reduction to fishmeal. With regard to the processing process, there is no distinction between the processing for human consumption and the one for fishmeal.

The only industrial process, to which *R. argentea* is subjected, is fishmeal production. An increasing part of the total landings is now used for fishmeal production. Estimates vary from 50 percent to more than 60

percent. With an increasing amount of *dagaa* being caught in Lake Victoria, fishmeal and animal feed factories have obtained a new and cheaper source of supply of animal protein. Some years ago, the fishmeal and animal feed factories procured mainly low quality *dagaa*, which was not properly dried and was contaminated with sand. Increasingly, the fishmeal processing companies now demand a higher quality product. This demand generates direct competition with *dagaa* dried for human consumption.

Nile perch

The Nile perch fishery is exclusively artisanal and divided into an inshore and offshore fishery. The inshore fishery targets small Nile perch together with tilapia, which has a ready local market. The offshore fishery targets Nile perch in deeper waters for processing factories. The fishery comprises fishermen operating traditional non-motorized fishing vessels such as canoes, using either paddle or sail power, gillnets, baited longlines as well as beach seine nets. Fishermen set gillnets and baited longlines overnight and haul them early in the morning. Those who only use longlines, set their gear during the early morning hours and haul them in the late afternoon.

After fish has been landed, it is weighed and sorted. Fish of highest quality is sold to local agents and middlemen, who sell the fish to processing factories. The factories agree on a price with the agent before the fish is bought from the fishermen. Once this has been done, the price paid to fishermen is determined by agents. In June 2005, the price of Nile perch paid by fish agents to fishermen ranged from TSh1 000 to 1 200 per kg while the price paid to fish agents by factories ranged from TSh1 200 to 1 500 per kg. According to the fishermen at Bwai beach, in most cases, agents manipulate the weighing scales to increase their profit. In some cases, agents provide equipment and capital to fishermen, who then have to sell their catches to them at lower prices. Some factories deal directly with fishermen without going through agents and provide outboard engines, nets and other fishing gear to fishermen on credit under an agreement, by which the fishermen will supply their catch to the factories.

Second grade Nile perch or factory rejects are sold to artisanal fish processors and traders. About 5 percent of the Nile perch landed is rejected by processing factories on quality grounds. Fish caught in remote places, where preservation facilities are poor, is sold fresh for local consumption or is used for artisanal processing. Other Nile perch products that undergo artisanal processing are Nile perch filleting by-products, which are bought by women from processing factories.

Drying and salting

Sun-drying is normally used for preserving small Nile perch, which are caught illegally by fishermen or caught as bycatch when fishing for *dagaa*. Typically, the fish is dried on the beach, on rocks or on elevated racks together with *dagaa*. Just like in the case of *dagaa*, the end product is usually heavily impregnated with sand particles, unhygienic, has a rancid and bitter flavour and does not meet the expected health and nutritional requirements for human consumption.

Second grade, factory rejected low-quality fish is split, gutted, and stacked to allow salt penetration, which by itself causes a dehydration process. The process can take up to three days depending on the size of the fish. Fish is then dried under the sun individually on racks unprotected from the environment. Measurements such as quantity determination or moisture content determination are never employed. The final product is known locally as Kayabo and appears dull white to yellowish in its early shelf-life but with time develops a brown coloration with dark pigmentation. The products have a low nutritional value compared with fresh fish. Vitamins, proteins (amino acids) and lipids degrade during the course of processing and storage. The longer the product is stored, the poorer it becomes nutritionally.

Smoking

Smoking is used for factory rejects and fresh Nile perch of small size. The fish is handled more or less as in the case of salting during the initial preparations. Large size fishes are de-scaled, gutted and split while small size fishes are only de-scaled and gutted. The most commonly used kilns are Chorkor ovens. In these ovens, fish is placed on layers of racks and a fire is lit underneath. When Altona smoking ovens are used, the fish is arranged in rows on spits and a fire is lit under it. In the case of traditional Banda and Drum ovens, which usually are used by small-scale or domestic processors, only one layer of fish is placed on a rack and a fire is lit under it. Most of these traditional ovens are made of mud or mud bricks. They have

limited capacity and are difficult to operate. Drum ovens while durable are also of limited capacity and difficult to operate.

With regard to the hygienic conditions of artisanal fish smoking, the environment is similar to the one described in the case of drying and salting. In the case of smoking though, the heat effect could take care of microbes if the finished product were handled hygienically. This is, unfortunately, not the case. Other characteristics of smoked Nile perch products include the colouration of the final product depending on smoke deposition and exposure time. The final colour of the products also depends on the freshness of the raw material: the fresher the raw material the more attractive the colour. The flavour of the smoked product is a function of its freshness and the type of wood used. Texture is another important aspect. Since the temperatures used are not controlled and depend only on the combustion temperature or the source of fuel used, which in most cases is wood, the final product toughens and becomes hard to chew. Smoked products from Nile perch are mostly of poor quality because they are made from spoiled fish rejected by fish processing plants. The appearance of the product is not attractive. Smoked fish products made from Nile perch rejects are only consumed by low-income groups in the community.

Frying

Frying is used for the preservation of fresh, mostly small-size Nile perch below the minimum size limit. Artisanal fish processors buy Nile perch fat from processing factories and use it for frying the fish. Larger fishes are gutted and cut into small pieces to fit into the frying pan while fishes that are small enough to fit in the pan are fried whole. Insertions are cut across the fish to expose a maximum surface to the heat. Deep and shallow frying is carried out mostly by women only a few metres from the fish landing sites. The product is popular as it represents a ready-to-eat meal and it is usually consumed by fishermen and fish traders as they carry out their daily activities at landing sites and fish markets.

As in the case of other processing methods, hygiene problems are a major concern with this method of processing. The fact that the processing method is carried out in the open only a few metres from the landing site exposes the product to contamination from dust. Furthermore, the product is a ready-to-eat product of limited moisture content, a condition that puts it at risk of microbial and insect contamination and infection. Ideally, the product should be kept in clean protected areas and prepared in shelters that are free from dust.

Nile perch filleting by-products

Nile perch by-products constitute up to 60 percent of the fish after removing the fillets. Artisanal processors buy Nile perch filleting by-products such as trimmings, frames consisting of head, backbone and tail, chests, belly flaps, visceral flaps and skin from industrial processing factories. The belly flaps are dried while the visceral flaps are used for the production of oil used by local fish fryers.

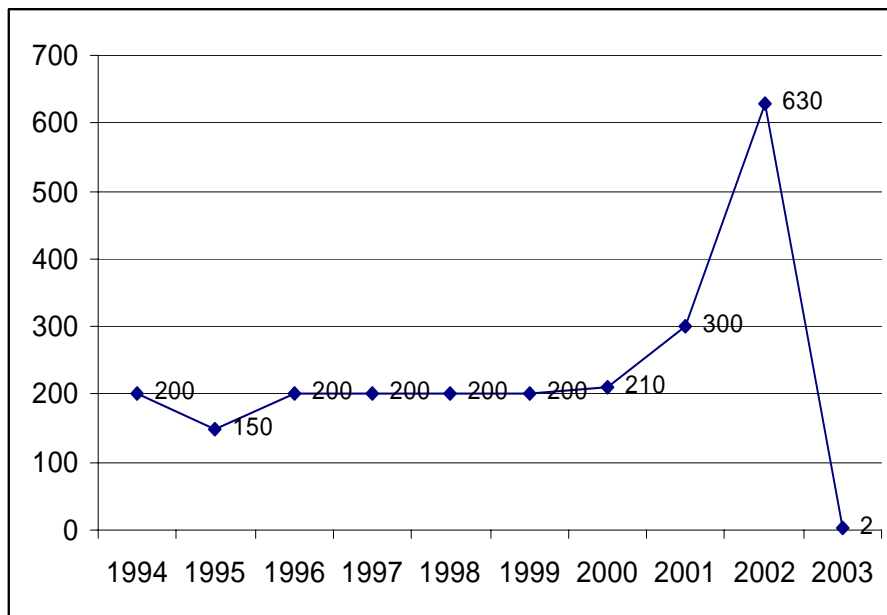
The heads are split open and sun-dried and the backbone with the tail attached is in most cases fried or sun-dried for preservation. Previously, the skin was also dried for human consumption but lately the declining amount of flesh remaining on the skin due to improved filleting methods prohibits this use. The skin is now dried and used as fuel for frying. During the rainy season, drying of Nile perch filleting by-products becomes difficult because the by-products take longer to dry and a good fraction goes bad due to spoilage and insect infestation.

Considerable employment is involved in the artisanal processing of Nile perch by-products. The workers usually lack formal training and education in handling, hygiene and processing methods. Benefits from the processing and trading of Nile perch by-products trickle down to other members of the local communities. The growing fishmeal industry is a major competitor for artisanal processors of Nile perch by-products and *dagaa* threatening employment and protein supply among the poorer parts of the local population. Competition is especially strong for Nile perch frames.

Nile tilapia

Figure 4.8 shows the landings of Nile tilapia during the period from 1994 to 2003. Catches peaked in 2002 and then dramatically dropped in 2003. Like Nile perch, Nile tilapia is exclusively landed by artisanal fishermen. At present, there is no demand from fish processing factories for Nile tilapia. The fish is

exclusively processed by artisanal processors. Nile tilapia is processed with the same methods as factory rejects of Nile perch. Most of the catch is consumed in fresh form and a part of it is smoked and fried.



Source: FAO FISHSTAT PLUS, 2005

Figure 4.8: Nile tilapia landings in Tanzania, 1994-2003 (in tonnes)

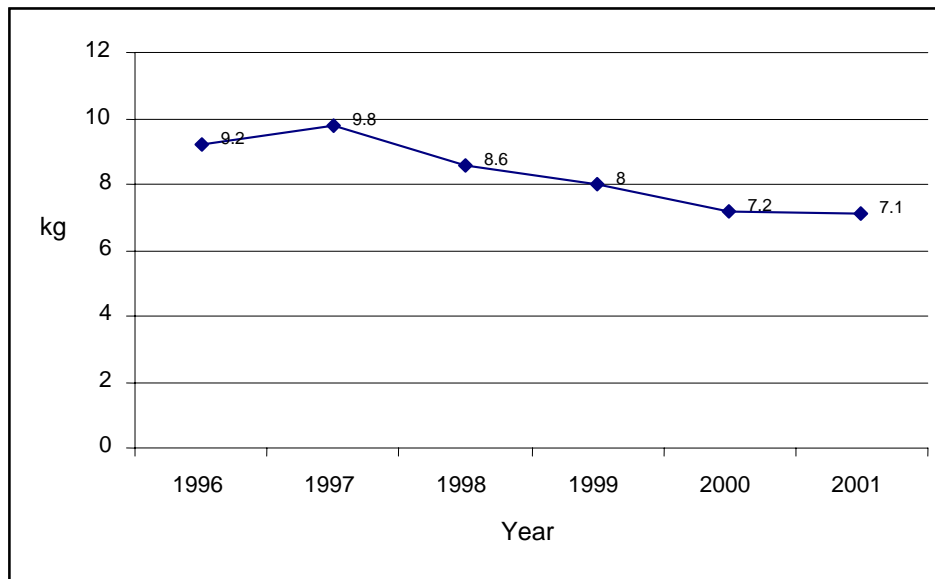
4.2.4 Consumption patterns and marketing channels for small-scale fisheries products

Consumption patterns

In 1999, the world average annual per capita consumption of fish was 16 kg while the overall consumption in Africa was only 6.2 kg. For a fish producing nation, the domestic consumption of fish in Tanzania is relatively modest. In 2001, as shown in Figure 4.9, the per capita consumption of fish in Tanzania was estimated at 7.1 kg, which is only slightly higher than the all-Africa average but lower than the average per capita consumption of about 12 kg in the East Africa region, where fish has traditionally been the most affordable source of animal protein.

Various types of sardine-like fishes in dried form are an important source of protein in the traditional diet of poor and middle-income groups throughout East and Southern Africa. The availability and affordability of dried fish make it well suited for low-income households. *Dagaa* (*R. argentea*) has important implications for food security in Tanzania. While most of the Nile perch and marine fish products are exported, dried *dagaa* remains the staple fish for many households around Lake Victoria and for many communities in Tanzania.

Its high protein content and flesh composition is an advantage to consumers especially to children threatened with malnutrition. Vitamin A is particularly vital for good vision and a healthy skin. Dried fish is one of the richest sources of vitamin A. In Kenya, *dagaa* is used to prepare a protein-rich baby food based on beans, soy and maize to protect against *kwashorkor*, a disease associated with lack of protein. Access to only 10 g of dried *R. argentea* adequately addresses iron, zinc and vitamin A deficiencies common among children. In addition to human consumption, *dagaa* is also used as a source of protein for domestic animals. Fish consumption is high in the dry months of July and August when there are few vegetables that can substitute it.



Source: FAO Fisheries Circular No 821 Revision

Figure 4.9: Fish consumption in Tanzania, 1996-2001 (in kg per person)

Nile perch consumption in Tanzania is relatively low as most of the fish is exported. Only poor quality factory rejects and waste from the processing plants are available in local markets. Tilapia is the most consumed and preferred fresh fish by local consumers. It is easily accessible and can be found in most local restaurants and hotels, particularly those located near lakes. Most of the marine fish is consumed locally, mainly in fresh form. According to the Fisheries Department of Tanzania, almost all crustaceans and cephalopods landed are exported to the European Union, Asia and the Middle East.

Distribution and markets

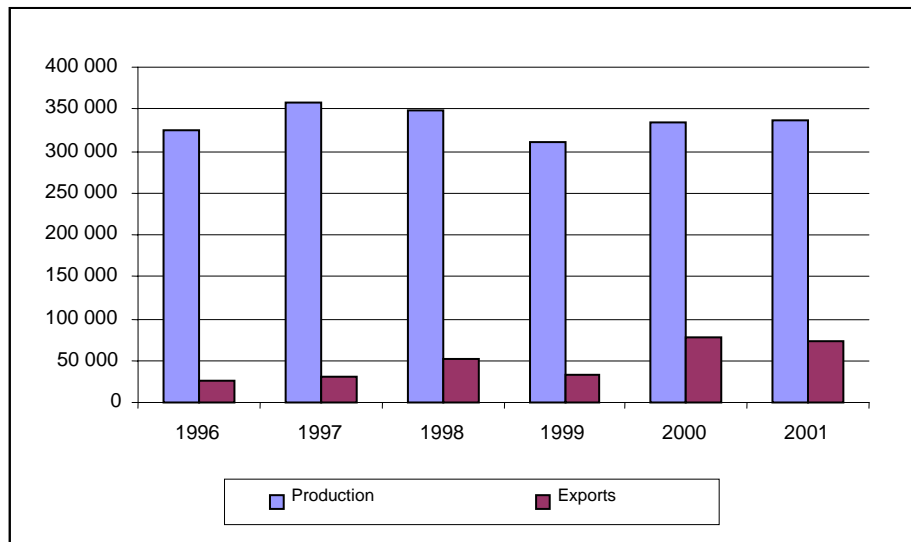
There are two major trade channels for fish in Tanzania. The first channel supplies the local market. It is commonly referred to as the artisanal or informal trade sector. The second channel supplies fish to regional markets. Fishermen sell fish to women or male traders at the landing site, who then sell the fish in nearby markets or to middlemen, who transport it to other rural markets or to distant urban markets. Traders make use of public transport, bicycles or just walk.

Fresh fish is generally traded close to the production centres and in well connected urban centres. Local street markets are still common in Tanzania even though modern retail shops and supermarkets are being established in cities. Rural areas are still penalized by the absence of proper transport, logistics and cold storage facilities.

While Nile perch and marine products such as crustaceans and cephalopods are exported to the United States, the European Union, Asia and Australia, fried and dried Nile perch by-products, dried *dagaa*, fresh and smoked tilapia and various marine products are sold in the domestic and African regional markets. As can be seen from Figure 4.10, only a minor part of the production of fish in Tanzania is presently exported.

Table 4.14 shows that both quantity and value of Nile perch product exports from Tanzania have been increasing during the period 2001-2003.

As far as regional markets are concerned, Table 4.15 shows that the average fish consumption varies widely in African countries. While coastal countries like Mauritius consume an average of 22 kg of fish per person per year, the fish consumption in landlocked countries like Zimbabwe is as low as 1.4 kg per person.



Source: FAO Fisheries Circular No 821 Revision

Figure 4.10: Fish production and exports of Tanzania, 1996-2001 (in tonnes)

Table 4.14: Exports of Nile perch products from Tanzania, 2001-2003 (quantity in tonnes, value in US\$1000)

Product/year	2001		2002		2003	
	Quantity	Value	Quantity	Value	Quantity	Value
Belly flaps	2 876	916	1 280	561	1 546	920
Fillets	31 386	77 212	23 829	78 233	31 561	102 375
Fish frames	398	68	98	15	582	98
Fish maws	1 452	4 689	1 011	2 857	1 354	5 774
Fishmeal	1 655	603	1 019	212	390	157
H & G	1 037	2 324	903	4 283	875	2 083
Fish chests	0	0	267	131	121	64
Fish skin	66	29	706	1 611	601	360
Off cuts	35	13	259	73	129	33
Fish offal	121	286	106	252	124	173
Kayabo	13	38	1	3	4	13
Total	39 039	86 179	29 479	88 232	37 287	112 050

Source: Fisheries Department, Dar es Salaam, 2004

Tanzanian fish is exported to other African countries in fresh or cured form. The main markets for products processed by the artisanal and small-scale fisheries sectors are neighbouring countries in Central, West and Southern Africa, the latter ones being the most important regional export market for artisanally processed fish products.

Dagaa (*R. argentea*) is exported to the Republic of Congo, Kenya, the Central African Republic, Sudan, Nigeria, Rwanda, Burundi, Zambia and South Africa. These markets, together with the markets of the three countries bordering Lake Victoria, i.e. Tanzania, Uganda and Kenya, have a market potential of more than 360 million consumers. the Republic of Congo is by far the single most important export destination for *dagaa*.

Nile perch by-products such as dried trimmings and chests are exported to the Republic of Congo, Burundi, Rwanda and other Central African countries. Small volumes of dried Nile perch (*Kayabo*) are exported to Senegal, Sierra Leone, Zambia and Malawi. Salted Nile perch, often in dried form, is exported to the Republic of Congo and to Rwanda.

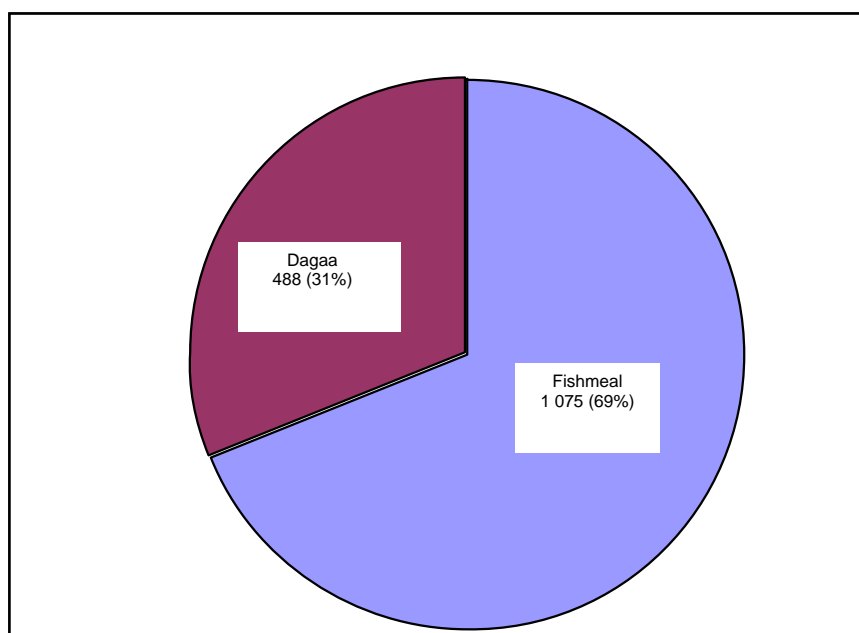
Table 4.15: Per capita seafood consumption in southern Africa, 1996-2001 (in kg)

Country/year	1996	1997	1998	1999	2000	2001
Angola	12.8	11.6	9.8	13.2	13.5	17
Botswana	3.2	4.1	3	3.5	4.7	3.6
Congo	6.5	5.9	7.1	6.5	5.8	5.9
Malawi	6.3	5.5	3.9	4.2	4.1	3.6
Mauritius	19.6	21.1	24	22.9	23.9	22
Mozambique	2.2	2.2	2.7	2.7	2.8	2.1
Namibia	13.1	13.3	13.1	13.5	14.4	14.2
Seychelles	64.2	61.2	60.8	53.4	57.6	61.9
South Africa	6.8	8.5	6.9	6.8	6.4	7.5
Swaziland	0.2	11.6	8.7	6.7	6	4.5
Tanzania	9.2	9.8	8.6	8	7.2	7.1
Zambia	7.6	7.2	7.5	7	7	6.5
Zimbabwe	3.3	3.1	2.4	2	1.8	1.4
Average consumption	11	12.69	12.15	11.53	11.94	12.1

Sources: FAO Fisheries Circular No 821 Revision

South Africa represents the main export market for Tanzanian crustaceans, followed by Mauritius and Ethiopia. The main export products in 2004 were lobsters, squid and prawns. Lobsters were also exported to Zambia and Mauritius. Other important markets for Tanzanian crustaceans are countries in the Middle East and Asia.

Figure 4.11 shows exports of *dagaa* and fishmeal from Lake Victoria in 2004. Fishmeal accounted for more than two-thirds of the total quantity.

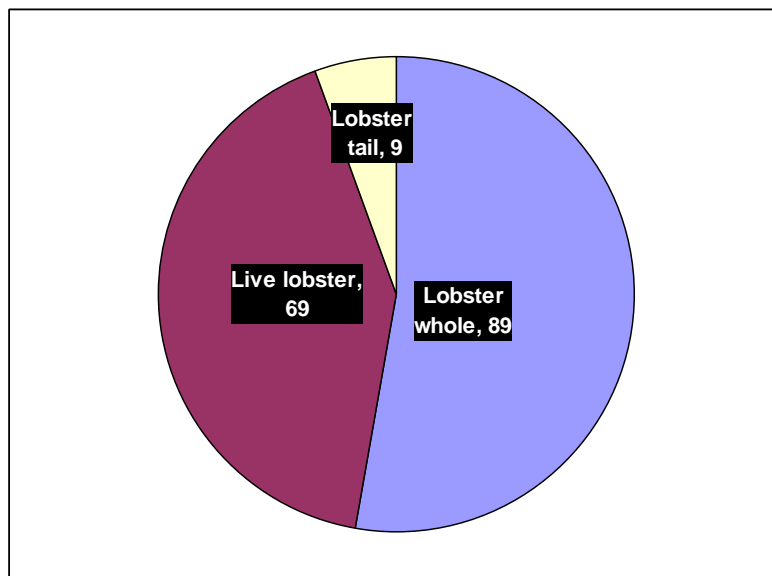


Source: Lake Victoria Fisheries Organization

Figure 4.11: Exports of *dagaa* and fishmeal from Lake Victoria, Tanzania, 2004 (in tonnes)

As far as non-African export markets for fish products from Tanzania are concerned, Nile perch is the dominant fish species accounting for almost 80 percent of the value of Tanzania's total fish exports as shown in Table 4.16. The exported products of Nile perch include fillets, whole gutted and headless fish, fish maws and Nile perch bladders. Main export destinations for fillets are Europe, Australia, the United States of America, China, Hong Kong SAR, Singapore, Japan and the Middle East. Sun-dried Nile perch maws are exported to Asian markets, particularly to China, Hong Kong SAR, China and Japan. Nile perch skin is exported to the UK. Figures 4.13 to 4.16 show exports of Nile perch products from Tanzania.

Other fish products exported from Tanzania to non-African markets are crustaceans, i.e. lobsters, prawns, crabs, freshwater crayfish, molluscs, octopus, squid and marine fish including small quantities of live fish. Figure 4.12 shows exports of lobsters from Tanzania in 2003. In the early 1990s, the marine shrimp production showed a promising development. The main markets for shrimp are Japan and Europe. The European market is the main importer for fish products from Tanzania.



Source: Fisheries Department, Dar es Salaam

Figure 4.12: Tanzanian exports of lobsters in 2003 (in tonnes)

Exports of fish and aquatic products from Zanzibar are shown in Table 4.17. In terms of value, lobsters, sea cucumbers and shells are the main export items.

4.2.5 Involvement of women in fisheries in Tanzania

Women occupy a central place in fisheries in Tanzania, particularly in the onshore and post-harvest sub-sector of the marine and freshwater fisheries sectors, where they play important roles as artisanal fish processors and traders. With regard to *dagaa*, the fishing and fish processing activities usually involve couples. The men go fishing during the night, bring the catch to the landing site in the morning, and women take over the processing and trading of the fish caught.

Previously, women processed Nile perch and tilapia but these species are no longer available in sufficient quantities as they are now being processed in factories. Because of this situation, many women either left the processing sector or turned to processing of Nile perch by-products such as Nile perch frames bought from fish processing factories. These women are often organized in cooperatives and most of them are single mothers, orphans and widows. In Tanzania, women handle from 70 to 87 percent of all fish trade in the artisanal sector and sell all sorts of fish products including smoked, fried, fresh and dried fish.

Many of the marketing centres, where women sell their fish, have no electricity or running water even where water pipes are installed. Despite the fact that women are of great importance to the fishing industry, they have received little attention from both government and non-governmental organizations.

Table 4.16: Tanzanian exports of fish and fish products, 2003

Product	Quantity (in tonnes)	Value (in US\$1000)
Aquarium fish	25 pieces	249
Beche de mer	12	40
Belly flaps	1 546	920
Crabs	40	119
Dagaa	62	79
Nile Perch fillets	31 561	102 375
Fish chests	121	64
Fish frames	582	95
Fish maws	1 354	5 774
Fishmeal	390	157
Fish offal	124	173
Fish skin	601	360
H & G	875	2 083
Kayabo	4	13
Live crabs	168	926
Live lobsters	166	2 051
Lobster tails	2	12
Lobsters	146	1 443
Off cuts	129	29
Octopus	1 603	5 045
Prawns	1 672	5 980
Sea shells	896	380
Squids	298	1 240
Total	42 352	129 607

Source: Fisheries Department, Dar es Salaam

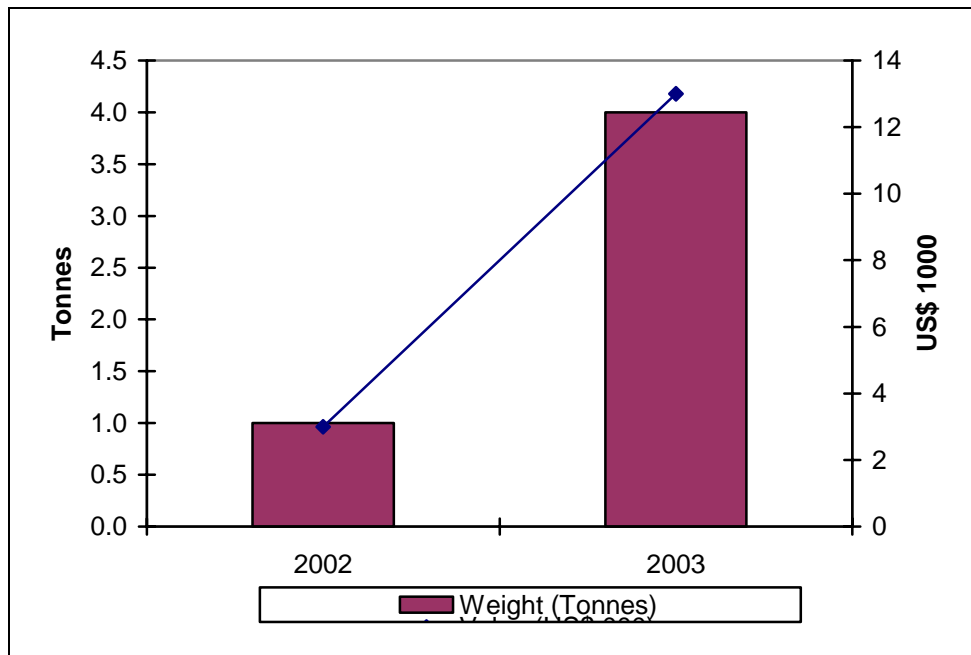
4.2.6 Improving marketing efficiency for fish products from small-scale fisheries and developing innovative products

There is a great potential for improving the marketing efficiency of the small-scale fisheries sector in Tanzania. Significant improvements could be achieved if better and more hygienic fish handling and storage methods and facilities were introduced. This would improve product quality, reduce post-harvest losses and increase the income of the people involved in the sector.

There are also possibilities for adding value to fish products. A major problem with artisanally processed fish products is packaging and labelling. Presently, final products traded by artisanal fish traders are not packed in any form. Small pelagics are sold in cans or containers in bulk and traders use plastic shopping bags or newspapers to wrap their products. The most popular cans are engine oil cans obtained from petrol service stations. To make matters worse, the buyer generally has no knowledge of the origin of the fish and fish products he/she purchases. Improved and more eye-catching packaging and labelling could qualify dried artisanally processed products for distribution through national and regional retail chains.

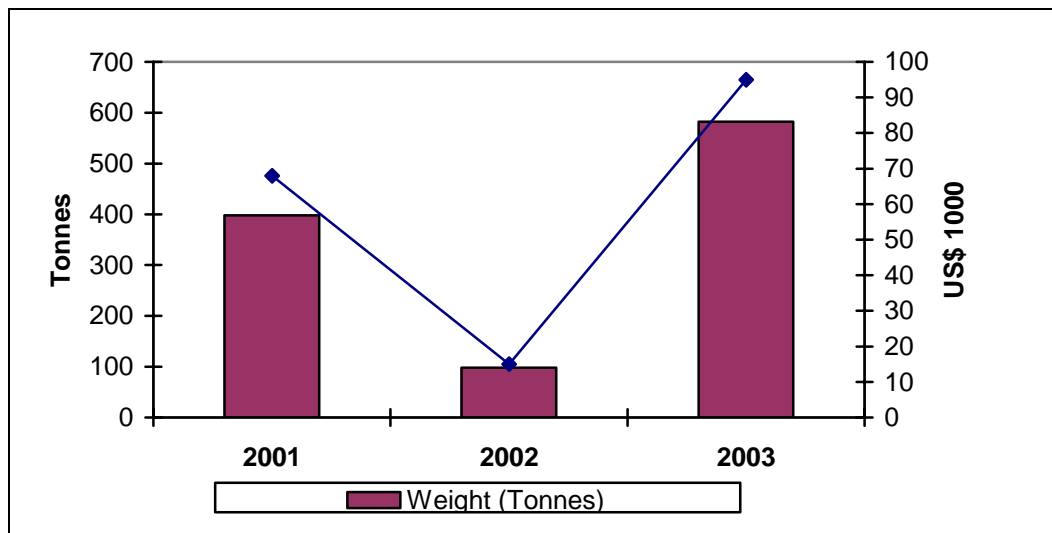
Presently, about 75 percent of all traded fish go through some form of processing like freezing, filleting, smoking, canning, de-scaling and gutting before being consumed. About 40 percent of all processed fish is processed into fishmeal and fish oil and about 60 percent is destined for human consumption.

Processing of fish is one possible approach for adding value to fish, obtaining better prices, prolonging the shelf-life and giving it wider possibilities for marketing. Value-addition does not necessarily mean advanced processing but can also be achieved through improved packaging, transportation or marketing.



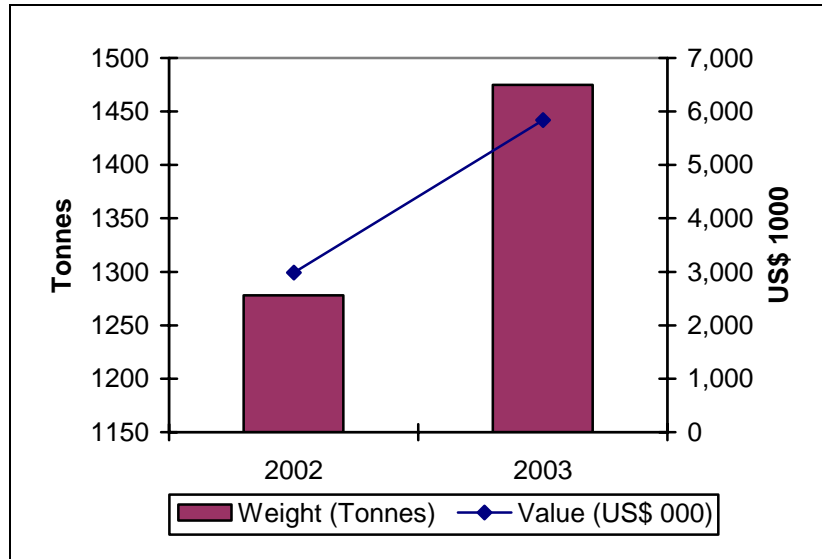
Source: Fisheries Department, Dar es Salaam, 2004

Figure 4.13: Tanzanian exports of salted Nile perch, 2002–2003 (in tonnes)



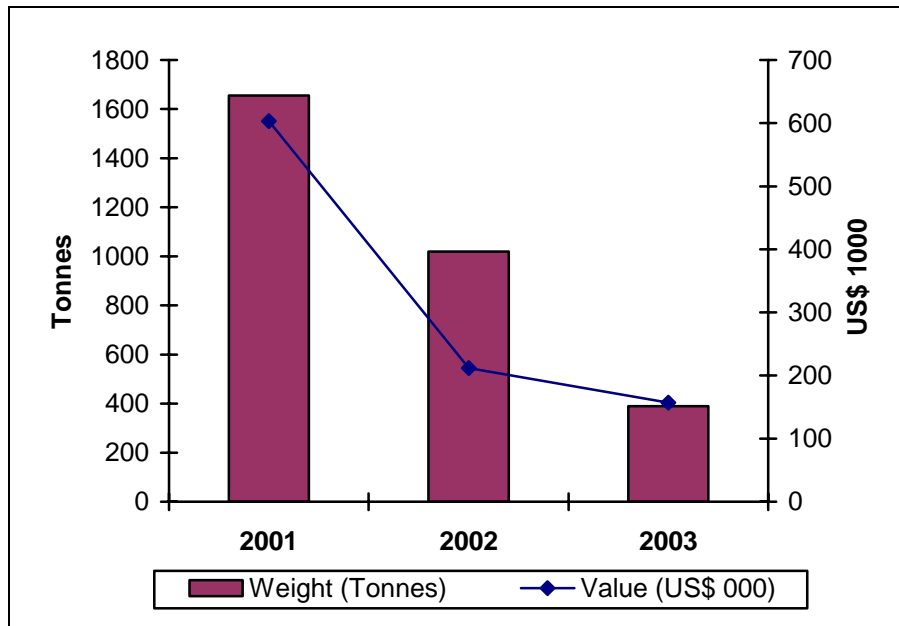
Source: Fisheries Department, Dar es Salaam, 2004

Figure 4.14: Tanzanian exports of Nile perch frames, 2001–2003 (in tonnes)



Source: Fisheries Department, Dar es Salaam, 2004

Figure 4.15: Tanzanian exports of Nile perch trimmings and chests, 2002–2003 (in tonnes)



Source: Fisheries Department, Dar es Salaam, 2004

Figure 4.16: Tanzanian exports of fishmeal from Nile perch, 2001–2003 (in tonnes)

Enhancing product image, quality, packaging and presentation are the key factors in determining consumers' acceptance of new products and increasing marketing efficiency of products from the small-scale fisheries sector. Small pelagics in Tanzania are consumed either in fresh, in the case of marine products, or dried form as in the case of freshwater *dagaa*. The most interesting small pelagic species for value addition is *dagaa* because it represents the economically most important small pelagic species in the country. The *dagaa* industry has shown a lot of initiative in developing high quality products. One possible product is represented by smoked and spiced *dagaa*, which is currently produced at an experimental level, targeting the high income group in local markets. In Kenya, the Kenyan Fish Processors' Association is providing training for small-scale processors and traders on fish handling and sanitation and also on solar drying techniques to improve the quality and add value to *dagaa* products. Other potential opportunities for value-added *dagaa* include such products as canned *dagaa* in tomato sauce, brine and olive oil.

Table 4.17: Annual exports of marine products from Zanzibar, 2000-2004 (W= quantity in tonnes, V= value in TSh)

Product	2000		2001		2002		2003		2004	
	W	V	W	V	W	V	W	V	W	V
Lobster	0.04	125 750	0.38	528 000	5.54	11 001 000	15.08	39 764 000	27.78	77 820 000
Sea cucumber	11.64	13 406 740	25.67	36 352 980	83.39	73 486 300	34.32	29 640 175	50.93	41 979 125
Fresh fish	1.69	7 028 300	0.51	118 500	0.01	40 000			0.00	18 000
Fish offal					0.02	5 400	3.13	1 225 000	0.12	330 000
Octopus	4.39	2 625 000	0.29	322 600	0.01	23 000	290.71	44 184 200	12.57	13 927 500
Squids	0.04	78 500	0.01	14 400						
Skin of grouper									1.33	9 160 000
Shark fin	0.10	480 000	0.70	5 780 000	1.57	11 346 950	5.30	9 810 000		
Crabs					61.00	4 260 000	2.55	1 046 000		
Shells			58.01	12 660 500	90.50	19 647 000	114.91	27 633 000	92.22	32 990 000

Source: Department of Fisheries and Marine Resources, Zanzibar, 2004

Other small pelagic species with potential for value-addition are marine pelagics such as anchovies, horse mackerels and small mackerels. A wide range of anchovy products are produced around the world including frozen and dried anchovies, salted anchovies, canned anchovies, canned anchovy fillets and anchovies boiled in saltwater. Common anchovy products for direct human consumption are salted anchovy fillets or whole salted anchovies, which are used, among other things, as pizza or salad toppings. More elaborate products are rolled anchovy fillets with capers or anchovy paste. Usually, salted products are packed in glass jars or easy-to-open tins while paste is offered in tubes of different sizes for catering, retail and individual use. In Malaysia and Japan, dried and spiced anchovies (*Niboshi*) are used as snacks to eat at cinemas and sport arenas.

In Tanzania, frozen small pelagics are processed in different ways. They are de-headed, split and placed in brine for one or two hours and then sun dried. Another preparation is to dip them in a sugar, chilli and pepper solution for one or two days before sun drying. The final products are used in soups, porridges, with noodles, vegetables and meat.

Box 2

Example of value addition – *Dagaa* Fisheries Department Training Centre, Mwanza

The Fisheries Department Training Centre in Tanzania is experimenting with value-addition for *dagaa*. *Dagaa* is dried, spiced and smoked to improve shelf-life, quality and taste. The new production process takes approximately five hours while the traditional, artisanal processing takes 24 to 48 hours. The product is of a high quality and sold to local communities, schools and institutions. There is a great demand for this high-quality product.

There is need for investment to expand the production capacity. Currently, only about 100 kg are produced per day. A strong potential for exports to other African countries is foreseen. The local population would benefit through higher income and improved product quality. Post-harvest losses could be reduced significantly.

Potential value-added products from Nile perch by-products

Various studies have been conducted to assess the possibilities of producing value-added products from Nile perch by-products through the preparation of fish burgers and sausages for export markets and by using the waste products for the production of pet food. While the proposed products would improve the

yield and increase foreign exchange earnings, such innovative value-added products from Nile perch by-products for exports could be detrimental to the existing artisanal industries and markets in East Africa. The existing market for fried Nile perch frames and the regional market for Nile perch trimmings, chests and oil are well established and support food security for a number of low income and vulnerable people in Southern and East Africa.

Introducing higher quality and hygiene standards for the present product forms would be the first step in the right direction. Current processing methods suffer from a lack of hygiene and basic equipment. Simple facilities like drying racks or more efficient cooking facilities could reduce post-harvest losses. Training in improved fish handling and hygiene would have a positive impact on the quality and nutritious value of the final product. In addition, improved and more eye-catching packaging and labelling could increase customer acceptance and distribution in national and regional market chains. Vacuum packaging of fresh, fried and smoked products such as whole Nile perch and Nile tilapia would contribute to a longer shelf-life.

Target groups for value-added products and future markets

Value-added products from small-scale producers could target two different types of consumers. The first group is represented by the current target group, i.e. low income consumers in domestic and regional markets. The products to be sold to this group are high-quality products but without extra ingredients added, e.g. spices and salt, that would increase the price as long as the product is produced in hygienic conditions and fit for human consumption. The second potential target group is represented by the economically well-off. In Africa as a whole, there is a growing middle class, mainly living in urban areas, which is able to pay for quality products. This type of consumer is looking for attractive packaging like pull-top oval tins or transparent plastic containers with foil tops.

Intraregional trade in the SADC region is currently underdeveloped. In 2001, an estimated 150 000 tonnes of fish products were distributed within the region. This represents only 10 percent of the 1.5 million tonnes of fish produced annually. The trend is likely to change as better trade agreements are implemented. The SADC Protocol on Fisheries is of particular importance to the cross-border fish trade by small-scale traders because it promotes intraregional fish trade through the reduction of trade barriers and increased investment within the fisheries sector.

Also, the recent trends to expand international trade through tariff reduction and trade agreements promoted by the World Trade Organization is of particular importance for Tanzanian marine products such as shrimp, prawn and lobster, which are exported to international markets. Global international trade in fish and fish products is growing. A recent study shows an increase in international fish trade from US\$52.7 billion in 1996 to a record US\$63.3 billion in 2003.

4.2.7 Constraints and needs

Constraints

Small-scale and artisanal fisheries are confronted with serious problems throughout all stages of fishing, fish processing, distribution and marketing. The major obstacles are listed below.

Security

The majority of fishermen fishing at sea and in major lakes have expressed concerns about theft and lack of security while fishing. Fishermen are being attacked and even killed by thieves trying to steal their gear and boats. The most dangerous place appears to be Lake Victoria, where security is rapidly deteriorating.

Lack of credit

Artisanal and small-scale fishers in remote areas of Tanzania experience difficulties in obtaining credit to purchase fishing equipment. Currently, fishermen rely on factory owners and agents to provide them with fishing equipment in exchange for supplying fish at lower prices. Women in particular are affected by the lack of credit in their communities. Providing credit to women would enable them to buy processing facilities, increase production and access new markets both locally and regionally. Despite the fact that women have a higher loan repayment rate than men, they still do not have access to credit.

Lack of knowledge of and infrastructure for handling, storage facilities, transport, and distribution

There is a lack of sufficient knowledge of and facilities for fish handling and preservation. Currently, post-harvest losses due to poor handling are estimated to be as high as 40 percent of total fish landings. Products processed at the artisanal level are usually prepared in unhygienic conditions with negative impacts on the quality of the final product. The availability of simple cold storage facilities and the application of hygiene standards in processing areas for fish products could easily reduce this predicament and subsequently alleviate the pressure on fish stocks through a more efficient utilization of the available resources.

Poor transport system is hampering the distribution and marketing of fish in Tanzania. Most of the road networks in rural areas are in poor condition and cannot be used during the rainy season. Flights between African countries are very expensive. A functioning transport system including proper roads and the use of insulated trucks could facilitate the distribution of fresh fish in domestic markets and to neighbouring countries.

Taxes and import duties

High tariffs, a lack of harmony of currencies and inefficient customs services have prevented most African countries from increasing trade between them. The volume of cross-border fish trade in Tanzania is very difficult to assess as most of the trading is done informally and in small quantities to avoid taxation. Many efforts are being made by a number of regional and sub-regional organizations to identify a common trade policy for their respective member countries but so far very little has been achieved and countries have not enforced regional trade initiatives. Some African countries are also afraid that lowering or eliminating tariffs on trade with their regional partners will deprive them of an important source of government revenue.

Lack of information and education

Many small-scale fishing communities are located in small isolated settlements along the shores of coastal and inland waters and have no access to information. Illiteracy is widespread in fishing communities. This hampers their access to appropriate technology for fish preservation and processing as well as their ability to access information on resources, markets and prices. The region is also characterized by poor dissemination of information on appropriate techniques of fish handling, preservation, processing and distribution methods.

Needs

Improvement of product quality and marketing efficiency for small-scale fisheries products will require financial investments, which governments and local communities are unable to make on their own. The fisheries sector requires external finance and technical assistance from donor agencies in areas such as training, research and infrastructure. Training and technologies for fish handling, preservation, processing and storage as well as quality assurance systems are needed to add value to the current products and increase commercialization of the small-scale fisheries production to benefit fisherfolk through higher prices for better quality fish products.

Infrastructure for fish processing and marketing and construction of laboratories for quality assurance are urgently needed. Fish processing shelters would be beneficial especially during the rainy season when processing in major landing sites closes down. Processing facilities such as improved drying racks for drying *dagaa* and Nile perch are needed to improve hygiene standards.

Fishing communities need financial assistance to establish solar drying facilities as currently used in Kenya. Solar drying techniques will improve the quality of the end product, increase production and relieve women of the current labour-intensive methods of fish processing. In addition, solar panels and more efficient cooking facilities are required for frying Nile perch and Nile tilapia to eliminate the use of firewood, the collection of which has increasingly contributed to environmental degradation in most of the rural communities.

Clean tap water is missing in many processing and trading areas. Existing marketing infrastructure needs to be rehabilitated and new ones need to be built in many of the fish markets following the examples of the new Kirumba market in Mwanza and the Ferry Integrated Fish Marketing Complex in Dar es Salaam both

financed by the Japanese government. The Kirumba market consists of a jetty for landing of fish, two shelters and wooden racks for wholesale and retail trading. This marketing structure was specifically established to cater to small-scale traders supplying regional and domestic markets. The new fish market in Dar es Salaam, which is the biggest fish market in East Africa, has seven sections including a fish landing site, an auction building, fresh fish retailer stalls and a processing section for frying fish.

Road rehabilitation and maintenance is another major concern. Most of the roads connecting fishing communities are in bad condition and need to be rehabilitated in order to increase access to markets both in terms of selling products and buying commodities. In addition, post-harvest losses have been encountered due to the difficulties of transporting fresh products destined for inland markets because of poor roads.

Interest has been shown by small-scale fishers to have ice-making machines, insulated trucks and storage facilities available at landing sites. The ice could be used onboard the vessels to preserve catches and extend the shelf-life of fresh fish, while insulated trucks would be used for distribution of fresh fish to markets.

Fishermen need credit facilities where they can borrow money to purchase fishing equipment. Most of the landing sites and processing plants have community-based organizations such as Beach Management Units (BMU) and cooperative societies with chairpersons, treasurers and secretaries. Credit facilities should be provided to and administered through these community-based organizations. There is also a need for the promotion of village level savings associations accompanied by training on savings schemes and creation of awareness of the importance of savings for income generation.

5. PRESENT AND FUTURE MARKETS FOR FISH AND FISH PRODUCTS FROM SMALL-SCALE FISHERIES IN LATIN AMERICA – THE CASES OF MEXICO, PERU AND BRAZIL

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5.1 Artisanal fisheries and aquaculture in Latin America

In Latin America, the term “artisanal fisheries” is commonly used in many countries to distinguish this sector from industrial fisheries. Different countries have different definitions. In Brazil, it is not the size or dimensions of the fishing gears used but the working relationship, which defines artisanal fisheries. An artisanal fisherman is self-employed and owns his fishing gears. He works together with relatives or associates without a formal employer-employee relationship.

In Mexico, the terms “small-scale” and “artisanal fisheries” are not commonly used. When used, they distinguish fishing and production areas. Small-scale and artisanal fisheries operate within three nautical miles from the coastline as opposed to high sea fisheries and use small boats defined as boats of less than 10 GT. Boats with more than 10 GT are categorized according to the species targeted, i.e. tuna boats, sardine and anchovy vessels, shrimp vessels and white fish or multiple-purpose fishing vessels.

In Peru, artisanal fisheries are defined as those practiced by boats having a fish hold capacity of up to 32.6 m³, which corresponds to a vessel size of about 30 tonnes and a vessel length of up to 15 m. Artisanal fisheries are also defined as fisheries, which catch fish for human consumption and not for reduction to fishmeal. There are different landing sites for artisanal fishing boats and industrial fishing vessels even in the same harbour.

All other Latin American countries have their own definitions of small-scale and artisanal fisheries related to the size of fishing gears, fishing areas and employment relationships and conditions. In some countries, the differentiation between artisanal and industrial fisheries is more important than in others according to the importance given to this differentiation in national fisheries statistics and other factors.

In the light of current global concerns, the characterization as artisanal fisheries should be seen as positive characterization. The limited coastal fishing grounds accessible to and exploited by artisanal fisheries for instance highlight the important potential role artisanal fishermen and their communities can play in coastal management. The limited size and dimensions of their gears have a positive impact on the sustainability of fishery resources exploited by them. The free association of skilled workers of a community without formal employment relationships can be seen as a very modern way of working and of creating wealth.

The semantic differentiation between “small-scale” and “artisanal” may have implication for the perception of the public in general as well as of consumers. In some countries, for food products including fish, the seal “artisanal product” is perceived as a seal of quality. In Latin American countries, with very few exceptions such as the Brazilian whale hunting in the eighteenth century, all fisheries could be considered as being artisanal until the middle of the twentieth century. Artisanal fisheries are therefore largely also traditional fisheries.

By the nature of their activity, for joining efforts and for common security, fishermen in almost all countries live in separate communities. Fishermen villages along the coast or along rivers or fishermen districts in big coastal towns and cities are normally established around small wharfs or landing facilities. Since the first half of the twentieth century, most of these communities are organized in associations or cooperatives. The organization of fishermen communities in the first half of the twentieth century was supported by the national navies as a means of supervising national coastlines through “the eyes and ears” of the fishermen. It was in this sense that the Brazilian Navy, for instance, organized a four-year (1919-

1923) mission of a cruiser to organize “fishermen colonies” with basic medical care and schools and a strong sense of patriotism. Most of these colonies still exist today.

The modern Latin American industrial fishery sector was developed during the 1960s and 1970s targeting mainly export markets. The development of industrial fisheries focused on shrimps, lobsters, tuna, hake and other commodities demanded by growing international markets. Other industrial producers, however, focused more on domestic markets such as the suppliers of canneries and some processors of frozen seafood.

Artisanal fisheries have improved during this period through the modernization of boats and gears, utilization of bigger boats, a growing use of steel or fibreglass in substitution of wood and the progressive substitution of oars and sails through inboard and outboard motors. Artisanal fisheries, however, remained largely focused on the domestic markets, which were growing everywhere, following a rapid population growth in most Latin American countries combined with growing urbanization. About 80 percent of the Latin American population is currently urban and concentrated in big cities.

Together with the development of fisheries as part of the overall development of the countries, road networks were constructed along most of the coasts, facilitating the transport of catches to markets and also encouraging tourism, which began to occupy large portions of the coastlines through the construction of beach residences for local urban middle and upper classes and hotels for domestic and foreign tourists. The impact of this development on traditional fishing communities was multiple. On the one hand, it made the sale of their fish production easier through better transport facilities and by bringing consumers closer to fishing communities, at least during vacation times. On the other hand, many fishermen were attracted to other activities like construction industries and tourism. Many fishing communities, particularly small ones, vanished and were absorbed by new employment opportunities. Other fishing communities quickly adapted to the new times and modernized their fishing activities.

The cases of Mexico, Peru and Brazil illustrate the general trend of the Latin American continent. These three countries concentrate more than half of the Latin American population and also more than half of the Latin American fish production. The largest part of this production is of Peruvian *anchoveta* processed into fishmeal as shown in Table 5.1.

5.1.1 The case of Mexico

There are about 1 650 fishermen cooperatives in Mexico known as *Sociedad Cooperativa de Producción Pesquera*. In the 1940s, the Federal Government had promoted these cooperatives and given them for many years the monopoly of the catch and marketing of eight important species including shrimps, lobsters and oysters.

The case of Tamiahua Fishermen’s Cooperative is illustrative of how artisanal fishermen can organize their community. The town of Tamiahua is located at the southern mouth of the Tamiahua lagoon. The lagoon covers an area 88 000 ha and is about 100 km long and 25 km wide. The lagoon serves both tourism and fisheries. Catches in the lagoon are regulated through concessions given to local fishermen organizations. These concessions ensure the protection of habitats and the conservation of the aquatic and natural resources of the lagoon. The fishermen organizations have agreed to use only selective fishing gears, which ensure the sustainability of their fishing activities and restrict possible negative ecological impacts. The main species harvested in the lagoon are oysters, shrimps and some white fishes.

The town of Tamiahua has 5 153 inhabitants, which account for 19.2 percent of the population of the entire municipality. The town has 2 562 registered fishermen, of whom 343 belong to the Cooperative “Fishermen of Tamiahua”. This cooperative was legally established as a cooperative society with limited responsibility and variable capital. The cooperative is one of the biggest social organizations in the state of Vera Cruz. Since its establishment in 1972, the number of members of the cooperative has remained the same. The cooperative has concessions for the extraction, catch and processing of oysters and shrimps, as well as authorizations to catch blue crabs and finfishes such as seabreams, snooks, mullets, sea trout and other species inside as well as outside the lagoon. The concessions are renewable every 20 years.

Table 5.1: Average seafood consumption in Latin America and the Caribbean, 1999-2001

Country	Production (tonnes)	Non-food use (tonnes)	Import-export balance (tonnes)	Population (1 000)	Per capita production (kg)	Per capita consumption (kg)
Mexico	1 366 071	238 725	- 92.070	98 928	13.8	10.4
Peru	9 032 601	8 302 807	-212.085	25 950	348.1	20.1
Brazil	922 658	60 635	229.241	171 795	5.4	6.5
Total Latin America & Caribbean	19 197 660	12 617 204	-2.147.991	520 214	36.9	8.7
Share of 3 countries of total Latin American production, non-food use and population	59%	68.2%		57%		

Source: FAO, 2002, Fisheries Statistics – commodities

Production techniques in Tamiahua

Oysters are harvested with fibreglass boats of 18 to 23 ft (5.5 to 7 m) in length and outboard motors of 15 to 40 hp. Grapples are used, which consist of two rakes with 26 nails joined in the middle and operated like pincers. On banks with high oyster density, it is possible to extract around 200 oysters in one operation. Oysters under 8 cm in length are returned to the oyster bank. The oysters of a proper size are packed in bags of 35 to 40 kg. These bags may contain up to 500 oysters each.

Shrimp is caught from 19.30 hours in the evening to 05.30 hours the following morning by only one person per boat operating a scoop net in a wooden corral locally called “charranga”. To catch blue crabs, a crew of two persons in a boat operate crab pots. Pots are set with fish or chicken parts as bait for about 30 minutes.

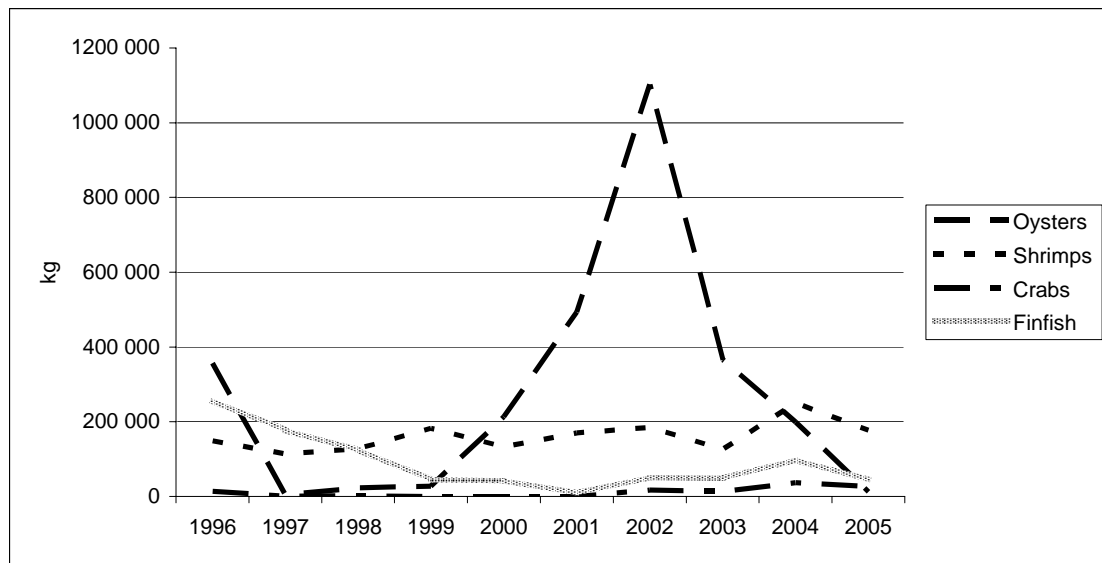
Finfish are caught with gillnets of about 300 m length, 3 m depth and mesh sizes between 76 to 102 mm. The nets are made of mono- or multifilament twine of 0.2 to 0.55 mm. Nets are set for 8 to 12 hours. A boat fishing for finfish has a crew of 2 or 3 persons. The main species caught are seabreams, snooks, mullets and sea trout. The catches are kept onboard in fish boxes with a capacity of 40 to 50 kg without ice. The boats return in the evening to unload their catches at the landing site, where fishes are kept in basins covered with wooden panels.

Fishermen bring their catch to the cooperative to be sold locally or to be sent to other towns of the region and to Mexico City. In the latter cases, the catch is placed in insulated containers made of fibreglass and kept in ice. The ice is bought at the ice plant of the town at a cost of 90 to 100 Mexican pesos, which is equivalent to US\$8.40 to 9.50 per ice bar. The monthly average cost of ice incurred by the cooperative is about US\$2 000. Table 5.2 and Figure 5.1 show the catch record of the Tamiahua Fishermen’s Cooperative society over from 1996 to 2005. This period includes three years, i.e. 1999 to 2001, when crab catches were banned. While the catch records of shrimp suggest that the resource is exploited in a sustainable manner, the oyster banks seem to have been overexploited during the period from 2000 to 2004. It seems that the exploitation of oysters in the lagoon is not well managed.

Table 5.2: Fish landings in Tamiahua, Mexico, 1996-2005 (in tonnes)

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Oysters	357.28	4.48	22.99	27.47	212.94	493.43	1 102.11	365.64	199.28	12.07
Shrimps	148.60	114.24	127.92	182.18	132.820	170.07	185.17	126.06	250.16	177.07
Crabs	13.64	.90	1.97	0	0	0	17.34	12.58	36.46	26.81
Finfish	255.97	176.79	124.53	44.81	41.70	9.39	50.44	49.07	97.61	44.74

Source: Tamiahua Fishermen’s Cooperative



Source: Tamiahua Fishermen's Cooperative

Figure 5.1: Fish landings in Tamiahua, Mexico 1996-2005 (in kg)

As shown in Table 5.3, the cooperative sorts, processes, packs and sells the production of its members. The preparation of the final products, including packaging and the peeling of shrimp, is done by the women of the community. Women do much more than simply process fish. They are perceived by the entire community as the real managers of the earnings of their fishermen husbands and manage their homes and families including the economic affairs.

In November 2005, the oysters produced by the Tamiahua Fishermen's Cooperative were sold in Mexico City and Guadalajara, while shrimps were mainly sold in Mexico City and Tampico. Crabs and finfish were sold locally.

The Cooperative sells most of its products to local wholesalers because it still lacks the means to sell the products directly to retailers and consumers. The local wholesalers have better possibilities than the cooperative to store and transport large quantities of fish products to markets. The cooperative has only one truck, which is not sufficient to transport the entire production. Similarly, the cooperative does not have enough space to display products for local retailers. It works therefore with the 20 independent local fish stores of Tamiahua, which take charge of selling its products locally. There is no supermarket in Tamiahua. The closest supermarket is in Tuxpan, 40 km from Tamiahua. It belongs to the Chedraui chain and buys weekly 100 kg of big shrimps, 50 kg of small shrimps and 100 kg of finfish directly from the cooperative.

Table 5.3: Products sold by the Tamiahua Fishermen's Cooperative, Mexico

Product	Description/presentation	Packaging	Perceived quality
Fresh fish, whole	Variety of species, washed and packed in plastic boxes with crushed ice	None	Fresh, good flavour, nutritious, affordable prices
Blue crab, whole	Whole, fresh	None	Fresh, good flavour, nutritious, affordable prices
Crab meat	Cooked	1 kg nylon bags	Good flavour, nutritious, affordable prices
Shrimp	Blue and "coffee" shrimp, packed in plastic boxes with crushed ice	None	Fresh, good flavour, nutritious, affordable prices
Oysters	Shell-on	45 kg bags	Fresh, good flavour, nutritious, affordable prices
Oysters	Shell-off	Bags	Iced, good flavour, nutritious, affordable prices

Retail prices for finfish and crabs in Tamiahua are normally equal or sometimes higher than the prices at the Nueva Viga wholesale market in Mexico City. Higher prices for shrimp and oysters in Mexico City, up to 35 percent, make it logical to sell these products there. Compared with the prices at the wholesale level, fishermen in Tamiahua receive fair prices for their production as can be seen in Table 5.4. The relatively high prices paid to fishermen are one of the positive results of joining efforts in a cooperative.

Table 5.4: Fish prices and profit margins at Tamiahua, Mexico, 2005 (in Mexican pesos)

Species	Price paid by cooperative to fishermen (a)	Price paid by local wholesaler or retailer to cooperative (b)	Margin of cooperative (b/a, in %)	Price paid by local consumer to retailer (c)	Margin of wholesalers/retailers (c/b, in %)
Lisa	16.00	19.00	18.7	21.00	10.5
Sargo	35.00	37.00	5.7	40.00	8.1
Lebrancha	7.00	10.00	42.9	11.00	10
Robalo	70.00	75.00	7.1	85.00	13.3
Chucumite	30.00	33.00	10	35.00	6.1
Trucha pinta	30.00	33.00	10	34.00	3
Mojarra	30.00	33.00	10	35.00	6.1
Trucha blanca	15.00	20.00	33.3	25.00	25
Tilapia	10.00	15.00	50	19.00	26.7
Ostión*	90.00	100.00	11.1	125.00	25
Camarón grande	85.00	95.00	11.8	120.00	26.3
Camarón chico	55.00	65.00	18.2	85.00	30.8
Jaiba cruda	20.00	22.00	10	25.00	13.6
Palota	32.00	36.00	12.5	38.00	5.6
Cazón	15.00	20.00	33.3	26.00	30
Bacalao	24.00	26.00	8.3	30.00	15.4
Bandera	10.00	11.00	10	13.00	18.2
Cubera	27.00	27.50	1.9	30.00	9.1
Chabela	27.00	28.00	3.7	30.00	7.1
Chopa	10.00	12.00	20	14.00	16.7
Churro	3.00	4.50	50	6.00	33.3
Guachinango	55.00	63.00	14.5	75.00	19
Gurrubata	8.00	11.00	37.5	14.00	27.3
Jurel	12.00	15.00	25	19.00	26.7
Pargo	25.00	30.00	20	38.00	26.7
Pámpano	30.00	35.00	16.7	40.00	14.3
Raya	8.00	11.00	37.5	15.00	36.4
Rastrero	6.00	8.00	33.3	10.00	25
Ronco	5.00	7.00	40	10.00	42.9
Sierra	11.00	13.00	18.2	15.00	15.4
Tonton	8.00	11.00	37.5	14.00	27.3%

Source: Tamiahua Fishermen's Cooperative, US\$1 = Mexican pesos 10.66 (in October 2005)

In addition to the fair prices paid to fishermen, the cooperative also earns revenue from its sales. Based on the prices and gross margins shown in Table 5.4 by species and the volume of catch during the first nine months of 2005, the gross earnings of the cooperative during the first 9 months of 2005 can be estimated about US\$200 000. During its 33 years of existence, the Tamiahua Fishermen's Cooperative has managed to survive, to benefit its members and indirectly the whole community of Tamiahua. This is due to the traditional support given by the Mexican government to social organizations and also to the seriousness of management of the cooperative during all those years. The monitoring of the present situation, the identification of problems and opportunities and the development of strategic plans shown in Table 5.5 make the cooperative look like any professionally managed medium-sized enterprise in the fishery sector.

The main difference between cooperatives and private companies, however, is the fact that the cooperative is owned by its members, who effectively work and produce a common wealth from a common resource.

Table 5.5: Strategies and goals of the Tamiahua Fishermen's Cooperative

Strategy	Impact	Actions
Harvesting of fish and shellfish		
Modernizing equipments	Improved quality	<ul style="list-style-type: none"> ▪ Develop research activities related to inland waters through consulting firms and research centres ▪ Obtain financing options for fishermen ▪ Introduce support activities according to the needs for changes ▪ Inform the subsequent elements of the distribution chain about the benefits of the changes.
Processing		
Develop processing activities	Add value to products	<ul style="list-style-type: none"> ▪ Search for financing options for the cooperative
Marketing		
Better positioning of products in the regional market	Increase the demand for products, increase selling prices, improve the image of products	<ul style="list-style-type: none"> ▪ Implement market surveys through consulting firms ▪ Implement a publicity campaign in order to better inform consumers ▪ Establish different levels of association with members of the distribution chain
Transport		
Acquire more adequate transport units	Reduce losses, increase opportunities of delivery, improve quality of products	<ul style="list-style-type: none"> ▪ Identification of better conservation and transport equipment ▪ Identification of financing possibilities for their acquisition

The Tamiahua Fishermen's Cooperative can be considered as a successful artisanal fishermen initiative in Latin America. It can also serve as an example for many others even though there is still much that can be improved.

5.1.2 The case of Peru

In Peru, 62 341 persons are involved in artisanal fisheries and fish farming activities. As shown in Table 5.6, the vast majority of these, i.e. 87 percent, are directly involved in marine and freshwater capture fisheries, while 12 percent are involved in fish farming. Only one percent of all persons employed in the artisanal fisheries and fish farming sector are involved in fish processing.

Artisanal fishermen in Peru are organized in some 300 fishermen associations. They land their catches at 109 marine and 13 inland fish landing sites called "caletas", which are exclusively reserved for artisanal fishermen. The artisanal fishing fleet of Peru consists of 6 258 boats, which fish up to 80 nautical miles offshore. In 1999, 237 881 tonnes of fish were landed by the fleet, most of which were destined for the domestic market and for direct human consumption.

Artisanal fishermen and fish landing sites are located along the entire Peruvian coast. Table 5.6 presents the geographical distribution of artisanal fishermen in Peru. The density of artisanal fishermen and fishing boats is slightly higher in the northern than in the southern part of the country. The average crew size of an artisanal fishing boat in Peru is between four and five fishermen.

The National Directorate of Artisanal Fisheries under the Vice-Ministry of Fisheries encourages artisanal fishermen to join or form social organizations, i.e. associations, unions or companies. There are currently 108 of such organizations functioning in Peru.

Table 5.6: Geographical distribution of artisanal fishermen in Peru

Marine fishing zone (from north to south)	Number of artisanal fishermen	Number of artisanal fishing boats
Tumbes (Pto Pizarro – Cancas)	2 125	468
Piura (Máncora – Negritos)	3 576	911
Piura (Colán – Chulliyachi)	3 631	834
Piura (Parachique – Puerto Rico)	1 896	455
Lambayeque (San José - Chérrepe)	2 938	285
La Libertad (Pacasmayo – Puerto Morin)	1 080	172
Ancash y Norte Lima (Santa – Supe)	3 299	784
Lima (Calta Vidal – Callao)	2 146	741
Lima Centro y Sur (Chucuito – Cerro Azul)	1 440	474
Ica (Tambo de Mora – San Juan)	2 372	626
Arequipa	2 318	260
Ilo - Tacna	1 177	248
Total	27 998	6 258

Source: MIPE (Vice-Ministry of Fisheries for Peru), 2000

The fishing community of El Chaco, located in the district of Paracas, 18 km south of the city of Pisco and 260 km south of Lima, is a good example of the variety and complexity of Peruvian artisanal fisheries. In this desert area crossed by the southern Pan American highway, the first settlers appeared in the 1960s and started fishing activities as a means of subsistence. Since then, the population of El Chaco has not grown much and even started to decline after 1980. National statistics record a population of 727 persons in 1961, 1 378 persons in 1981 and 1 196 in 2000.

The fisherfolk community of El Chaco is located close to the town of Paracas in an important tourism area, which includes the National Park of Paracas. The park was created in 1975 as a reserve for biodiversity and ecosystem reserve. The park is also an archaeological site and has pre-Incan relics. The park is the only marine protected area in Peru. Research in the park is carried out by national and international non-governmental organizations (NGOs) like Pronaturaleza, ACOREMA, the Nature Conservancy and WWF. These NGOs have implemented training programmes for fishermen on resource management. The Humboldt Current ensures a rich primary marine life. The coast has one of the largest Peruvian natural scallop banks known as “La Pampa”.

The community of El Chaco has 190 registered fishermen, of whom 165 are directly involved in fishing. The other 25 fishermen of El Chaco do not go out fishing but work at the local wharf instead. As shown in Table 5.7, the fishermen operate 46 boats. More than two-thirds of the boats are powered by outboard engines while the rest is powered by inboard engines. About half of the boats have a fish hold capacity of between two to three tonnes while the other half of the fleet has a fish hold capacity of less than two tonnes. The fishermen operate traditional fishing gears such as gillnets, purse seine nets and longlines.

Table 5.7: Fishing fleet of El Chaco, Peru

Fish hold capacity	Number of vessels	Type of engine	Number of vessels
0.5 to 2 MT	24	Outboard	32
2 to 5 MT	22	Inboard	14
Total	46	Total	46

Source: Vice-ministry of Fisheries of Peru

Many of the fishermen are also divers, who dive for scallops. The productivity of the natural scallop banks is due to El Niño. In years when El Niño does not appear, the scallops grow in deeper waters and can no longer be accessed by divers. This has encouraged the development of aquaculture based on natural seed collection. Scallops are grown on lines suspended from floating frames. The fishing community of El Chaco also harvests algae, mainly edible *Rhodophytes*. The landings of fish, shellfish and algae at El Chaco from January to August 2005 are shown in Table 5.8. In terms of quantity, anchovy is the most important species landed followed by scallops and algae.

Table 5.8: Fish and shellfish landings at El Chaco, Peru, January-August 2005

Species	Volume (in tonnes)
Scallops	655.6
Top shell	132.5
Abalone and mussels	18.4
Algae	531.8
Anchovy	5 215.8
Silverside	142.7
Mackerel	64.0
Horse mackerel	46.2
Limpet	1.1
Octopus	25.0
Mahi-mahi	20.0
Total	6 853.2

Source: Vice-ministry of Fisheries of Peru

Anchovies and other pelagic species are sold to processing plants in the Pisco region, where they are salted and marinated. A boat owner has typically two possibilities to sell his catch. He can either sell his anchovy catches to a processing plant and other species to general fish wholesalers or he can offer the processing plant to lease his boat and its crew for a fishing trip. In this case, which is less common, the plant covers all operating costs, rewards the crew and keeps the entire catch.

Other fish species are bought by wholesalers at the wharf and transported to Pisco and Lima, where they are sold to other wholesalers or directly to retailers. Sometimes, supermarket chains from Lima send refrigerated trucks and buy fish directly at the wharf. However, unlike traditional wholesalers, these buyers normally do not pay in cash. Table 5.9 shows the prices of selected fish and shellfish species as well as the profit margins of wholesalers, local markets and supermarkets.

The profit margins of wholesalers and supermarkets buying from the fishing community of El Chaco, Peru, are much higher than the profit margins of wholesalers and retailers buying from the Fisheries Cooperative of Tamiahua, Mexico, as shown in Table 5.4. In the Peruvian case, it can be assumed that fishermen could get much higher prices for their catches if they were organized in a cooperative, used ice for the preservation of their catches and were able to attract more wholesalers to increase competition.

Women of fisherfolk families are involved in local retailing. They usually gut and clean fish and chuck shellfish, which they sell locally and also in Paracas. They also prepare and sell local fish-based dishes like the traditional “ceviche” or “chupe”, a local soup. Women contribute significantly to the income of fisherfolk families. Women are also employed as workers in the processing plants of the region. Their work normally consists of gutting, de-heading and cleaning fish, mainly anchovies, which are marinated. During the tourism season in summer, women and children make handicraft items from shells or sea lions’ teeth. Women of fisherfolk families also offer their homes as accommodation for tourists.

The community of El Chaco still lacks a fishermen association or cooperative. The scallop divers have joined the Shellfish Harvesters Association from Pisco, which has 65 members from both Pisco and El Chaco. As far as the future of artisanal fisheries in El Chaco is concerned, the small community of less than 200 active fishermen is likely to decline because of the further development of tourism and related

employment opportunities. It is doubtful that the artisanal fisherfolk community will be able to survive for long without organizing itself and without stronger government support, be it from the municipality, from the province or from the Directorate of Artisanal Fisheries of the Vice-ministry of Fisheries.

Table 5.9: Prices and profit margins of selected fish and shellfish species landed in El Chaco, Peru, 2005

Species	Prices in nuevos soles/kg ¹						
	Wharf (a)	Ventamilla wholesale market in Lima (b)	Margin b/a (in percent)	Local markets (c)	Margin c/a (in percent)	Supermarkets (d)	Margin d/a (in percent)
Silverside	0.50	1.70-2.20	290	3.0-3.50	550	4.00	700
Drum	0.50-0.60	1.50-2.00	218	2.50-3.0	400	3.50	536
Snapper	0.50-0.60	1.50-2.00	218	2.50-3.00		3.50	
Horse mackerel	2.00-2.20	3.50-4.00	79	4.50	114	5.00	138
Blenny fish	2.50-3.00	5.00	82	6.00-6.50	127	7.00-7.50	164
Crab ²	4.00-5.00	8.00	78	10.00	122	12.00	167
Scallops ³	10.00	18.00	80	22.00	120	35.00	250
Mussels	3.00-5.00	8.00	100	10.00	150	12.00-15.00	237
Top shell	3.50-5.00	8.00-9.00	100	10.00-11.00	147	12.00-15.00	218

Source: direct observation at Maria Ayala, November 2005

¹US\$1 = S/.3.40

²per dozen

³per "manejo" (= 8 dozens)

El Chaco is an example of a great number of artisanal fishing communities in Peru, which have so far been unable to take advantage of increasing tourism, by expanding their fisheries activities through the opening of seafood shops, restaurants and similar activities. The main opportunities for the fisherfolk community of El Chaco are based on the fact that the area is classified as a national park. Environmentally friendly activities such as scallop aquaculture, improving the quality of fish landed by using ice onboard their vessels and better marketing of their catches could result in a revitalization of the local community and economy.

5.1.3 The case of Brazil

At the end of the First World War, the Brazilian Navy helped to establish fishermen colonies. There are currently 750 fishermen colonies in Brazil, organized into 23 federations, one for each of the 24 federal states of the country with the exception of one state. The total membership of the fishermen colonies and their federations stands at 326 696 fishermen. In 2003, artisanal fishermen accounted for two-thirds of the total fish production of Brazil of 712 143 tonnes as shown in Figure 5.2.

While most of the fishermen colonies are associations, 50 of them are organized as fishermen's and fish farmers' cooperatives. By the end of 1999, the Brazilian Cooperatives Organization (OCB) consisted of 14 registered cooperatives working in the fields of fisheries and aquaculture. The National Association of Fisheries Cooperatives (ANACOOP) counted 53 associated fisheries cooperatives and the Ministry of Agriculture counted 90 formally registered cooperatives, many of which, however, were in a precarious state or not functioning at all. As far as fish farming is concerned, the 278 128 tonnes of farmed seafood produced in 2003 were produced by 19 277 registered fish farmers.

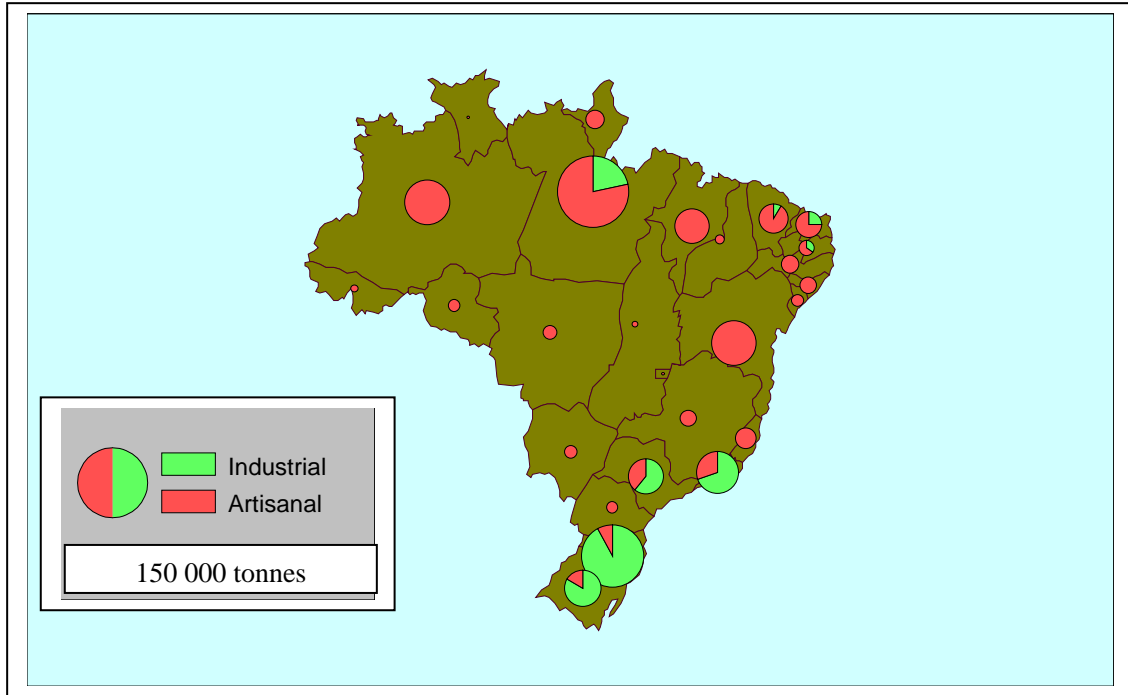


Figure 5.2: Artisanal and industrial fish landings in Brazil, 2003 (in tonnes)

The case of the Women's Association of Betume in the northeastern state of Sergipe is an example for a type of association, the scope and purpose of which extends beyond production. The village of Betume where the association is located has 900 inhabitants and is located in the municipality of Neópolis. The villagers traditionally earn their living from rice culture and cattle ranching. As Betume is located at the lower São Francisco River, the region was chosen at the beginning of the 1990s by the Federal Government of Brazil for the development of tilapia aquaculture and other freshwater fish culture, mainly the culture of *Colassomas*. Many rice growers of the lower São Francisco region became small-scale fish farmers. Each fish farmer produces from 20 to 30 tonnes of fish per year. The fish farmers formed associations and cooperatives, which, unfortunately, had neither ways and means of processing their fish nor of selling it in markets other than local markets.

In 1997, a group of 14 women, wives and daughters of local farmers, established the Women's Association of Betume with the purpose of adding value to farmed fish by filleting it. With the help of the federal organization CODEVASF, the women built a small fish processing establishment equipped with stainless steel working tables, working tools, water and electricity. With the help of an international cooperation project, funded by the Common Fund for Commodities and implemented by INFOPECA, the women installed a small ice plant with a production of three tonnes per day. The ice was used to preserve raw material and processed products and was also sold to local fishermen, fish farmers and restaurants. Through the sale of ice, the association increased its working capital and could procure larger volumes of fish for processing.

The farm gate price of tilapia in the region is from R\$2 to R\$2.4 per kilo⁹. The association sells tilapia fillets at R\$ 11, in most cases directly to restaurants in the region as well as in Aracaju, the capital city of the state of Sergipe. Considering the fact that 3kg of whole fish are required to produce 1kg of fillets, the gross margin of the association per kg of fillet ranges from R\$3.8 to R\$4.4. The break-even point is reached at one tonne of fillet per month after paying the national minimum salary of R\$300 to each of the 14 members of the association. The selling price of the association is relatively high because of the high quality of the product. The quality is assured from the moment the fish is taken out of the water by preserving the fish in ice. The final products, the fresh fish fillets, are wrapped in plastic and kept in ice. Associated with the quality of the product are the logistics of supplying clients, who are willing to pay for

⁹ R\$2.2 = US\$1 in November 2005. R\$ is the currency sign for reais.

quality, rapidly and regularly. In this sense, the choice of the association to supply restaurants rather than supermarkets or municipal markets was very adequate. The association also encourages villagers to farm tilapia in order to have an easier supply of raw material.

The case of Betume shows that artisanal fisheries or fish farming can begin with the establishment of an artisanal fish processing workshop. This initiative, led by women, has received the support of the federal government as well as support from an international cooperation project. Without this support, it would have been very difficult for the women to establish the fish processing workshop and to pay for all the investments needed to begin a viable production process.

5.2 The marketing of small-scale fisheries products

The three cases presented above show that artisanal fisheries and aquaculture in Latin America are dynamic and diverse. According to its level of organization and to its working means, an artisanal fishing community can sell directly to consumers or to a portfolio of retailers. Artisanal fishermen can also remain isolated and sell their production to the traditional middlemen they know, who control the wholesale marketing at their level. Prices for producers are obviously low when the product passes through two or three successive wholesalers, often poorly preserved with little ice and taking several days before reaching the final consumer. Traceability of fish products is also difficult to track under such conditions.

To a large extent, the marketing of the artisanal fish products in Latin America and elsewhere faces the paradox that quality is inversely proportional to price. The best quality a fish can have is when it comes out of water after being caught by the fisherman. As fish goes through the distribution chain from one wholesaler to another, to retailers and finally to consumers, its quality deteriorates while the price increases. In the end, the consumer receives the worst quality for the highest price while the fisherman sold the best quality fish, for which he received the lowest price.

With few exceptions, the artisanal fisheries production is marketed through the traditional distribution chain, which leads from the production sites to the consumption centres. This distribution chain normally includes two wholesalers, one being responsible for collecting seafood at landing centres and production sites and for transporting it to the seafood wholesale markets in the main consumption centres and the other one being responsible for the sales to retailers at these markets.

Sometimes the second wholesaler is substituted by a processing plant, which produces value-added products. Processing plants must not be confused with wholesalers, who freeze the products they receive and sell them frozen to retailers, who, at their turn, de-freeze the products and sell them as fresh fish products. This second type of processing just adds costs to the product while it lessens its quality. Freezing and de-freezing often do not follow good processing practices. Bad practices of salting and drying of fish products have often similar cost-adding and quality-reducing effects.

Over the last 50 years, Latin American countries experienced a strong migration from rural to urban areas. Today, 80 percent of the 520 million inhabitants of Latin America live in urban areas, most of them in big cities. Over 50 cities in Latin America have more than one million inhabitants. Four cities have more than 10 million inhabitants and two of them, i.e. Mexico City and São Paulo are close to 20 million. The domestic markets in Latin America have become more concentrated from a geographic point of view. INFOPECA had identified this trend already 10 years ago, when it began to survey the seafood markets in the big Latin American cities. A collection of 14 already published studies gives a broad illustration of Latin American urban markets.

- Mexico City (1998)

Size of the seafood market: 145 555 tonnes per year; yearly per capita consumption: 8.6 kg; 101 552 tonnes of seafood are consumed fresh.

- Bogotá (2001)

Size of the seafood market: 42 011 tonnes per year; yearly per capita consumption: 7 kg; 24 237 tonnes of seafood are consumed fresh; supermarkets are responsible for 57 percent of seafood distribution, district markets for 33 percent and restaurants and institutions for 10 percent.

- Caracas (2000)

Size of the seafood market: 48 478 tonnes per year; yearly per capita consumption: 15.2 kg; 19 200 tonnes of seafood are consumed fresh; fish stores are responsible for 34 percent of seafood distribution, municipal markets for 25 percent, supermarkets for 17 percent, restaurants for one percent and others for 23 percent.

- Maracay (2005)

Size of the seafood market: 5 870 tonnes per year; yearly per capita consumption: 9.3 kg; supermarkets are responsible for 49 percent of seafood distribution, municipal markets for 29 percent, fish stores for 16 percent, restaurants for 5 percent.

- Valencia (2005)

Size of the seafood market: 16 836 tonnes per year; yearly per capita consumption: 19.8 kg; supermarkets are responsible for 69 percent of seafood distribution, municipal markets for 15 percent, fish stores for 8 percent and restaurants for 8 percent.

- Recife (2005)

Size of the seafood market: 26 872 tonnes; yearly per capita consumption: 8.05 kg; supermarkets are responsible for the distribution of 34 percent of all seafood, public markets for 29 percent, restaurants for 6 percent, street markets for 4 percent and others for 27 percent.

- Maceió (2004)

Size of the seafood market: 12 685 tonnes; yearly per capita consumption: 12.8 kg; municipal markets are responsible for 68 percent of the seafood distribution, supermarkets for 20 percent, street markets for 7 percent and restaurants for 4 percent.

- Aracaju (2004)

Size of the seafood market: 7 760 tonnes per year; yearly per capita consumption: 16.8 kg; 2 076 tonnes of the seafood are consumed fresh; supermarkets are responsible for 71 percent of seafood distribution, municipal markets for 20 percent, restaurants for 5 percent and fish stores and street markets for 4 percent.

- Brasilia (1997)

Size of the seafood market: 23 201 tonnes per year; yearly per capita consumption: 12.8 kg; 4 961 tonnes of the seafood are sold fresh; supermarkets are responsible for 59 percent of the seafood distribution, restaurants for 17 percent, institutional catering for 14 percent, street markets for 4 percent and others for 6 percent.

- Rio de Janeiro (1997)

Size of the seafood market: 167 124 tonnes per year; yearly per capita consumption: 16.4 kg; 54 452 tonnes of the seafood are consumed fresh; supermarkets are responsible for the distribution of 50 percent of all fresh seafood, street markets and ambulant vendors for 25 percent, fish stores for 15 percent, municipal markets for 7 percent and restaurants for 3 percent.

- São Paulo (1998)

Size of the seafood market: 249 087 tonnes per year; yearly per capita consumption: 15.3 kg; 145 317 tonnes of the seafood are consumed fresh; restaurants and institutions are responsible for 49 percent of all fresh seafood distribution, street markets and municipal markets for 35 percent, “catch & pay” sport fishing establishments for 12 percent and supermarkets for 4 percent.

- Montevideo (1997)

Size of the seafood market: 12 400 tonnes per year; yearly per capita consumption: 9.1 kg; 5 225 tonnes of seafood are consumed fresh; municipal markets and street markets are responsible for 45 percent of the

distribution of fresh fish, fish stores for 32 percent, supermarkets for 12 percent and restaurants for 11 percent.

- Buenos Aires (1997)

Size of the seafood market: 109 730 tonnes per year; yearly per capita consumption: 9.5 kg; 80 372 tonnes of seafood are consumed fresh; fish stores are responsible for 36 percent of fresh fish distribution, open air markets and municipal markets for 26 percent, supermarkets for 23 percent and restaurants and institutions for 15 percent.

- Santiago de Chile (2000)

Size of the seafood market: 161 000 tonnes per year; yearly per capita consumption: 26.4 kg; 58 710 tonnes of seafood are consumed fresh; supermarkets are responsible for 45 percent of the seafood distribution, fish stores for 24 percent, restaurants and institutions for 16 percent and open air markets for 15 percent.

This rapid overview of some big Latin American urban markets for fish products shows a great diversity of situations and of annual per capita consumption of fish ranging from 7 kg in the case of Bogotá to 26.4 kg in the case of Santiago. It also shows a diversity of the relative importance of different market segments such as supermarkets, fish stores, restaurants and others.

The challenge of ensuring and preserving the quality of fresh seafood along the distribution chain in Latin America has so far not received the same attention as the challenge of ensuring quality of fish handling, preservation and processing onboard fishing vessels or in fish processing plants. The quality of fresh seafood therefore varies considerably depending on the sales outlet and the place where fish is sold. There are no training programmes implemented or planned for seafood retailers or for wholesalers in Latin America apart from limited efforts made by some international supermarket chains. The relatively low per capita seafood consumption in most cities of the continent is also due to the small number of seafood retail outlets as compared to the number of meat retail outlets for example.

Artisanal seafood products have been exported in various Latin American countries, both as exports of fresh fish as well as of processed fish products. In the latter case, the real clients of the artisanal fisheries sectors are processing plants, which purchase from both industrial and artisanal fishermen as well as from fish farmers. For fresh fish to be exported, first class quality and efficient transport logistics are required. Fresh fish exporters have generally only few customers abroad and supply them with few species. Very often, the exporters are in fact local agents of foreign importers. Prices paid to fishermen for fish destined for export are normally a little higher than for fish destined for the local market in order to encourage fishermen to take special care of their catches, use ice for preservation, handle fish carefully and keep fishing trips as short as possible.

Unfortunately, a common result of the export of fresh fish caught by artisanal fishermen has been in many cases the depletion of the targeted species in fishing grounds used by local fishing communities.

5.3 Marketing potential for artisanal fisheries and aquaculture products

Most seafood produced by artisanal fishermen and fish farmers passes through two marketing channels. The first channel is the fresh fish market and the second one is the fish processing industry. While there are no reliable statistics available, it is estimated that in Latin America, the fresh fish market is much more important than the processing industry as marketing channel for fish and fish products produced by artisanal fisheries. It is estimated that 70 to 80 percent of the fish produced by the artisanal fisheries and aquaculture sectors passes through the fresh fish market. Most of this fresh seafood is destined for domestic markets but there are some examples, which show that artisanal fish products can also be exported by traders with good transport logistics. Some markets attract seafood produced by artisanal fisheries in neighbouring countries. This is the case in Colombia, where importers often buy fresh seafood from Ecuador, Venezuela or Brazil. Amazonian freshwater fishes caught by artisanal fishermen in Brazil are purchased by wholesalers in Leticia and account for 85 percent of their supplies.

As most coastal fishery resources are already fully exploited, the challenge is not to produce more fish but to sell the same quantities of catches for better prices. The quality of the product supplied by artisanal fishermen is crucial for realizing higher prices. Improving quality requires good logistics for transporting, handling and preserving fish as well as consciousness of the need to maintain the quality of fish along the fish distribution chain. Customers, who are willing to pay for quality, exist everywhere in Latin America. They are normally restaurants, specialized fish shops and some supermarkets. The Women's Association of Betume has understood that better prices can be realized by selling products of higher quality directly to restaurants and that a regular supply is as important as the quality of the product.

The use of ice onboard fishing vessels and at landing sites as well as a quick transport of fish from landing sites to consumption centres are indispensable aspects of improved fish marketing arrangements. There are also other possibilities to realize better prices for artisanal seafood. One of them is to shortcut as many elements as possible in the fish distribution chain and to make use of existing market information. In Mexico, for instance, daily changes of prices at the Nueva Viga wholesale market are easily accessible on the Internet. The same is true for seafood prices at the São Paulo CEAGESP wholesale market. These prices are used as reference prices for any seafood transaction in the country. Access to the Internet is spreading everywhere in Latin America as well as the use of cellular telephones. This helps fishing communities to stay informed and to gain information that can be used in price negotiations. Pricing becomes also more transparent. The fishermen cooperative of Tamiahua, for instance, is aware of the price variations in different markets. Taking advantage of this knowledge, the cooperative sells some of its products locally and sends others to the wholesale markets of Mexico City and Guadalajara. Another way of realizing better prices is to distinguish a product from other, similar products by making the product known and also the community, which produces it, and by highlighting the artisanal character and quality of the product.

As the case studies of Mexico, Peru and Brazil show, there are thousands of artisanal fishing communities in Latin America. These communities are dynamic and each community has its own characteristics. While some fishing communities give up their traditional occupation over time due to urbanization, depletion of traditional fishing grounds, expansion of tourism in coastal regions or other causes, other communities adapt themselves to new developments, grow stronger and get better organized to deal with changes. Most artisanal fishing communities have characteristics, which are already highly valued in present times. These characteristics, when transferred to the products produced by these communities, could enhance the attractiveness of the products for consumers and thereby increase their value. Linking a product to a particular community, which produces it, also conforms to the modern concept of traceability.

Characteristics of artisanal fishing communities, which can be used to differentiate their products from similar products produced by industrial fisheries in a positive way and to highlight product-specific uniqueness, include environmental and cultural characteristics. As the fate of an artisanal fishing community is closely linked to the fate of the living resources in their area, the community is aware of this fact and participates actively in coastal management in order to conserve its aquatic and natural resources, to fight sources of pollution and to ensure the sustainability of its main livelihood activity. This is the case in Tamiahua, where the fishing community uses the resources of a limited and well defined area, i.e. the Tamiahua lagoon. The fishing community and cooperative of Tamiahua carefully monitor the fishery resources and the lagoon ecology and environment and use selective fishing gears. Consumers should appreciate the fact that fish they buy from the Tamiahua Fishermen's Cooperative has been caught in a responsible and sustainable way and originates from a healthy aquatic environment. Artisanal fishing communities can be closest to the concept of responsible fisheries.

Most fishing communities are located in beautiful coastal landscapes, which attract many tourists. Strong communities have taken advantage of tourism, sometimes with the support of their municipalities, as the culture of artisanal fishing communities and the possibility to buy fresh fish directly from the producer are tourist attractions by themselves besides the landscapes, the beaches and the sun. Fishermen do not need to go very far to sell their products and the prices of fish usually follow the higher prices being charged at any tourist site. An example is the case of the fishermen colony of Copacabana beach in Rio de Janeiro, where the municipality has built a small fish store for fishermen to sell their catches. The fishermen colony existed on that beach prior to its urbanization at the beginning of the 20th century. Fishermen repairing their nets, pushing their boats into the water or sorting their catches on return from the sea are part of the

landscape of Copacabana. As the case of Copacabana and many fashionable ports from Isla Margarita to Acapulco and from Punta Del Este to Cancún show, tourism and artisanal fisheries can enter into a win-win relationship.

Artisanal fishing communities have many common cultural characteristics such as closeness to sea and nature, seamanship, hard work, solidarity and many more. World literature has always portrayed these characteristics in novels such as “The Old Man and the Sea” by Ernest Hemingway. These characteristics can still be found in many fishing villages in Latin America as well as some characters described by Jorge Amado in his books and in traditional popular songs such as the *jangadeiros* by Bahia’s Dorival Caimi.

Further to common characteristics, there are specific cultures related to the national or ethnic origin of artisanal fishermen communities. The national and ethnic cultural heritage of fishing communities can help to differentiate and distinguish their products. For instance, the artisanal fishermen of Mar del Plata in Argentina have their roots in Sicilian immigration and even today, the Sicilian cultural heritage is associated with the artisanal fisheries of this Argentinean harbour. Some of the fish species caught are processed according to the traditional and original techniques such as salted anchovies, which are processed *alici*-style.

In Florianópolis, Brazil, artisanal fisheries have been originally developed by Azoreans and some fishing communities still maintain their traditions. Similar traditions and cultural heritages can be found in many communities residing along Latin American coastlines such as Caiçaras in Southern Brazil, Miskitos and Garifunas in Central America, Quechuas and Aymaras on Lake Titicaca and in Mayas on the Yucatan Peninsula. Most of these communities have their unique values, religion, traditions, languages, songs and dances, mythologies, culinary habits and fishing techniques, which can be associated with their products in order to differentiate them from other products and show their uniqueness.

As far as artisanal fish farming is concerned, this is a new activity in Latin America. Most artisanal fish farmers do not live in special communities as artisanal fishermen do. There are exceptions though like the fish farming communities in the lower São Francisco valley. In this case, an effort of differentiation of fish farmed in this area is under way through the adoption of seals of geographical origin. The region is culturally very rich and includes towns having kept their ancient colonial styles. The water of the river used by local fish farmers is particularly clean. Other artisanal fish farmers in Latin American are labelling their products as “organic products” in order to realize higher prices.

5.4 Constraints to the development of small-scale fisheries

Artisanal fisheries in Latin America face many constraints, which prevent their taking full advantage of the opportunities described above. In many places, artisanal fishermen, particularly part-time and occasional fishermen, are not perceived as professional artisans of fisheries but only as second class fishermen due to the fact that many poor and unskilled persons have taken up fishing because of a lack of other employment opportunities. Artisanal fishermen have typically a low educational level and many of them, particularly the older generation, are still illiterate. Artisanal fishermen are generally considered to belong to the lowest social strata of society.

Many artisanal fishermen do not master their profession well, use inadequate fishing gears, are not aware of the need for resource sustainability and do not care too much about the quality of their products. In Latin American countries, there are few training institutes for artisanal fishermen. Most of the few existing courses are about the organization and the management of associations or cooperatives, seldom about resource management, selective fishing gears, quality control or seafood marketing. This was not always the case and many older Brazilian artisanal fishermen still remember that during the 1940s and 1950s, there were so called free “fishing boarding-schools” managed by the Navy and especially intended to train artisanal fishermen’s sons. At that time, during and just after World War II, the Navy’s aim was to train young men living in fishing communities for the control and defence of the coastline. Nowadays, in peace times in this part of the world, a similar training could be given, for instance, for the control and defence of the marine and riverine environment and ecology.

Domestic seafood distribution and marketing does not receive the same attention from sanitary authorities as exports. The national sanitary services that control the export of seafood are different from those controlling domestic seafood marketing, which often remains under the authority of municipalities. The quality of seafood offered for consumption varies widely. Most countries in Latin America lack training opportunities for seafood vendors. If the quality cannot be assured along the distribution chain, it is unlikely that efforts at only one part of the chain, such as the level of the artisanal fish producer, can yield positive results.

5.5 Strategies for overcoming constraints to a further development of small-scale fisheries and their integration into regional and international fish trade

The main advantage of Latin American artisanal fisheries is that many artisanal fishing communities are organized in colonies, associations, cooperatives, unions, federations and confederations. It is together with these existing organizations that one can conceive solutions for a better utilization and marketing of the artisanal seafood production.

Many artisanal fishermen organizations are involved in local politics. While some of them might be tempted to increase the number of their members in order to have more political weight, artisanal fishermen organizations are also aware that an increase in the number of fishermen in a community can jeopardize the sustainability of the fishery resources of this community. In some cases, growth of fishing communities can be more gainfully attained through the conversion of part of their activities from capture fisheries to fish farming. An example is the Brazilian state of Santa Catarina, where artisanal fishing communities were encouraged through low interest loans and technical support from state government extension workers to farm mussels and oysters. Over a period of five years, the mussel and oyster production in the state grew from zero to 4 000 tonnes per year. This example could be replicated in many other regions. With the continuous development of aquaculture technology, one can imagine that in a not-too-distant future, many artisanal fishing communities could become involved in sea ranching. This possibility also reinforces the need of organizing communities and involving them in the coastal management and conservation of their region.

It is clear from the above that the main solutions to overcome the existing problems and to take full advantage of existing opportunities for improving the utilization and marketing of artisanal fisheries products are intimately linked to training. A pre-requisite of a sustainable production of high quality seafood, which commands higher prices, is a well organized artisanal fishing community, which masters its profession and is open to innovations. Many modalities of training can be implemented. They require the political will of the concerned governments as well as investments.

Technical support and training for fishing communities should focus on better handling of catches, better knowledge of local resources for fish farming and sea ranching and better knowledge of markets and marketing possibilities. Technical support and training can be provided by professional extension workers hired and trained by national or state fisheries authorities. These extension workers can also be backed by local universities working together with the fishermen organizations in their communities. The interaction between fishermen and students of different subjects, i.e. biology, sociology, veterinary medicine, geography, food technology, business administration and other disciplines can only be enriching for both sides.

The establishment of artisanal fishery schools can also play an important role in improving the utilization and marketing of artisanal fish products. Such schools can be established as boarding schools for boys and girls from different fishermen communities, who will be practically taught over a period of a few months about fishing and fish farming techniques, conservation and management of the environment, fish utilization and marketing and other related subjects. Fisheries related training can also be provided at local schools frequented by members of fishing communities in addition to the normal national educational programme. This type of professional training should aim to shape a new, more professional generation of artisanal fishermen and fish farmers with up-to-date knowledge of their profession. Formally supervised apprenticeships are another form of training, which could be considered. In addition to training of artisanal fishermen, training should also be provided for seafood retailers. Training of national trainers in domestic

marketing of seafood can be funded by a specialized international organization such as FAO, for instance, and implemented by regional organizations such as INFOPESCA.

Besides training, the improvement of artisanal seafood marketing requires investments in equipment, civil works and working capital. This can only be achieved by organizations like cooperatives, companies or associations, which are legally entitled to market seafood. Investments include investments in ice plants, in workshops for light fish processing such as filleting or peeling, in transport facilities such refrigerated trucks and in working capital. Normally, national and regional investment banks are in a position to provide low interest loans for these types of investment. Often, however, banks do not have the technical background to appraise investment plans prepared and presented by artisanal fishermen cooperatives. In many cases, artisanal fishermen cooperatives do not have the technical background to prepare an investment plan. For this reason, the preparation of investment plans should be assisted by fisheries extension workers. Sometimes, the guarantees required by banks might appear as not affordable to some cooperatives or associations. Affordable interest rates, collateral and guarantee requirements depend on national economic policies, which give priority to these types of investment. In addition to the investment needs of the production side of the distribution chain, one must also foresee investments at the level of wholesalers and retailers in order to assure the supply of quality products to consumers.

As far as legislation and regulations are concerned, most Latin American countries have legislation and regulations that cover artisanal fisheries and seafood distribution. While the definition of “artisanal fisheries” differs from country to country, fisheries legislation including legislation on sanitary matters commonly not only affects artisanal fisheries but also other sectors. The same is true for national legislation regarding the establishment of cooperatives or other categories of associations, legislation regarding the registration of trade marks, seals of indication of geographical origin and other types of legislation. Normally, artisanal fishermen, their associations and cooperatives and even national fisheries authorities are not aware about all possible implications of the existing national legislation. The preparation and dissemination of national compendiums on the subject among all stakeholders in the artisanal fisheries sector and the entire fisheries and aquaculture sector would be helpful. The exchange of experiences with legislation and of evaluations of the results of legislation should be organized together with national fisheries authorities in order to assess the adequacy of legislation in relation to national and regional development policies.

While most fishing communities along the Latin American coastline are linked by road to the main consumption centres and are served by electricity, telecommunications including cellular phone coverage and drinkable water, there are still some isolated communities in some parts of the continent which do not benefit from this infrastructure. This is particularly the case in the Amazon, the Andean and the Mosquito Coast regions. With the rapid development of these regions, it is likely that in a couple of decades, basic infrastructure will be available everywhere on the continent.

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