DEVELOPMENT OF MARINE FISHERIES

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Summary

The primary function of the fishing industry is to feed people by exploiting natural ocean resources for maximum long-term net benefits to humankind. As time goes by, feeding people becomes even more important because there is no peace in the world of hunger.

The fishing industry is at a crossroads with regard to the transition from a chaotic hunting industry to adopting a farming approach to the harvesting which includes a growing responsibility. Another important goal is the full rational use of known and yet

unknown but existing fishing resources.

Fisheries management must be a global effort if fish stocks are to remain commercially viable for generations to come. There is a concern over the lack of rights-based management of the Exclusive Economic zones (EEZ) and on the high seas. With no incentives to look after the stocks, the environment, abiding by the rules, and the concept of responsibility becomes "everyone else's problem."

The Individual Transferable Quota (ITQ) system offers fishermen the chance to overcome hostility among themselves, to come to one International Fishermen's Policy, to develop strong self-organization and effective joint actions aiming to achieve the industry's economic independence.
Political borders have no meaning in the functioning of large marine ecosystems and in their rational exploitation. For realistic determination and rational sustainable use of aquatic resources, including in the high seas, a kind of Global Fishing Management System must be established, backed by the UN. Fishing will change over future generations, and so decisive roles belong not only to fishermen but also to the general public.

1. Introduction

During the history of humankind, the fisheries industry has been continually growing, beginning on river and lake banks to encompassing enormous areas of the ocean, from sea shallows to depths of 1500 m to 2000 m at the continental slope (see *A History of Fishing***).**

Contemporary fishermen have huge potential power to destroy nature's gifts. If not used with extreme care, it will impact on living aquatic resources. Marine animals make up 50% of the animal protein consumed by humans, half of which is found in fish products, the other half being consumed indirectly as fish meal for breeding cattle and poultry. World population growth fuels the increased rate of total world catch. Unfortunately, the per capita fish catch volume has the tendency to steadily decrease.

The gap between fish supply and demand in LIEDCs (Low Income Food Deficit Countries) is widening. There is the potential to improve food security in undernourished lands by switching pelagic resources presently utilized for fishmeal and oil to human consumption. It may be possible to achieve a greater total catch by using unconventional methods to target untapped open-water species.

The fishing industry is highly dynamic because of the great fluctuations in its resource base in time and in space. Economic appeal of fisheries is governed by the fact that investments in this sphere are often more profitable than say in agriculture. On average, each dollar that is generated by the fishing industry generates four dollars in the nonfishing economy. Fishery costs are decreasing by means of new fishing techniques being developed, and profits are increasing by means of discovering new fish processing techniques and developing new fish products (see *Development of Specialized Ships, Nets, and Equipment*).

The effort-to-costs ratio depends on the state of resources but also on the labor value, the cost of credits, the population solvency, and on the availability or absence of protectionism from the state involved in the fishing industry.

The way of selling fish delivered at port affects the cost of the catch obtained. Fishermen gain the highest profit through auction trade. Prices are dependent on fish species, the part of catch which is reduced into fishmeal and fish oil, the competition level at initial sales, the volume of unsold fish, and export expenditures.

It has become evident that something has gone wrong with the fishing industry. The very world of fishing may disappear because of the following:

- Massive supercapitalization of the entire fishing industry
- The overcapacity in comparison with the resources consumed
- Acute struggle for resources on all levels
- Pollution of reservoirs and aquatic biological resources

With no incentive for the fishermen to protect the fish stocks, they are forced to compete by purchasing larger, faster, more efficient boats, and catch as much fish as they can before someone else gets a larger share. This understanding of the threatening situation forced many countries to restrict the admission of users to their bioresources by means of allocation and licensing the right to fish. Restrictions have been introduced as to the number of ships, their length and tonnage, and to the types and numbers of catching gear and catching equipment.

Functioning of the world fisheries is possible thanks to the labor of many people. First and foremost, these are the fishermen. There are some 13 million professional fishermen who, with their dependents, comprise roughly 50 million people directly dependent on fishing for their livelihood. A further 150 million people are involved in the shore-based sector that services the fleets. There are also about 30 million part-time fishermen and more than 100 million sportsmen for whom fishing is just a hobby. In addition, there are scientists, economists, fish processors, along with lifesavers, shipbuilders, and traders involved in the industry. Many work at educational establishments and consultative institutions, governmental and regional control establishments, manufacturing firms, banks and insurance agencies, advertising agencies, in professional journalism and in international organizations dealing with fisheries problems.

2. History

2.1 Fishing History Periods

The modern fisherman is the product of an endless chain of generations of artisans. Fishing is one of the components of forming both materialistic and spiritual culture for human society as a whole. The images of salmon, along with images of deer, carved on a horn 30 000 years ago, were found in a cave in France. The process of fishing has been depicted in rock paintings, papyruses of the Ancient Egyptians, and in antique mosaics. In Ancient China bronze images of fish were used about 1000 BC as a form of currency. In Japan and China the fish was a symbol of happiness and wealth; they were

painted on expensive porcelain plates, vases, and other wares. The images of fish and sea animals appeared on ancient Syracusian, Delphian, and Roman coins. One can also see fish depicted in many coats-of-arms of ancient and medieval cities. Fish appear on modern coins and postal stamps. Fishermen became the first apostles of Christianity. The Sea of Galilee, rich in fish, was the scene of most of Jesus Christ's ministry. A rock carving of a whale from a cave near Oslo, Norway, is presented on Figure 1.

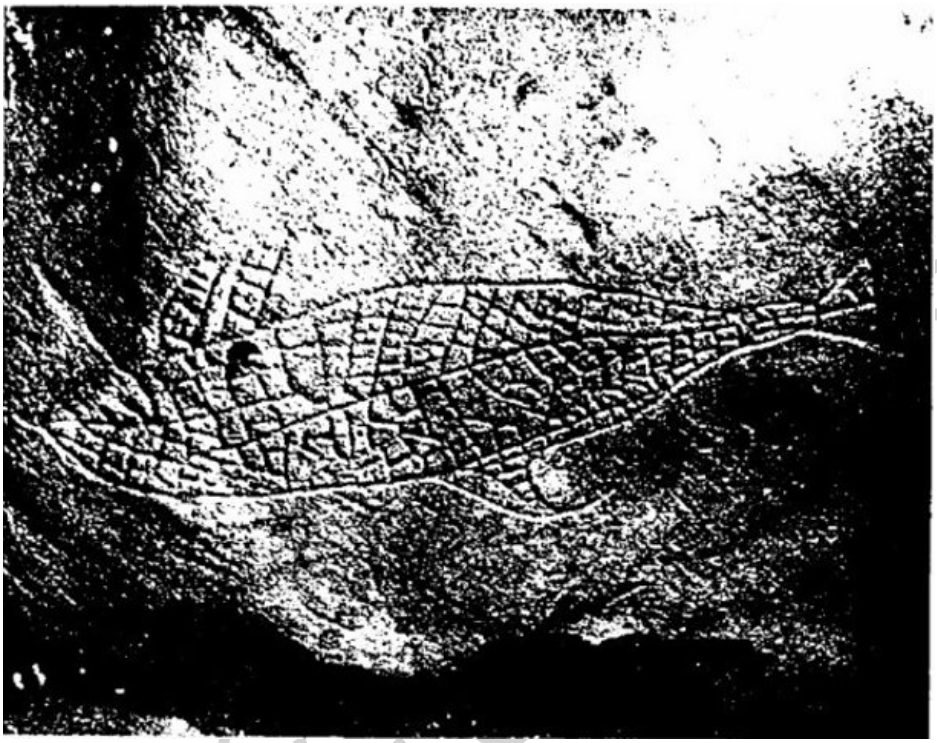

Figure 1. Rock carving of whale

To make the historical process easier to comprehend it is reasonable to highlight three main periods: 1. Pre-industrial. 2. Industrial. 3. The period of crisis.

1. Pre-industrial period covers more than a million years: from a primitive society up to the establishment of the fish commodity economy.
2. Industrial period covers a little bit more than 100 years since the appearance of the first steam-trawler in England in 1870. From the middle of the nineteenth century to the end of the twentieth century the annual world catch went up from 2 million tons to 100 million tons of fish.
3. The period of crisis began in the last quarter of the twentieth century and continues.During the Glacial period, because of the scantiness of flora and fauna, some tribes used to settle down by the sea. On coasts of the Baltic Sea, in Northern Norway, in the Nile delta, and in the area of Rudolph Lake excavations, dwellings have revealed harpoons, bone hooks, primitive water conveyance made of reed, wood, and leather. Traces of fishing communities were found in Mexico, Peru, Guatemala, Japan, and on the North American continent. A long time before the ancient civilization in the valleys of the Tigrus and Euphrates Rivers, people used to catch and process fish.

Fresh fish was considered a luxury in the ancient world, while salted and dried fish was regarded as a food for the poor and slaves. The Roman Empire became a main sales center for seafood. Certain days in the Roman calendar were specially celebrated during which people couldn't eat any meat except fish.

Fishing settlements on the coasts of the present Germany and Holland were known since the seventh century. The epoch of the Vikings led to the development of fishing and seal hunting in what is now Iceland, England, Scotland, Ireland, and islands of some archipelagos of the Northern Atlantic and the coast of Greenland.

In the twelfth century the people of the Pyrenean Peninsula developed methods for catching whales and cod in the Bay of Biscay and then along the entire coast of Europe north to Norway. Beginning in the fourteenth century, the Dutch began to improve the herring fishery. In the fifteenth century the English and French began fishing in the waters of Iceland and then the Europeans began to develop fisheries in the Western Atlantic. After 1497, when John Cabot reached Newfoundland, the rapid evolution of the fisheries began in the Grand Banks of the Atlantic. In the middle of sixteenth century large-scale fisheries already existed in Russia by the White and Barents Seas. Caspian Sea fisheries served Europe and domestic markets with sturgeon and herring. Before the twentieth century they remained the main suppliers of the huge Russian market.

2.2 Influence on People's Fate

Although the job of a marine fisherman was difficult and dangerous, the meat of marine fish received a higher rating than freshwater fish, meat, and butter. The main seafood in Europe for a long time was clipfish and stockfish, which were cut salt cod and dried cod, respectively. In conjunction with cod, herring was another important fish resource. Haddock was constantly in great demand in Scotland, and in Spain hake and flatfish, such as plaice, sole, and halibut were of great value. Salmon, mackerel, and cod were targeted in the English Channel, North Sea, and the Baltic Sea. The Mediterranean Sea was renowned for tunas, squid, octopus, sardine, and anchovy. The Hanseatic League to a great extent was indebted to fishing and the fish trade for its success. In Europe, some river fisheries were able to become prosperous. The Loire River became famous for salmon and carp, the Rhine river for perch, and the Volga river for sturgeon and caviar. Significant achievements were also attained in Czechia and Germany with the development of artificial carp ponds.

In Newfoundland permanent settlements were established in 1583 under English sovereignty. The fishery was responsible for providing England with more than a half of the nation's income. At the end of eighteenth century 600 ships and 6000 people were engaged in the fishing industry of New England. The US and Canada, after being founded, began to dominate the fishing industry of the western Atlantic.

It was widely believed that the prosperity of Holland was built on herring's bones. Dutch vessels sailed to Dogger-bank, to the coasts of England and Scotland reaching the Orkney Islands. Salted and smoked herring was exported to Italy, France, and Spain by sea, rivers, and on land via horse-drawn vehicles. Figure 2 shows the city of Amsterdam

in the eighteenth century with its fish market in the foreground.

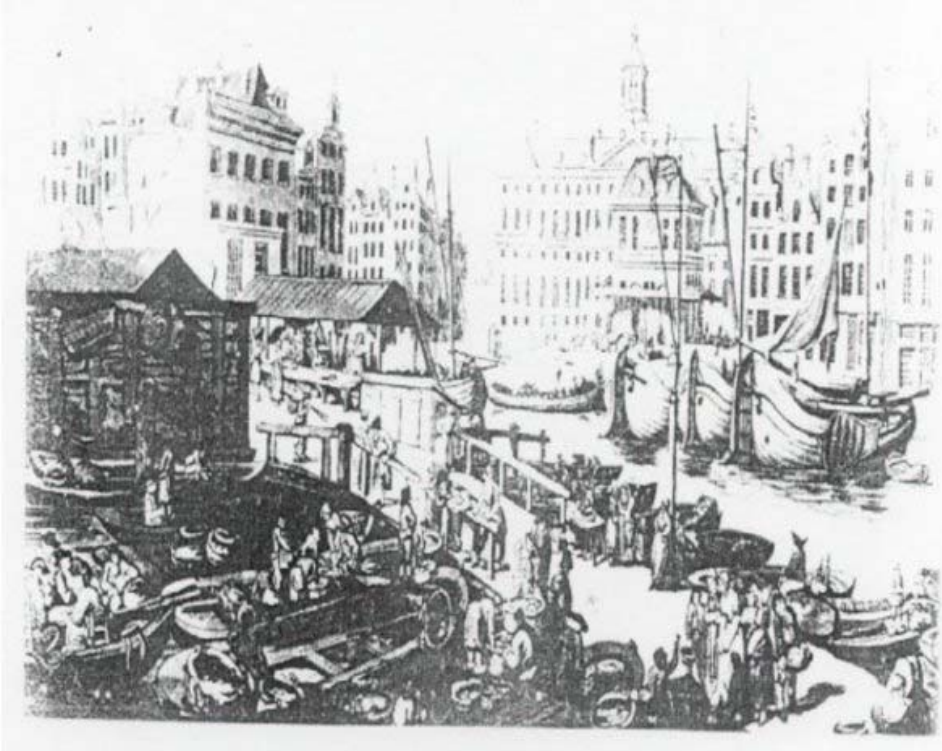

Figure 2. Amsterdam fish market (eighteenth century painting)

Industrial power in Great Britain was not based solely on wool, but also on herring. Fighting with the seemingly invincible Spanish Armada was also a struggle for herring fishery. Marine fisheries found continued success because of advances in navigation and shipbuilding techniques primarily developed by the British (see *Development of Specialized Ships, Nets and Equipment*).

2.3 The Establishment of Fish Markets

Fish-women were the first market mediators between buyers and fishers. Then trade dealers rose to the level of owners of specialized shops. Rich fish merchants became influential persons in public management. Some fishers lost their means of production and started to sell their labor to employers. Creditors, merchants, and users began gradually to control fisheries activities by offering loans, especially for shipbuilding. Fish guilds, which were unions of traders, appeared in such centers as Santander in Spain, Luebeck and Cologne in Germany, and Yarmouth and London in England. Guilds ensured the profitable sale of goods, helped to guard transported fish, created townhouses in ports, purchased salt, barrels, hemp for nets, iron for hooks, and founded mutual insurance companies in case of unforeseen damage.

Self-adjusting fish markets balanced supply and demand by means of a price-varying mechanism. The profits created by most fisheries were always unstable and easily manipulated. For the formation of fixed and more stable profit fish manufacturers who had become rich intended to put their money into shipbuilding, ports, and onshore fish

businesses.

Transportation was limited by the time necessary for preservation of quality of perishable nonprocessed fish. China was an exception because it developed a process for preserving fish in the form of a sauce that underwent direct fermentation. American Indians had dried salmon in the open air and then ground it into powder to be prepared as pimmokan, which is a product allowing long-term preservation fit for remote trade.

3. Fishermen Character and Policy

The expression "fishing community" means a group of people who are substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs. The term includes fishing vessel owners, operators, crew, and processors who are all based in a small geographic area. In the fishing community women play an important role. During the long absences of their husbands, the women bear not only the responsibility of raising their children, but actively participate in community businesses. Staying ashore, they deal in all the matters concerning the fish handling, net repair, and fish trade.

In general the role of commercial fishermen is underestimated, their influence on economic and political life is marginal and their ability to defend their own interests is negligible. On the whole, fishermen tend to have courageous and bold personalities and think quickly with strong resoluteness. Unfortunately, the majority of commercial fishermen do not receive sufficient formal education. However with the practical education learned over time at sea, fishermen understand perfectly and know local conditions of sea ecosystem life, sometimes to a level surpassing the scientific community. Modern-day commercial fishermen, although concerned about the future of the marine environment, are considered by the public to be merely hunters and destroyers of biodiversity.

Fishermen tend to intuitively reject innovation because of the fear of spoiling the existing routine practice inherited from ancestors. Fishermen are also afraid of new expenditures because each new expenditure, if not financially covered, could lead to the demise of a business. Fishermen thirst for freedom and independence. They do not want an unexciting job, but enjoy relying on good fortune. To generalize, it is a continuous game with a high probability of loss. The permanent concern is always present at home and is collectively shared by wife and children. As fishing boats become bigger and voyages longer, individual or family labor, typical of small fisheries, will give way to the collective labor relationship between the owner and other workers selling their skills in the labor force.

Being that fishing is an ancient occupation, often taught through family generations, it is not surprising that fishermen tend to be superstitious. Rituals, customs, and habits, some relayed by myths and fairytales, are an integral part of the life of fishing communities. To avoid unforeseen dangers bullhorns were fixed to the early fishing vessels of the Mediterranean, an ongoing tradition from the times of the holy bull Apis of the ancient Egyptians. The fishermen of India and other Eastern countries believed that good and evil spirits live in fishing gear, and that people were often reincarnated as fish. Early

Korean and Japanese fishermen drove the evil spirits away by means of smoke. Catholics organized the holidays in honor of their patrons Saint Peter, Saint Anselm, and others. Chinese fishermen believed that their dead forefathers protected them while at sea, they prayed for their protection with a tap of a wooden fish in a temple with a sacred wooden bar.

Making fishing gear and handling the gear was often accompanied by ritual ceremonies. The South American Indians believed that the first fish caught was the mother of the rest caught later, and that the fish caught in excess and not eaten were an insult to the spirits that dwelt in the ocean. In the lore of European fishermen, there is oftentimes mention of fish-kings. In England, a herring-king and in Brittany, a sardine-king was believed to frequent the surrounding waters. If a fisherman caught a fish-king, releasing it would reward him, whereupon the fish-king would direct other fish into the nets.

Like any form of hunting, multiple techniques exist for the capture of fish. In many different scenarios each fisherman acquired invaluable experience pertaining to a specific fishing tactic, which he passed on to his descendants. Although the experience and understanding contributes to the catch, fishermen employ instinct and intuition unexplained by logic, and spontaneous actions to yield satisfactory catches.

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Biographical Sketch

Alexander L. Fridman. Dip. Eng., Ph.D., Dr.Sc., Honorary Researcher of Science and Engineering in the Russian Federation, 1994, Decree of the President of Russia. He entered the fishing industry in 1945 as a student at the Fishing College. In 1946-48 he worked as a deckhand aboard many vessels in different fisheries of the Caspian and the Barents Sea. Training as an engineer began at the Fisheries Experimental Station of the Murmansk Trawl Fleet. From 1951 through 1957, served as a manager of the sea fleet operations of the Trawl Fleet in the North Atlantic. During the period of 1957-61, served as an Assistant Professor in the Maritime Academy also in Murmansk.

In 1961-1993, was elected and held the position of Professor and Head of the Commercial Fishing Chair at the Kaliningrad State Technical University. In 1991 - 1994, he served as a Chairman of the Graduation Council appointed by the Government for awarding Ph.D. and Dr.Sc. Degree in fishery science. During this time he lectured and consulted in Germany, Poland, England, Italy, Denmark, Canada, China, Japan, and Australia. He was also a participant at the FAO Conferences, ICES Working Groups, and other international professional events.

Publications includes roughly 200 articles, books, textbooks, and the author's patent license, published since 1951 in different Russian and International Publishing Houses, Transactions, Journals and Proceedings, also several articles in the Large Soviet Encyclopaedia. Since 1957 he was a Major Professor for 700 Dip. Eng. and for 25 Ph.D. candidates.

After retirement in 1994 he worked for half a year with the Australian Maritime College. From 1995 until his death in 2008 he was a Visiting Professor at the Fisheries Center of the University of Rhode Island, USA.