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COMMITTEE ON FISHERIES

SUB-COMMITTEE ON FISH TRADE

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FISH TRADE AND HUMAN NUTRITION

Executive Summary

The paper reviews the role fish plays in human nutrition and looks at the impact fish trade might have on food security and nutrition. Fish is recognized as an excellent source of protein but also plays a particular role in providing essential fatty acids and micronutrients deficient in many diets.

International trade has allowed developing countries to export high value fish and in many cases allowed them to purchase a larger quantity of low value but highly nutritious fish or other foods. Trade has also opened up markets for fish products considered waste in one market but a valuable product in another market.

Suggested action by the Sub-Committee:

- Guide and advise the Secretariat on how to improve FAO's assistance to member countries for increasing the role of fish in improving nutrition and food security;
- Propose concrete actions on how FAO could assist member countries in improving trade of sustainably managed fish resources as a tool in combating malnutrition and hunger;
- Advise the Secretariat on improving collection and use of data on trade, nutrient composition and contaminants of important fish resources;
- Advise the Secretariat on the need to look further at the impact that the trade of fish could have in improving the yield of fish for human consumption and reduce post-harvest losses.

INTRODUCTION

1. Fisheries and aquaculture play an important role in nutrition, food security and livelihoods. Consumption of fish provides protein and a range of other nutrients, particularly essential fats, minerals and vitamins. Eating fish is part of the cultural tradition of many people, and in some populations fish and fishery products represent a major source of food and essential nutrients. With a growing world population, the demand for fish and fish products is expected to increase whether the per capita consumption remains at the present world average level of 19 kg/year or increases.

2. Employment in fisheries and aquaculture has grown faster than employment in traditional agriculture and faster than population growth. About 56 million people are directly engaged in the fisheries sector. In addition many people are employed in important secondary sectors such as handling, processing and distribution, where women represent half of those involved. Including the families of these workers, fisheries and aquaculture support the livelihoods of some 660 to 880 million people, or 12 percent of the world's population[1].

3. Fisheries represent one of the most traded food commodities, with a share of about 40 percent of total fishery and aquaculture production entering international trade and a yearly export value of more than USD 130 billion. Trade of fish and fishery products provides an important source of income for many countries, particularly developing countries, which have a share of more than 50 percent in value and 60 percent in quantity (live weight) of all exported fish and fishery products.

4. Studies have shown that a significant share of fish exported by some developing countries (e.g. Nigeria, Egypt) consists of species of high economic value, generating an income that enables the exporting country to purchase a larger quantity of cheaper but highly nutritious fish. Lower value fish imported often consist of small size low cost pelagic fish (e.g. herring, mackerel), with high levels of essential fatty acids in many cases they also represent an exceptional source of micronutrients when eaten whole with heads and bones. From a nutritional point of view these are high value fish species.

THE ROLE OF FISH IN NUTRITION

5. Fish accounts for about 17 percent of the global population's intake of animal protein. This share, however, can exceed 50 percent in some countries. In West African coastal countries, where fish has been a central element in local diets for many centuries, the proportion of dietary proteins that comes from fish is very high; for example, 43 percent in Senegal, 72 percent in Sierra Leone and 55 percent in Gambia and Ghana, respectively. The same picture is seen for some Asian countries and Small Island States, where the contribution from fish as a source of protein is also significant; for example, 70 percent in Maldives, 60 percent in Cambodia, 57 percent in Bangladesh, 54 percent in Indonesia and 55 percent in Sri Lanka.

6. Foods from the aquatic environment have a particular role as a source of the long-chain omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are major building stones of our neural system. These are important for optimal brain and neurodevelopment in children. Alternative sources of omega-3 fatty acids are found in many vegetable oils, but this is in the form of alpha-linolenic acid (ALA), which needs to be converted into DHA. However, in our bodies the conversion from ALA into EPA and DHA is in most cases inefficient, making it difficult to rely only on vegetable oil during the most critical periods of our lives: namely, during pregnancy and the first two years of life (the 1000 day window).

7. Experts agree that consumption of fish, particularly oily fish, is essential for optimal development of the brain and neural system of children, as omega-3 fatty acids in the form of DHA rather than ALA are needed to secure optimal brain development. A recent FAO/WHO expert

[1] FAO. 2012. The state of world fisheries and aquaculture 2012, Rome, FAO. 209 pp. Available at http://www.fao.org/docrep/016/i2727e/i2727e.pdf

consultation concluded that fish in the diet lowers the risk of women giving birth to children with suboptimal development of the brain and neural system compared with women not eating fish[2].

8. Fish consumption is also known to have health benefits for adults. Strong evidence underlines how consumption of fish, and in particular oily fish, lowers the risk of coronary heart disease (CHD) mortality. It is estimated that fish consumption reduces the risk of dying of coronary heart diseases by up to 36 percent resulting from the long-chain omega-3 fatty acids mainly found in fish and fishery products. CHDs are a global health problem affecting all populations. A daily intake of 250 mg EPA+DHA per adult gives optimal protection against CHD[3]. For optimal brain development in children, the daily requirement is only 150 mg per day.

9. Evidence on the role DHA has in preventing mental illnesses is also becoming more and more convincing. This is particularly important as brain disorders are increasing dramatically, and in the developed part of the world the cost related to mental disorders is now greater than the cost related to CHD and cancer combined.

10. Although the importance of including fish in a healthy diet is related to its unique nutritional value, increasing evidence shows the beneficial role of fish in our diets by replacing less healthy foods. Wild and responsibly farmed fish are a healthy and good alternative to meat products.

11. Even though fish consumption reduces the risk of diseases related to obesity such as cardiovascular diseases and diabetes, the role fish consumption plays in reducing obesity, per se, is also studied. Fisheries products are known to be easily digestible, ensuring that a high percentage of the nutrients are actually benefiting the consumer and not wasted. Studies have shown that the digestive system absorbs a higher percentage of EPA and DHA (omega-3 fats) if consumed as part of the fish[4], but that fish oil supplements might be a good alternative for people who do not regularly consume fish.

FISH: A SOURCE OF MICRONUTRIENTS

12. Fish and fishery products have traditionally been regarded as a good source of protein, but more and more emphasis is now being placed on their role in providing long chain omega-3 fatty acids and also on being a rich source of vitamins and minerals deficient in many local diets[5, 6]. Micronutrient deficiencies are affecting hundreds of millions of people, particularly women and children in the developing world. More than 250 million children worldwide are at risk of vitamin A deficiency, 200 million people have goiter, and 20 million are mentally retarded as a result of iodine deficiency, 2 billion people (over 30 percent of the world's population) are iron deficient affecting particularly women in the developing world, and 800 000 child deaths per year are attributable to zinc deficiency. Rural diets in many countries may not be particularly diverse, depending on a large proportion of rice or maize. Thus it is vital to have optional food based sources that can provide all essential nutrients in such diets.

13. More and more attention is given to fisheries products as a source of micronutrients such as vitamins and minerals. In particular, this is true for small sized species consumed whole with heads

[2] FAO. 2011. The state of world fisheries and aquaculture 2010, Rome, FAO. 218 pp. Available at http://www.fao.org/docrep/013/i1820e/i1820e.pdf

[3] Mozaffarian, D. & Rimm, E.B. 2006. Fish intake, contaminants, and human health: evaluating the risks and the benefits. *JAMA*, 296: 1885–99.

[4] Sala-Vila, A., Harris, W.S., Cofán, M., Pérez-Heras, A.M., Pintó, X., Lamuela-Raventós, R.M., Covas, M.I., Estruch, R. & Ros, E., 2011. Determinants of the omega-3 index in a Mediterranean population at increased risk for CHD. *Br J Nutr*, 106: 425–31.

[5] Toppe, J., Bondad-Reantaso, M.G., Hasan, M.R., Josupeit, H., Subasinghe, R.P., Halwart, M. & James, D. 2012. Aquatic biodiversity for sustainable diets: the role of aquatic foods in food and nutrition security. *In*: Burlingame, B. & S. Dernini, eds. *Sustainable diets and biodiversity*, pp. 94–101. Rome, FAO and Bioversity International. 309 pp.

[6] Weichselbaum, E., Coe, S., Buttriss, J. & Stanner, S. 2013. Fish in the diet: a review. *Nutrition Bulletin*, 38: 128–177.

and bones, which are excellent sources of many essential minerals such as iodine, selenium, zinc, iron, calcium, phosphorus, potassium, vitamins A and D, and several B vitamins. Seafood is almost the only natural source of iodine. Iron and zinc are found in significant amounts, particularly in fish species eaten with bones, such as small indigenous fish species. For example, only 20 g of Chanwa pileng (*Esomus longimanus*) from Cambodia contains the daily recommended allowance of iron and zinc for a child. Mola (*Amblypharyngodon mola*), a small indigenous fish species from Bangladesh, is reported to have a vitamin A level of > 2 500 µg RAE in 100 g of fish; 140 g of this fish will be enough to cover a child's weekly requirement for vitamin A.

14. In many cultures small indigenous fish species are consumed at local level. In some Asian countries for example, rice fields have not only been important for supplying rice, but have been an important source of small fish for providing highly needed protein and micronutrients in their diets. The importance of small fish in traditional diets has been increasingly highlighted because of their contribution to micronutrients as they are eaten whole and nutrient dense parts (e.g. heads, bones and liver) are not thrown away[7,8].

IMPACT OF TRADE ON NUTRITION

15. The increasing demand and trade of fish at the global level has triggered more farming of fish, in most cases limited to a few high value species such as shrimp and salmon as well as more affordable species such as carp, tilapia and pangasius. In some low income countries monoculture of fish has increasingly replaced traditionally consumed small fish species with their unique nutritional composition. However, polyculture of carp and small indigenous fish species is an example of how aquaculture could add, rather than replace, fish to vulnerable local diets.

16. In some cases small indigenous fish species, such as Mola in Bangladesh, is increasingly being traded. The growing knowledge on the exceptional nutritional quality has led to an increased demand and higher market price for Mola. In Africa, small lake sardines such as Dagaa/Mola (*Rastrineobola argentea*) from Lake Victoria and similar species, such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*) in southern Africa, are an important source of micronutrients in traditional diets as they are consumed whole. Significant volumes of Dagaa, for example, are being traded to areas outside their region of capture, providing nutritious food to people in neighbouring countries. At the same time, these small indigenous fish are also being traded more and more as a valuable feed ingredient as a result of a well-paying market.

17. Increased trade of fisheries products has increased the need for fish to be processed, enabling the export of the higher valued parts of the fish and leaving less valued by-products such as heads, viscera and back-bones for local markets. By-products represent between 30 and 70 percent of the fish after being processed at industrial level. In most cases these by-products are further processed into fishmeal and fish oil, primarily for feed purposes, and therefore indirectly contributing to food security. At present, more than 30 percent of the raw material for producing fishmeal and fish oil is based on by-products and waste rather than whole fish. This percentage is growing and increasingly replacing the small pelagic species historically used for this purpose[9]. Fishmeal and fish oil are internationally traded products, an important source of revenue for some countries, and a very important feed ingredient for the aquaculture sector, the fastest growing food production system in the world.

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[7] Halwart, M. 2013. Valuing aquatic biodiversity in agricultural landscapes. *In*: Fanzo, J., Hunter, D., Borelli, T., Mattei, F. eds. *Diversifying food and diets: using agricultural biodiversity to improve nutrition and food security*, pp. 88–108. Routledge.

[8] Thilsted, S.H. 2012. The potential of nutrient-rich small fish species in aquaculture to improve human nutrition and health. *In*: Subasinghe, R.P., Arthur, J.R., Bartley, D.M., De Silva, S.S., Halwart, M., Hishamunda, N., Mohan, C.V. & Sorgeloos, P., eds. *Farming the waters for people and food*. *Proceedings of the Global Conference on Aquaculture 2010, Phuket, Thailand*. *22–25 September 2010*, pp. 57–73. Rome, FAO and Bangkok, NACA. 896 pp.

[9] IFFO. 2013. Fishery discards and by-products: increasing raw material supply for fishmeal and fish. http://www.iffo.net/downloads/Fishery%20discards%2008%2002%202013%20web%20version.pdf

18. As more fish is being processed on an industrial scale before being sold, more of the waste, or rather, by-products can potentially be processed into valuable products for direct human consumption. Although most of these by-products are not utilized at present for human consumption, international trade has opened up new markets for fish products traditionally not consumed in their country of origin. For example, there is a growing demand for fish heads in some Asian and African markets, a product not considered as food in other regions. For years, Nile perch caught in Lake Victoria has been locally processed, and high valued fresh fillets exported out of the region. By-products such as back-bones and frames have become a popular product on the local market, are now important products traded at local and regional level, and are an important source of nutrients in local diets.

19. From a nutritional point of view by-products in many cases can be of higher value than the main product, particularly in terms of essential fatty acids and micronutrients such as minerals and vitamins. The increasing global demand for fish oil as a nutritional supplement has also made it profitable to extract highly valued fish oil from by-products such as tuna heads. Mineral supplements can be made out of fish bones, although this is not yet widely done. A recent pilot production of a fish bone-based mineral product showed high levels of most essential minerals, particularly zinc, iron and calcium. The product was tested in traditional school feeding meals and was highly appreciated by the school children[10] .

NEXT STEPS

20. Increasing consumption of fisheries products could in many cases be an excellent food-based approach to combat malnutrition and, in particular, micronutrient deficiencies in developing countries. Promoting increased consumption of fish products could be a good approach in reducing levels of malnutrition in many vulnerable areas. In addition to improving incomes, fish trade could contribute to the distribution of healthy and affordable fish products. Low value fish are often processed into products not intended for human consumption, but could also in some cases become healthy and affordable alternatives of food.

21. Data and information on fish production and consumption, as well as on their nutritional value, are limited in most developing countries. In order to fully understand the role that fish and fisheries products can play in providing nutrients deficient in many diets, there is a need to generate more knowledge on the nutrient composition of local fish species where this is lacking.

22. The increasing focus on the benefits of fish consumption has had a corresponding and increasing concern for fishery products as a source of contaminants. Consumption of fish, as for any other food, may lead to ingestion of harmful agents. Levels of a few contaminants in some cases can be higher than the maximum permitted levels in fish. These contaminants can also cause obstacles to trade, but local data and knowledge on contaminants in fish could help countries to avoid exporting fish that might be rejected by importing countries. Any foods we eat have benefits and risks associated with their consumption, but very few foods provide benefits to the same levels as fish products.

23. In 2010, FAO and the World Health Organization (WHO) held an expert consultation on the health risks and benefits of fish consumption, and the conclusion was quite clear that the benefits of eating fish outweigh the risks, even if consumed more than several times a week for all species studied. It was concluded that the consumption of any amount of fish has a positive impact on health. In particular, pregnant women and nursing mothers should ensure they eat enough fish[11]. In the case of a need to communicate potential risks of fish consumption, FAO Members are advised that this should be well planned to ensure consumers are not confused and scared from eating fish in general.

[10] Glover-Amengor, M., Ottah Atikpo, M.A., Abbey, L.D., Hagan L., Ayin J. & Toppe, J. 2012. Proximate composition and consumer acceptability of three underutilised fish species and tuna frames. *World Rural Observ*., 4(2): 65–70. Online: http://www.sciencepub.net/rural

[11] FAO/WHO. 2011. Joint FAO/WHO expert consultation on the risks and benefits of fish consumption. Rome, FAO and Geneva, WHO. 50 pp. Available at www.fao.org/docrep/014/ba0136e/ba0136e00.pdf

24. In November 2014 the Second International Conference on Nutrition (ICN-2) will be held in Rome[12]. It will be a high-level Ministerial Conference which will propose a flexible policy framework to address today's major nutrition challenges and identify priorities for enhanced international cooperation on nutrition. A separate paper on the role of fish in nutrition is being prepared for the upcoming ICN-2. Existing knowledge on the role aquaculture and fisheries could play in combating malnutrition should be highlighted more than ever, both as a provider of essential nutrients and as an income generating activity.

[12] http://www.fao.org/food/nutritional-policies-strategies/icn2/en/