Współczesna Gospodarka

Contemporary Economy
Electronic Scientific Journal
www.wspolczesnagospodarka.pl

Vol. 4 Issue 2 (2013) 11-24
ISSN 2082-677X

STATE OF GLOBAL FISHERIES – MANAGEMENT POLICIES

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Abstract

Global fisheries landings have stagnated and are associated with many negative environmental impacts, affecting the economy and food security in many countries around the world. Although many different management policies trying to incorporate a more sustainable and resilient scope have been developed over the years to improve this current fisheries crisis, we are still in the early stages of adopting more adaptive and corrective fisheries management globally, as well as enforcing it, due to the inherent difficulties of managing uncertain natural resources Upon analysis of different management strategies, using Peru and the European Union as case studies, three major recommendations were made for developing more sustainable and resilient management policies: decentralisation of the management system, ecosystem-based fisheries management and reallocation of subsidies. Finally, possible management strategies for different scenarios predicting the future of fisheries were described. In the current fisheries crisis situation, developing and implementing sustainable and resilient fisheries management strategies should be seen as a long-term investment in the profitability of the industry, as well as an opportunity to decrease social tensions and improve food security.

Key words: management strategies, Common Fisheries Policy, sustainability, EBFM, subsidies

Introduction

Global fisheries are showing undeniable catch stagnation at about 90 million tonnes (FAO, 2012) with numbers of overexploited stocks continuing to increase. Nowadays, about 30% of stocks are overexploited above their biological potential, making the 2015 Maximum Sustainable Yield (MSY) target unlikely to be met (FAO, 2012). This target, defined in the World Summit on Sustainable Development (Johannesburg, 2002), aims at ensuring that stock levels are maintained at their full reproductive capacity and the highest long-term yields (Lassen *et al.,*

2012). This worsening situation tags along environmental negative consequences such as habitat degradation or biodiversity loss, as well as negative socio-economic impacts. The global fisheries crisis threatens its conservation and long-term sustainability (Xue, 2004) and is proof of the failure of the current fisheries management to provide healthy stocks and profitable industries (Sampath, 2005). There is a growing global realization and debate about this failure, and an example of it is this year's European Union Common Fisheries Policy (CFP) reform.

Apart from providing a livelihood and income for 10-12% of the world's population in 2010 through the primary and secondary sectors of fisheries and aquaculture, fish and seafood products represent a very valuable animal protein source (FAO, 2012). It provides 15% of the total animal protein intake to 4.3 billion people on the planet and the annual per capita consumption of seafood products has increased steadily worldwide from around 9.9 kg per capita in the 1960s to 18.4 kg on average worldwide (FAO, 2012). It is of extreme importance to address these issues as soon as possible with a sustainable and resilient scope in order to avoid a future snowball effect of negative consequences.

There are many causes that have contributed to the current ineffectiveness of the fisheries management: The technological advances and improved fishing efficiency of the last decades has not been matched by the development of sustainable management strategies (Pauly *et al*., 2002). Due to the complex and variable nature of fisheries management, those responsible for making the decisions and implementing effective measures have not taken an interdisciplinary approach to the issue and have focused their efforts on solving problems in isolation, independent of other key factors (Xue, 2004). In this situation of overcapacity, excessive subsidies, destructive fishing methods and deficient communication of scientific findings, many suggestions have been made on how to improve fisheries management, but so far no effective general proposal has been adopted globally that has improved the situation. However, in recent years, there has been an improvement in the view of fisheries and its management. Marine Protected Areas (MPAs) are being developed, the long-term availability of resources is gaining importance as an objective (Xue, 2004) as well as utilizing a more pro-active precautionary approach. However, technology and fishing methods keep developing and improving, catching up on the management improvements to control and limit fishing mortality. Providing a solution to these many problems is a difficult objective, and this is subject to the States compliance and adoption of such measures, which has generally been incomplete (Xue, 2004).

The aim of this review is to provide a basic overview of the global fisheries management practices The complexity and depth of the topic impedes the possibility to discuss every detail in depth, so only a basic overview is given to exemplify some of the current management objectives and practices, weaknesses and strengths, causes and consequences. The paper uses Peru and the European Union (EU) as case studies with their different approaches to fisheries management as result of their different social, political and economic situation and their importance on the global market. Up until 2010, Peru was the second most important fishing country in terms of production, but a decline in catches of its main fisheries, the Peruvian anchoveta, brought the country down the list. The EU example is particularly interesting as it is currently going through a reform of its Common Fisheries Policy (CFP). The focus is also placed on marine capture fisheries management, excluding the inland capture fisheries and the aquaculture sector management.

Based on the analysis, three major recommendations were developed to improve the efficiency of the management system. These can be included in designs of completely new fisheries management policies or may be partially implemented into already existing strategies to enhance sustainability. Finally, examples of management strategies for different scenarios of fisheries in the future were given.

1. Fisheries management

For centuries, coastal states have had national jurisdiction in a very narrow area from their coast, with all the rest of the sea being lawless and free to exploit (UN, 2012). In the 1960s, pollution and international conflicts due to competing interest in offshore production and exploitation, lead to the first signs of overexploitation in the fish stocks. This triggered the creation of the United Nations Convention of the Law of the Seas (UNCLOS), which came into force in 1994. Its objective is regulating all aspects of the resources and uses of the sea – from the conservation and management of living marine resources, to setting territorial sea limits, protecting the environment and establishing a procedure to settle disputes between States, among many other things (UN, 2012). One of the main implementations was the creation of the 200 nautical miles (~370 km) of sovereignty rights for coastal states, the Economic Exclusive Zone (EEZ), which was added to their 12 nautical miles of territorial waters already claimed. States were then considered responsible for the exploitation and conservation of resources in their EEZ (UN, 2012).

Pure or unregulated open-access conditions means non-existent or poorly defined fishing access rights (Aranda, 2009a) leading to Hardin's "Tragedy of the Commons" (Hardin, 1968). Unregulated open-access common resources become depleted due to the expected individualistic decisions of fishermen to maximize personal profits (e.g. increase in the fleet size and capacity), despite their understanding of the over-exploitation and possible depletion of the shared resource. Over the last 50 years, overfishing has been considered a major global problem, however; effort has been put into regulating landing quantities and fishing methods, rather than fishing capacity management (FAO, 2005).

Fishing limits should be set according to the best scientific evidence available. This is currently done in the form of Total Allowable Catches (TACs), which are further divided into quotas that are given to individual vessels in a nationally managed fishery (Xue, 2004) (e.g. Peru) or to individual States in an internationally managed fishery (e.g. European Union). Usually, to regulate the TAC, landings are limited, technicalities are regulated (e.g. gear limitations, closed areas, seasons or Minimum Landing Size -MLS-) and the fishing effort is controlled by regulating fishing time (i.e. Days At Sea, DAS) and capacity (Daw & Gray, 2005).

States subsidize the fishing fleets to allow them to continue fishing profitably under variable stock conditions. This has lead to over investment in fishing vessels (i.e. over capitalization) due to market incentives. Excessive subsidies, together with globalization of fisheries and political and economic pressures have lead to a large number of industrialized vessels from more economically developed countries establishing "cash for access" fishing agreements with the less economically developed countries to access their EEZs (Swartz *et al.,* 2010). Vessels move away from overexploited waters and take advantage of the scarce economic resources of developing countries to control the amount and value of their fishing, leading commonly to an unfair price for access and unsustainable and ecologically damaging practices. This threats the food security of the less economically developed countries which, instead of re-investing this money for socio-economic benefits for the fishing communities, often have corrupt governments that prefer to finance other luxury products (Swartz *et al.,* 2010).

Overcapacity in the global fleets is considered to be one of the main problems driving the current overexploitation of fish stocks (FAO, 2005), which has led to low productivity industries that damage the marine environment (COM, 2009). Regulating overcapacity is usually done by retiring fishing vessels, therefore creating unemployment, so added socio-economic incentives should be included in any fisheries management reform to support early retirement, as is the case of Peru's 2008 anchovy fisheries reform (FAO, 2005).

Non-Governmental Organisations (NGOs) have been a pressure force behind many environmental decisions made by reluctant governments, thanks to their influence on the media

through major actions, drawing the attention and involvement of the general public. An example of this was the pressure put on the 27 EU Fisheries Ministers during the CFP reform by 217 NGOs and social organizations to stop overfishing by EU fleets by 2015 (Votewatch Europe AISBL & Votewatch CIC, 2013). Another example is the World and Wildlife Fund (WWF) initiative, together with Unilever Corporation, which created in 1996 the MSC (Marine Stewardship Council), a NGO that targets the major fisheries and certifies or eco-labels the fish products as sustainable (Constance & Bonnano, 2000).

1.1 Peru

Right up until 2010, Peru was the second largest capture fisheries producing country in the world, thanks to the Peruvian anchoveta fishery *(Engraulis ringens)* (FAO, 2012). This small pelagic and reduction fishery is the largest single-species fishery in the world with average landings of 5 to 6 million tonnes per year (SFP, 2013), placing Peru in the top five fish oil producing countries in the world (FAO, 2010). However; its environmentally variable location makes it a very unstable fishery susceptible to the El Niño and La Niña Southern Oscillation events. Since the beginning of its exploitation in the 1950s, the fishery has suffered dramatic collapses and recoveries, becoming a priority for the Peruvian Government to achieve a stable stock biomass through effective management (SFP, 2013). So, after the cooling phenomenon of La Niña in 2010, when spawning and recruitment of the stock was favoured, Peru decided to put in place a precautionary management measure and close the fishing season in the final quarter to protect the high juvenile population. This measure has lowered Peru's ranking as a marine producer, with countries such as China, the USA and Indonesia higher in the ranking (FAO, 2012). Nowadays, the Peruvian anchoveta is again the most-caught species, nevertheless; the Peruvian Government has introduced an annual country quota that would prevent the high catches previously reported, with the objective of stabilizing the fleet and the processing plants capacity (FAO, 2012). The Peruvian anchoveta fishery will be used as an example of the Peruvian fisheries management.

Peru's aquatic living resources are administered by the State through the Ministry of Production (i.e. PRODUCE) which, taking into account the best scientific evidence and socio-economic factors, defines the management characteristics to achieve socio-economic development, environmental conservation and sustainable use of the resources, according to the General Fishing Law and Law 26821 for the Sustainable use of Natural resources.

After many years of debates and proposals, the anchovy fisheries management in Peru was changed in 2008 from an open-access approach towards an "Individual Vessel Quota" (IVQ) management system. The objective was to set "Maximum Catch Limits to Vessels" (Law 1084) and end the race for fishing, which had lead to overcapacity (i.e. too many vessels too powerful and technological for the available resources).

Basic characteristics of the Peruvian fisheries management strategy include:

- The fishing rights are granted for a period of 10 years to specific vessels and fishing licenses. After this period, the IVQ system will be evaluated and re-adjusted. Fishing rights are given according to a coefficient calculated based on the best catching year from 2004 to date. In the case of the large-scale fleet, this accounts for 60% of the coefficient calculation, with the remaining 40% related to the vessel's fish-hold capacity. The coefficient is multiplied by the TAC recommended by IMARPE, the Peruvian scientific authority.
- In order to incentive the investment of stakeholders to retire less competent vessels or improve their quality, the Contract of Compromise of Permanence of the IVQ regime guarantees no change in the management system for 10 years. However, based on IMARPE's recommendations, the government may take decisions on regulations and enforcement.
- The boat owner can transfer the allocated rights between his boats. This limit avoids the accumulation of rights in a few more powerful vessels, but as no new entries are permitted, the

only way in is by purchasing vessels and their licenses. This stands in the way of the retirement of vessels (i.e. capacity reduction) and may result in the emergence of a market for rights, where selling them for a high price is very tempting (Aranda, 2009a). This has been seen in the IVQ system for the cod fishery in Norway, which incorporated extra transferability mechanisms (Standal & Aarset, 2008) due to the fast development of a market for fishing rights (Hersoug et al., 2000). It also limits the possibility of compensating for exceeding catches by buying or renting quota from other owners (Aranda, 2009b).

- Vessels are required to have a Vessel Monitoring System (VMS) to facilitate the control of the vessel's fishing grounds and landings. This is coupled to weight recording devices in the landing points. However, many vessels in the artisan sector lack any VMS (Aranda, 2009b).
- All fishing license holders have to contribute to a Compensation Fisheries Fund (i.e. FONCOPES) which is used to provide education for further work opportunities, employment reallocation and support early and voluntary retirement.
- The regulations enforcement was toughened with higher fines, 3-6 years in prison in the case of landings misreporting, reduction of quotas in the event of quota busting, or prohibition to sail if they don't contribute to the Compensation Fisheries Fund. Nevertheless, no specification was made for discarding (Aranda, 2009b).

This 2008 management change is an example of late, corrective management, rather than precautionary management (Aranda, 2009a). However, the 2010 introduction of a closed fishing season is the result of a precautionary management approach.

1.2 European Union

In the European Union (EU), the basic regulatory framework governing the fisheries sector is the Common Fisheries Policy (CFP), formally established in 1983. This is common for all the Member States and its objectives are to ensure economically, socially and environmentally sustainable fisheries (Votewatch Europe AISBL & Votewatch CIC, 2013). The CFP Framework Regulation covers all issues regulating the fisheries industry: sector salaries, environmental protection, fishing methods or modernization of the industry among many other issues, compiled into over 300 pieces of legislation and composed of 4 main policy blocks Conservation, Structural, Market and External policy, with technical, environmental or financial measures defined (Votewatch Europe AISBL & Votewatch CIC, 2013). The European Fisheries Fund (EFF) is the financial tool of the CFP. It allocated 3.8 billion Euros between 2007 and 2013 to help reach the CFP goals like helping decommission vessels or improve the fishing gear (Blenckner *et al.,* 2011). International relations are also detailed in Fisheries Partnership Agreements, as well as the compliance liability of the Member States is defined in the 2010 EU Control Regulation, which includes the Illegal, Unregulated and Unreported (IUU) Regulations (Votewatch Europe AISBL & Votewatch CIC, 2013).

Fisheries are managed by setting Total Allowable Catches (TACs) and quotas for the different stocks based on scientific advice, which are then divided between the Member States on the basis of their historical share of the catch. The International Council for the Exploration of the Seas (ICES) is the main source of scientific advice, but the Scientific and Technical and Economic Committee on Fisheries (STECF), established by the European Commission, revises such advices and gives their own opinion (Votewatch Europe AISBL & Votewatch CIC, 2013).

The CFP has undergone three reforms already, including this year's one. The previous reform took place in 2002 and significant improvements were included such as the creation of the Regional Advisory Councils (RACs) for a higher degree of involvement of the stakeholders or the withdrawal of public funds for vessel modernization and building. However after 11 years, the current CFP is considered highly unsatisfying (Votewatch Europe AISBL & Votewatch CIC, 2013).

The following are some facts to support such general unsatisfying consideration:

- 88% of European fish stocks are being overexploited (Votewatch Europe AISBL & Votewatch CIC, 2013) and 30% of the stocks are close to collapse (COM, 2009). 80% of the Mediterranean stocks and 47% of the Atlantic stocks are currently overfished.
- Overcapacity is still a crucial issue. The fleet profitability has been eliminated creating in 2009 a 4.6% loss when removing the estimated 10-20% of subsidies (Votewatch Europe AISBL & Votewatch CIC, 2013). 40% of the fleet represents excess capacity for the available resources with only an annual 2-3% capacity reduction having been achieved. This basically equals the estimated technological advances of 3-4%, which has lead to a continuous increase in fishing effort. At the same time, 60% of the seafood products are imported, reflecting the insufficient supply to the European market (Votewatch Europe AISBL & Votewatch CIC, 2013).
- Scientific advice was given little importance in terms of later implementation (Daw & Gray, 2005) with TACs and quotas on average 48% higher than recommended (Votewatch Europe AISBL & Votewatch CIC, 2013). The common words of caution used by the scientists due to the uncertainty surrounding the predictions are seen as negligible evidence and so aren't given the importance they deserve as the only source of information. This leads to delayed and/or unimplemented scientific recommendations (Daw & Gray, 2005).
- Great over-centralization of the system and the short-term priority of democratically elected politicians (Daw & Gray, 2005) favours short-term socio-economic benefits (Bostford *et al.,* 1997).
- Having no clear political objectives, results in the lack of comprehensible guidance for making decisions, together with no political will to ensure compliance. The poor enforcement has lead to discarding, illegal landing and unclear allocation of catches to fishing grounds.

A necessity to develop a resilient and adaptive management of the fisheries resources became apparent and called for a new reform and improvement of the CFP, coinciding with the mandatory 10 years fisheries management revision.

In 2009, the European Commission (EC) (i.e. the only EU executive body that can initiate legislative processes), through their Directorate General Maritime Affairs and Fisheries (DG MARE), started a round of Member State stakeholders consultation on the current CFP. This discussion document is called the Green Paper. Two years later, the EC published their first reform proposition, signalling the initiation of a long, two years legislative process. The CFP reform is composed of 3 legislative blocks out of 6 blocks: The Basic Regulation, the Common Market Organization (CMO) and the European Maritime Fisheries Fund (i.e. former EFF). During 2012 and over this year, the European Parliament Fisheries Committee and the Agricultural and Fisheries Council of Member State Ministers (i.e. with co-legislative power since 2009) revised such proposal and presented their amendments. In February-March this year, a series of negotiating meeting, (i.e. the Trilogues) took place in order to agree on the 6 different regulation blocks. On the 8th and 30th of May 2013, the CMO and the Basic Regulations were agreed respectively, although technical details remain to be defined. Negotiations for an agreement on the EMFF are currently being held.

The Basic Regulation is the most important legislative block. Within it, controversial and important issues such as the fleet overcapacity or the Maximum Sustainable Yield (MSY) level of stocks have been agreed on (European Parliament Council Secretariat, 2013). It has also been agreed that the exploitation of marine biological resources should allow stocks to be maintained above MSY levels by 2015, if the socio-economic sustainability is not compromised by doing so, and certainly not later than 2020.

2. Recommendations towards a more sustainable and resilient management system

Based on the detailed analysis of Peru´s, EU's and other fisheries management policies, the following three major recommendations are suggested: de-centralisation of the management system, ecosystem-based fisheries management and reallocation of subsidies. Implementing any or all of these measures could enhance sustainability and resilience of the management strategy, improving the region's long-term fishing activities efficiency and minimising the environmental impact.

2.1 De-centralisation of the management system

The obvious inefficiency of the top-down management systems calls for a reduction of the responsibility and control of politicians and empowering of the stakeholders. An example of that is the Individual Transferable Quotas (ITQ) management system, which is one that many countries have or are introducing (Copes & Charles, 2004), such as the Peruvian case previously discussed. Under this market-based system, the TAC assigned to a country is divided among the fishermen who obtain a percentage of the TAC according to their catch history. Fishing right owners can sell or buy (i.e. transfer) their quotas (Molnar, 2008).

However, there are several drawbacks to this management system (Copes & Charles, 2004): (1) Being market-based, it is independent of resource sustainability or community welfare. (2) Competition still occurs for "the best" catch. Hence, high grading or unreliable data collection are often observed. (3) These quota shares were given free of cost to the boat owners lucky enough to have a license at that time, so future fisher generations need to buy or lease the quota from these owners, becoming an economically selective process. Quota shares become valued market assets that tend to accumulate in the hands of fewer, more solvent hands (Molnar, 2008).

An alternative to the more common ITQ system is a community-based management system (CBM) (Copes & Charles, 2004): Community representatives make decisions combining biological, social and economic perspectives. This results in co-management and shared responsibility with the government that takes fisheries as part of a community welfare and sustainability plan. Benefits of this management system include (Copes & Charles, 2004): (1) The value of the license itself can equal or overcome the market assets value. (2) The capacity of fleets can be reduced while minimizing economic consequences. (3) Increasing the participation and responsibility in decision-making processes and management policies revisions of the stakeholders would increase the reliability of reported catches, the quality and quantity of the data recorded and decrease the illegal fishing (Botsford *et al.*, 1997; Copes & Charles, 2004). The little participation fishermen have on the management policy decision-making process clearly impacts their confidence on the scientific advice and predisposes them to side with politicians, who look after their short-term well being (Daw & Gray, 2005).

2.2 Ecosystem-based Fisheries Management (EBFM)

EBFM aims at considering and managing other components of the ecosystem apart from the target stock status, such as the ecological processes essential for the target species, non-target species or the habitats being exploited (Pikitch *et al*., 2004), hence; integrating biotic, abiotic and human factors (COM 2008). The priority is to preserve healthy and productive ecosystems to support resilient and abundant stocks, in order to obtain sustainable long-term social-economic benefits (Hall & Mainprize, 2004), so reversed priorities (Pikitch *et al*., 2004). The current single-species, short-term focus has been demonstrated to have severe social-economic impacts (Pikitch *et al*., 2004).

This integrated approach requires the definition and agreement of reference points (i.e. target, threshold and limit reference points) and management performance assessment metrics. Nevertheless, deciding which parameters should be selected as reference points or performance measures is difficult. They need to be robust and objective, quantifiable and simple, cost-effective. Also, a very important complement of an EBFM is the precautionary approach. This approach aims at avoiding undesirable outcomes such as overfishing, environmental degradation or social-economic impacts when there is limited reliable data and scientific information (FAO, 2012). It sets a series of precautionary reference points relative to higher exploitation levels, to avoid any risks (Lassen *et al.,* 2012). For example B_{pa} is the threshold reference point that designates the precautionary biomass of a stock below which potential depletion may occur (Hall & Mainprize, 2004). An example of precautionary approach is the fishing restrictions set by the Peruvian government after 2010 within the anchoveta fishery.

Although the EBFM concept has gained increasing popularity and is being included within the fisheries legislation in many countries, its implementation has proven to be difficult (Hall & Mainprize, 2004). Short-term social-economic benefits are compromised and there is comprehensible high uncertainty surrounding the current assessment of the state of fisheries (Daw & Gray, 2005) and ecosystem dynamics, as well as which parameters describe it best (Hall & Mainprize, 2004). For both, parameters and precautionary approach, the available scientific data is crucial. We are yet to understand many processes and relationships within the complex, variable and expensive to sample marine ecosystem. Thus, improving the current quality and quantity of scientific data has become an important requirement. In 2003, the FAO recognised this need and introduced the "Strategy for improving information on status and trends of capture fisheries" (Strategy-STF) (FAO 2013).

2.3 Subsidies reallocation

Subsidies represent another tool within the fisheries management policies in order to achieve its goals of social, economic and environmental sustainability. These subsidies are used for financing different areas such as management, enforcement, infrastructure and social support of decommission of vessels (Munro & Sumaila, 2002). Only in 2003, US$ 27 billion were designated as global fisheries subsidies (Sumaila *et al.,* 2010).

As previously discussed, excessive subsidies have enabled the fishing industry to fish beyond the ecosystem capacity, maintaining an unreal profitability, and leading to the current problem of fleet overcapacity (Swartz *et al.,* 2010). There is also a growing concern about the impact these subsidies have on the management of global fisheries, which has drawn the attention of international organizations, NGOs and governments (Munro & Sumaila, 2002).

In the EU, the future European Maritime Fisheries Fund (EMFF) is being debated at the moment (Votewatch Europe AISBL & Votewatch CIC, 2013). Some proposals from Members of the European Parliament (MEP) include the use of subsidies towards: (1) improving the quantity and quality of the data, (2) modernizing the industry rather than the fleet, and (3) aid in the enforcement of the regulations. Appropriate enforcement measures are the keystone for a successful management policy. In order to reduce the amount of non-compliance, enough funding must be dedicated to ensure patrols and appropriate equipment, as well as the application of more severe penalties, as was done in the 2008 Peruvian anchoveta management reform. Of the 209 EEZs worldwide analysed by Mora *et al.,* (2009), only 5% ranked in the top quarter for proper implementation of enforcement measures**.** The withdrawal of subsidies in case of a breach in the compliance with the fishery regulations could also be an enforcement measure.

In a simulation of subsidies impacts on the North Sea fisheries, it was concluded that by removing the subsidies, the total catches will decrease but the biomass of targeted species and the profitability of fishing it will increase overall (FAO, 2012). A very interesting point of view is that presented by Schrank (2001). He points out the necessity to assess subsidies by their im-

pacts, rather than their objectives. A focus should be placed on assessing the impact of subsidies on resource conservation, such as the subsidies designated towards research, enforcement or stock enhancement. Care must be taken with the funds directed to the decommissioning of vessels (Jörgensen & Jensen, 1999) and the subsidising of fishing in third country's waters, because the negative social, economic and environmental consequences are just shipped to another area (Munro & Sumaila, 2002).

3. Fisheries management in the future

In the upcoming years, the fishing sector will have to face several major challenges, including reducing excessive landings and environmental impact, struggling to match growing demand and adapting to climate change (Garcia & Rosenberg, 2010). For successful addressing of these issues, appropriate management strategies have to be implemented, adjusted for the level of economic development of the country, reliance on subsidies, political situation or sourcing of food supplies.

Several models were developed to predict the future of fisheries, many of those involving different management policies. A United Nations Environment Programme's Global Environmental Outlook 3 model describes four possible scenarios: markets first, security first, policy first and sustainability first, which were later assessed by Pauly *et al.* (2003). For each scenario, specific management measures could be proposed. In the markets first scenario, management is oriented towards market considerations. Free market will regulate itself, eliminating subsidies, Illegal, Unreported and Unregulated (IUU) fishing. As non-profitable companies will go bankrupt, availability of fish will become poorer, increasing the price and making it once again profitable to move to other areas, implement new technologies, fish deeper and with lower efficiency, exerting high pressure for high value and popular species, like currently in the case of tuna. Some, if not all, species of fish may eventually become financially accessible for the wealthiest nations, greatly affecting food security for the poorest. With the opposite, security first scenario, management should be focused on improving food safety for the poorest countries. With the current fishing down the food web, implementation of destructive fishing, and increasing inequalities between maritime countries, it seems especially important to try to improve the situation of poorer countries, as for their fisheries may not only be a source of income, but also of protein and foreign currency (Garcia & Rosenberg, 2010). Introducing subsidies for the poorer countries, support for their governments, incentives for implementation of new technologies and sustainable stock assessments and usage, together with quotas for more economically developed countries and a limit or ban for their outsourcing may be necessary. For the policy first scenario, in which a balance of social-economic and environmental concerns is obtained, management strategies would include high involvement of the public in policy making, regulation of pollution and bycatch, scientific research-based limits for sustainable landings, help for less economically developed countries and usually a level of coordination of actions between countries (Pauly *et al.,* 2009). Finally, for the last scenario of sustainability first, management measures such as keeping most of the policy making process local, forming marine reserves or no-activity zones, banning destructive fishing and close monitoring of fishing activities could be introduced.

Garcia & Grainger (2005) published a review of different scenarios proposed in the last 25 years and described three major types of scenarios: the market world, the fortress world and the transformed world. The market world scenario had two variants – business as usual (where short term interests dominate and market globalization is the most important factor) and policy reform (where sustainability is improved due to efforts of the public and governance). Management strategies for a market world, business as usual scenario, are minimal, perhaps limited to improved environment protection, including forming of reserves and introducing closed sea-

sons, and compensating displaced fishers (Ikeda, 1998). As mentioned previously, market self-regulation may lead to overexploitation of certain stocks of fish, due to placing short term interests above long term efficiency and sustainability. However, as it is crucial for politicians to appeal to different groups of society, introducing minimal environmental protection regulations, such as closed areas or seasons, together with compensation regulations is very possible, to please environmental protection groups and not lose fisherman appreciation. Overall, heading towards globalization in the business as usual variant, current management policies would be continued, with a potential to be simplified, normalized and unified. Policy reform, on the other hand, includes a major change of management strategy into a holistic, ecosystem-based management, resulting in the stabilization of landings (Kearney *et al.*, 2002). However, both of these studies were done on large, diverse ecosystems (e.g. Australian fisheries for the latter), not on a local, nor global, management scales. The fortress world and more radical breakdown world scenarios, are considering predictions of chaos or collapse of democratic governments. Because of that, management strategies that may be involved in these scenarios are very limited – either a dictatorship by a small group of people (which might cause increase in unemployment rates and lack of access to fish as food source for the poor) or total lack of management policies (more likely in countries with unstable, young governments). Both of these scenarios may bring not only irreparable destruction of the environment, but also social unrests and loss of livelihood and lives. The transformed world scenario, also known as the best case scenario, can also be divided into two variants: eco-communalism and new sustainability. Eco-communalism management may involve local community-based policy making, support for small vessels or even banning large vessels, limited quota aimed to meet local market demand, instead of acting as an outsourcing provider for other countries. These may be easier to implement in less economically developed countries where, although fish is an invaluable source of protein, the internal market demand is not as high as in more economically developed countries. The new sustainability scenario assumes technological progress and so a recommended management strategy in this case would be an ecosystem-based, local, precautionary management with scientific monitoring of landings and the environment, tough penalties for IUU activities, destructive fishing and misreporting and frequent re-evaluation of the strategy followed by corrective management. Measures such as closed seasons, marine reserves, limits on vessel size, number or landing grounds would be specific for a given ecosystem.

Conclusions

Based on the importance of the fisheries sector to the economy and food security of both more and less economically developed countries, it seems crucial to develop and implement fisheries management policies that help ensure sustainability and maximise its long term efficiency. Current stagnation in landings, destruction of ecosystems and overall unprofitability of the worldwide fishing activity is a result of many factors, including poor or lack of reliable and complete scientific data, development of high throughput and destructive fishing methods, lag time between introducing new fishing technologies and regulations of those activities, inefficient monitoring and enforcement of regulations and non-sustainable, short-term income oriented management policies.

Fisheries management in Peru and the European Union are two examples of how nationally or internationally managed fisheries are evolving and trying to adapt to the current fisheries crisis. Their willingness to constantly review and update their regulations and to base them on scientific data. gives hope that management policies developed in the future may be specific, scientifically robust solutions to well-defined and balanced needs of the industry, society and the environment.

Another aspect that seems to be very important is to boost precautionary management and improve the timeliness of corrective management. It seems especially important when considering the trends of fishing activity expansion to new species and ecosystems, as well as changes in distribution of species important to fisheries (Dabrowska, 2012). Fishing activities should not be commenced without throughout scientific investigations of new ecosystems, including the food web interactions and stock estimations. Upon obtaining sound scientific data, precautionary measures such as essential limits in fishing activity, space and time, should be introduced, for example closed seasons during a specific time of a species' life cycle. Regular monitoring of both fishing activity and the environment (including stocks) should be the basis of corrective measures.

To minimise socio-economic impacts, a lot of attention of policy makers should be paid to predicting and counteracting the effects of fishing activity changes. Whenever possible, including local fishermen, coastal societies, scientists, NGOs and stakeholders in public dialogues and the policy making process helps to form a sense of responsibility for the decisions taken and increases compliance with the regulations and quotas set.

In the times of declining landings, growing inequalities between more and less economically developed countries, unavoidable expansion to new species and habitats, climate change and financial crisis, sustainable management of fisheries is increasingly difficult, but of crucial importance. Developing and implementing sustainable and resilient fisheries management strategies should be seen as a long-term investment in the profitability of the industry, as well as an opportunity to decrease social tensions and improve food security.

References

1. Aranda, M. (2009a). Evolution and state of the art of fishing capacity management in Peru: The case of the anchoveta fishery. Pan-American Journal of Aquatic Sciences, 4 (2), 146-153.
2. Aranda, M (2009b). Developments on fisheries management in Peru: The new individual vessel quota system for the anchoveta fishery. Fisheries Research, 96, 308–312.
3. Blenckner, T., Döring, R. Ebeling, M., Hoff, A., Tomczak, M., Andersen, J., Kuzebski, E., Kjellstrand, J., Lees, J., Motova, A., Vetemaa, M., Virtanen, J. (2011). A first attempt at an ecological-economic evaluation of fishery management scenarios in the Baltic Sea region. Swedish Environmental Protection Agency FishSTERN Report 6428.
4. Botsford, L.W., Castilla, J.C., Peterson, C.H. (1997). The Management of Fisheries and Marine Ecosystems. Science, 277, 509-515.
5. COM, European Commission Communication (2008). 187 final. The role of the CFP in implementing an ecosystem approach to marine management.
6. COM, European Commission Communication (2009). 163 final, The Green Paper, Reform of the Common Fisheries Policy.
7. Constance, D.H., Bonanno A. (2000). Regulating the global fisheries: The World Wildlife Fund, Unilever and the Marine Stewardship Council. Agriculture and Human Values, 17, 125-139.
8. Copes, P., Charles, A. (2004). Socioeconomics of Individual Transferable Quotas and Community-Based Fishery Management. Agricultural and Resource Economics Review, 33 (2), 171-181.
9. Dabrowska, A. (2012). State of global fisheries – trends and predictions. Contemporary Economy, 3 (3), 25-36.

10. Daw, T., Gray, T. (2005). Fisheries science and sustainability in international policy: a study of failure in the European Union's Common Fisheries Policy. Marine Policy, 29, 189-197.
11. European Parliament Council Secretariat (2013). Outcome of the 6th and 7th trilogue on the CFP reform held on 28 and 29 May 2013. Available at: http://cfp-reformwatch.eu/wp-content/uploads/2013/06/text_outcome_6th_7th_trilogue_basic_regulation_3-june-version.pdf [Accessed 3rd June 2013].
12. FAO Fisheries and Aquaculture Department (2005). Fisheries and Aquaculture topics. Regulating fishing capacity. Topics Fact Sheets. Available at http://www.fao.org/fishery/topic/14857/en [Accessed 11th February 2013].
13. FAO (Food and Agriculture Organization) (2010). The state of World Fisheries and Aquaculture. Rome. 197pp.
14. FAO (Food and Agriculture Organization) (2012). The state of World Fisheries and Aquaculture. Rome. 209pp.
15. FAO Fisheries and Aquaculture Department (2013). Strategy for Improving Information on Status and Trends of Capture Fisheries. Available at http://www.fao.org/fishery/fishcode-stf/about/en [Accessed 11th March 2012].
16. Garcia, S.M., Grainger, J.R. (2005). Gloom and doom? The future of marine capture fisheries, Philosophical Transactions of The Royal Society Biology, 360, 21-46.
17. Garcia, S.M., Rosenberg, A.A. (2010). Food security and marine capture fisheries: characteristics, trends, drivers and future perspectives. Philosophical Transactions of the Royal Society, 365, 2869-80.
18. Hall, S.J., Mainprize, B. (2004). Towards ecosystem-based fisheries management. Fish & Fisheries, 5, 1-20.
19. Hardin, G. (1968). The tragedy of the commons. Science, 162, 1243-1248.
20. Hersoug, B., Holm, P., Stein, A.R. (2000). The missing T. Path dependency within an individual vessel quota system—the case of the Norwegian cod fisheries. Marine Policy, 24, 319–330.
21. Ikeda, H. (1998). On the future economy of capture fisheries and the future consumer market for fish. Journal of Northwest Atlantic Fisheries Science, 23, 185–189.
22. Jörgensen, H., Jensen, C. (1999). Overcapacity, subsidies and local stability. In: Overcapacity, Overcapitalisation in European Fisheries (eds A. Hatcher & K. Robinson). Centre for the Economics and Management of Aquatic Resources, University of Portsmouth, Portsmouth, pp. 239-252.
23. Kearney, R., Foran, B., Poldy, F., Lowe, D. (2002). Modelling Australia's fisheries to 2050: policy and management implications. CSIRO-University of Canberra.
24. Lassen, H., Kelly, C., Sissenwine, M. (2012). ICES Advisory Framework 1977-2012: From MSY to Precautionary Approach and Back [online]. Available at: http://info.ices.dk/products/CMdocs/CM-2012/L/L0712.pdf [Accessed 4th June 2013].
25. Molnar, L. (2008). Individual Transferable Quotas: Effects on Trade in New Zealand. Bachelor's Thesis. University of Georgia.
26. Mora, C., Ransom, A.M., Coll, M., Libralato, S., Pitcher, T.J., Sumaila, R.U., Zeller, D., Watson, R., Gaston, K.J., Worm, B. (2009). Management Effectiveness of the World's Marine Fisheries. PloS Biology, 7 (6), 1-11.
27. Munro, G., Sumaila, U.R. (2002). The impact of subsidies upon fisheries management and sustainability: the case of the North Atlantic. Fish and fisheries, 3 (4), 233-250.
28. Pauly, D., Alder, J., Bennett, E., Christensen, V., Tyedmers, P., Watson, R. (2003). The Future for Fisheries. Science, 302, 1359-61.

29. Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walters, C.J., Watson, R., Zeller, D. (2002). Towards sustainability in world fisheries, Nature, 418, 689-95.
30. Pikitch, E.K., Santora, E.A., Babcock, A., Bakun, A., Bonfil, R., Conover, D.O., Dayton, P., Doukakis, P., Fluharty, D., Heheman, B., Houde, E.D., Link, J., Livingston, P.A., Mangel, M., McAllister, M.K., Pope, J., Sainsbury, K. (2004). Ecosystem-based fishery management, Science, 305, 346-347.
31. Sampath, V. (2005). An Overview of the International and National Fishery Policy. Desk Research [online]. Available at: http://www.orissafisheries.com/File/Review%20of%20International%20and%20National%20Fishery%20Policies-dec04.pdf [Accessed December 2012].
32. SFP (Sustainable Fisheries Partnership) (2013). Fishery Imporovement Project of the Peruvian anchovy (northern-central stock) [online]. Available at: http://www.sustainablefish.org/fisheries-improvement/small-pelagics/peruvian-anchovy-northern-central-stock [Accessed 24th May 2013].
33. Schrank,W.E. (2001). Subsidies for Fisheries: A Review of Concepts. FAO Papers Presented at the Expert Consultation on Economic Incentives and Responsible Fisheries, Rome, 28 November - 1 December 2000, Rome, pp. 11-40.
34. Standal, D., Aarset, B. (2008). The IVQ regime in Norway: a stable alternative to an ITQ regime? Marine Policy, 32, 663–668.
35. Sumaila, U.R., Khan, A.J., Dyck, A., Watson, R., Munro, G., Tyedmerset, P., Pauly, D. (2010). A bottom-up re-estimation of global fisheries subsidies. Journal of Bioeconomics, 12(3), 201–225.
36. Swartz, W., Sumaila, U.R., Watson, R., Pauly, D. (2010). Sourcing seafood for the three major markets: The EU, Japan and the USA. Marine Policy, 34, 1366-1373.
37. UN (United Nations) (2012). Convention on the Law of the Sea (UNCLOS). Historical perspective [online]. Available at: http://www.un.org/Depts/los/convention_agreements/convention_historical_perspective.htm [Accessed 17th April 2013].
38. Votewatch Europe AISBL & Votewatch CIC (2013). CFP reform watch [online]. Available at: http://cfp-reformwatch.eu/ [Accessed 3rd June 2013].
39. Xue, G. (2004). China's response to international fisheries law and policy:national action and regional cooperation, PhD thesis, Centre for Maritime Policy, University of Wollongong.

STAN RYBOŁÓWSTWA NA ŚWIECIE – POLITYKA ZARZĄDZANIA

Streszczenie

Stagnacja światowych połowów i ich oddziaływanie na środowisko wywierają negatywny wpływ na gospodarkę i bezpieczeństwo żywnościowe wielu krajów. W ostatnich latach, w celu przezwyciężenia kryzysu w rybołówstwie, wprowadza się różne strategie zarządzania połowami uwzględniające założenia zrównoważonego rozwoju. Obecnie jesteśmy na wczesnym etapie wprowadzania bardziej elastycznych strategii zarządzania połowami na świecie, a także egzekwowania ich przestrzegania. W artykule, na podstawie analizy różnych strategii zarządzania rybołówstwem (w tym studiów przypadków Peru i Unii Europejskiej), sformułowano trzy główne rekomendacje dla zrównoważonej polityki połowów: decentralizacja systemu zarządzania, zarządzanie bazujące na wiedzy o eko-

systemie (EBFM) i realokacja dotacji. Opisano także przykłady regulacji, które mogłyby być zastosowane w różnych scenariuszach rozwoju rybołówstwa. W obecnej sytuacji kryzysowej sformułowanie i wprowadzenie w życie zrównoważonej strategii zarządzania połowami powinno być traktowane jako długoterminowa inwestycja w opłacalność tego sektora gospodarki, a także jako okazja do zmniejszenia napięć społecznych i zwiększenia bezpieczeństwa żywnościowego.

Słowa kluczowe: strategie zarządzania, Wspólna Polityka Rybołówstwa, zrównoważone zarządzanie, EBFM, dotacje

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