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TECHNICAL NOTE

Analysing the Need of Communication to Improve Black Sea Fisheries Management Policies in the Riparian Countries

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Abstract

Identification of regional problems and seeking the solutions over a comprehensive stakeholder involvement are very important for the regional management of fisheries. The Black Sea is rather poor by means of such involvment by the riparian countries even there are many problems regarding legal, environmental, scientific and socio-economic aspects. This article is based on the results of stakeholder discussions about the problems of the Black Sea fisheries under the ComFish [1] project which can be summarized as; the lack of regional and international organizations, common fishery regulations and absence of effective control mechanisms. There is an urgent need for bindery regional management rules and measures, and collaborations for the better management of fisheries, ecosystem safety and implementation of common standards as well as better infrastructures and communication ways. The challenges can be classified under 4 topics, as legal/structural, environmental, scientific, and socio-economy, for each of the Riparian countries and the Black Sea region. In this article, the general structure of the marine capture fisheries, administrative applications and scientific surveys performed regarding the state of fisheries were analysed as a reference in the other regional/local seas of the European continent. In this context, the situation of the Black Sea has been discussed by contacting with the scientific organizations in the country.

Keywords: Fisheries management, legal state, environment, scientific capacities, socio-economics, overfishing.

Introduction

The Black Sea is one of the most fragile ecosystems of the globe; shared by the riparian countries and effected by discarges of the central and eastern European countries via Danube River (Zaitsev & Mamaev, 1997). It is semi-enclosed sea connected with Mediterranean via Turkish Strait Systems. The Black Sea is living under the threats of environmental pollution, climate change, overfishing, invasive species and increased maritime activities (Oguz, 2014). This article is based on stakeholder discussions of the Black Sea case study of the Project "Strengthening the Impact of Fisheries Related Research through Dissemination, Communication and Technology Transfer: ComFish" implemented in 2012-2015. It is widely accepted that majority of the problems in the Black Sea can be attributed to lack of regional and international organisations, common fishery regulations and absence of effective control mechanisms. There is a need for powerfull regional rules and collaborations for the better management of fisheries such as ecosystem safety and common standards as well as better infrastructures and communication ways.

Many of the citizens in riparian countries are unaware of the importance and characteristics of the Black Sea and its environmental challenges i.e. anthropogenic pollutants, climate change and overfishing which are increasing by years (ELME, 2007). On the other hand, there are also better conditions, technologies, methodologies and opportunities to save the sea and marine living resources comparing with the last decades, if there is national and/or international intention. For example, solid wastes mainly the plastics can be reduced, prevented and recycled more easy by current technology, collection and separation methods. Additionally, threats due to other anthropogenic impacts disturb the coastal ecosystems causing reduction of fish populations and landings (ELME, 2007).

Majority of the stocks are under the pressure of overfishing, pollution, over-estimated spawning stock

abundunces due to use of catch data for single species assessments, limited surveys based on ecosystem approach, and lacking of ecosystem based management applications. More conserted actions are needed to collect data for the analyses and synthesis to implement efficient management measures and sufficient monitoring, surveillance and control (MSC) services. Better understanding of the relationships between the species within the same habitat and ecosystem is needed. Scientists should analyse all the overtime processes to analyse the reasons of the reduction of fish stocks. For instance, how long exploited fish stocks are under the thread of overfishing? What is the impact of fishing gears on the habitat and marine living organisms? What is the state of unexploited stocks? Are these challenges affect the behavior of fishermen on the management and reduction of stocks? Nowadays, many of the fishery economists consider the best promising solution to get rid of negative management problems is to create new management regimes based on "special property rights" (Asada, Hirasava, & Nagazaki, 1992; Arland & Bjorndal, 2002). In modern fisheries management concept, market regulations need to be reconstructed as well as the legislations regarding fish sales and processing procedures (Gran, 2010). Neither biological nor socio-economic reasons, participation of the fishermen and fishery organisations to the decision making processes on ecosystem and stock management is widely accepted (Asada *et al*. 1992). These considerations are also the basis of the "Common Fisheries Policy (CFP)" of European Union (Degnbol, 2009). On the other hand, "ecosystem aproached fisheries" concept of the FAO General Fisheries Commission for the Mediterranean (GFCM) has been constructed considering the state of fisheries and its ecosystem components, institutional/traditional infrastructures and socio-cultural state of the fisher communities in the region (De Young, Charles, & Hjort, 2008). The aim of CFP is to create common actions and provide participatory involvement of all stakeholders to the management decisions. So, besides the biological evidences, holistic approach to identify the problems, produce solutions and taking initiatives have been embraced covering the wievs of professional fishers as main users of the marine resources, other direct and indirect beneficiaries from fisheries.

There is "Total Allowable Catch (TAC)" and quota system only for sprat and turbot in Bulgaria and Romania in the region. Georgia has traditional quota system for anchovy based on different estimations other than EU. There are only catch and mesh size control measures, time and area closures, minimum catch size applications in Russia, Turkey and Ukraine (STECF, 2013).

The Black Sea became one of the EU interest areas after the membership of Bulgaria and Romania, for the implementation of CFP measures in the member's EEZ. On the other hand Turkey has been expected to adopt harmonised measures by primary and secondary legislations in the accession period (Mathews, 2010).

The use of the results and outputs of any scientific research is not efficiently shared, distributed and implemented by the relevant stakeholders. In order to overcome such challenges as to change the common understanding, share the knowledge and experiences, and develope an effective communication between stakeholders, some radical steps are essentially needed (Duzgunes & Saglam, 2008).

Policy makers and authorities should be in contact with all the stakeholders over effective communication to provide widest common agreement to create effective fishery policies and implement new management measures for the better management of the stocks (Mathews, 2010).

At present, there are 235 fish species (185 marine, 50 freshwater) in the Black Sea (BSEP, 2009), but the number of commercial species is too low and mainly represented by anchovy, sprat, horse mackerel, bonito, blue fish, whiting, turbot, red mullet and shad. Fishing activities in the region are intensively focused on the small pelagics as anchovy, sprat and horse mackerel. Due to drastic reduction on the targeted demersal stocks, serious catch limitation measures should be applied to restore the stocks. However, species of high market value (i.e. turbot) are subjected to illegal and high overfishing pressure (STECF, 2013) Sampson *et al*. 2013).

The majority of fish production (80%) in the Black Sea is obtained by Turkey. There are partial progresses in recent years in Bulgarian and Russian Federation fisheries after the collapse of fish stocks in the early 1990's due to *Mnemiopsis leidyi* invasion. Landings of Romania has continiously decreased and reduced to its minimum level in 2007/08 fishing season (Oğuz, Akoğlu, & Salihoğlu, 2012). In Georgia, landings has increased gradually in the last decade due to joint anchovy fishing operations with licenced purse seine vessels from Turkey in the Georgian coastal waters (Zengin et al. 2012). After 2000's, Rapa whelk fishery was started in Bulgaria and Romania while Turkey was the only producer since early 1980's. Dredges are used for Rapana fisheries and bottom trawls to harvest demersal fish species which are the most harmful fishing gears/methods for the ecosystem in the Black Sea littoral zone (Knudsen, Zengin, & Kocak, 2010).

There are differences in fisheries management systems in the riparian countries. Bulgaria and Romania are the EU countries since 2007 and Turkey is the candidate country to EU. Moreover, these three countries are the members of the GFCM and all riparian countries are the members of the THE Black Sea Economic Corperation (BSEC). In spite of the efforts of the Black Sea Commission (BSC) targeting the sustainable management of the marine living

resources, prevention of land based pollution and combatting with challenges in maritime traffic by playing active role on behalf of the Black Sea countries since 1992, there is still no international fisheries agreement and efficient MSC services in regional basis.

On the other hand, there are big variations in the current management measures in riparian countries such as (1) Turbot fishing with bottom trawl net is legal in Turkey but illegal in Bulgaria, Romania, and Ukraine, (2) Minimum landing size of turbot is 35 cm (in standard length) in Ukraine, 45 cm (in total length) in Bulgaria, Romania and Turkey, (3) Minimum allowable catch size for anchovy is 9 cm in Turkey (total length) and 7 cm in Georgia , (4) Sprat fishing is allowed whole year around in Romania, Bulgaria and Ukraine in their EEZ without any spatial limitation but there is temporal and spatial closures in Turkey (permitted only in the Samsun shelf area from September 15 to May 15), (5) Minimum catch size of sprat is 7 cm in Bulgaria, Romania and Ukraine while there is no size restriction in Turkey (BSEP, 2008; STECF, 2013).

In near future, there will be a great risk as to collapse of fragile stocks due to inefficient national management policies and insufficient legal measures. There is an urgent need to temporary or permanent limitations for certain fisheries to reduce the impact of overfishing and support better recruitment levels for the spawning stock sustainability. Regional fisheries management is one of the urgent issues in the Black Sea after ratification of a fisheries agreement especially for the shared stocks (BSEP, 2008). On the other hand, there is no particular common governance in the region to solve existing challenges. Fisheries needs common management measures due to nature of the marine ecosystem. The reasons of these defficiences are; 1) having different political and governance systems in the past; 2) absence of harmonized decision making systems; 3) lack of sufficient technical and scientific infrastructures; 4) non-binding agreements and regional organizations such as Commission on the Protection of the Black Sea Against Pollution (BSC-BSERP and STECF of JRC/EU, Expert Working Group for the Black Sea Assessments.

In this article, it was aimed to focus on the current challenges of the Black Sea fisheries over multinational stakeholder consultation by the participants from different user groups; fishermen (purse seiners, trawlers, dredgers), processing industry, scientists, NGO's and administrators. Identification of important fisheries topics with long term impacts and ascertains whether scientific results have been properly communicated among all the stakeholders is vital. In order to create innovative research and implementation procedures, better and efficient communication ways are needed between scientists, decision makers and other stakeholders in fisheries. After identification, prioritization and assessment of the essential tools to overcome each challenges are very important. All these procedures have been highlighted in the article.

Materials and Methods

Main target groups are fishery organisations, industry, consumers, marketing companies, and decision makers as (1) to create clear and open views, (2) to identify ways of communication, and (3) to test possible identified solutions on regional level. In this method, regional/local priorities were determined by comparing the fishing indicators for the designated partners with the standard EU legislations (ComFish, 2014).

Current challenges were discussed with 5 different national groups for the identification of basic problems in their juridication waters. Determined problems were presented to the whole group to prioritise them by voting for the top three of each group of challenges according to their individual experiences. At the final stage, scores summed and priorities for; (1) Legal/structural state, (2) Environmental issues, (3) Scientific capacities, (4) Social-economic status, were concluded according to the ratings from stakeholders.

Results

Definition of the Challenges

The state of the challenges have been classified under 4 thematic groups by countries and given in Table 1. There are of course some differences between riparian countries according to the ecosysytem differences, dependency level to the fisheries, fisheries policies, economical state, and binding to the international bodies (Membership to EU, GFCM) and ratified conventions (Bucharest, Biodiversity, Accobams etc.).

The most common challenges of the Black Sea Region were determined as follows:

(1) Legal/Structural Problems:

- Lack of regional approach to EU CFP regulations,
- Absence of rules for regional fisheries and control mechanisms,
- Need to increase the role of the Black Sea regional organisations,
- High rate of IUU fisheries in the region,
- Lack of common instruments to improve fisheries management,
- Weakness of collaboration/links between countries,
- Need to balance interests between fishing activities and other user groups,
- Need to implementation of no fishing zones.

Table 1. Main challenges in the Black Sea

Country	Legal/Structural	Environmental	Scientific	Social- economic
Russian Federation	• Lackof/poor fishery legislation, • None in line with CFP, • High pressure of IUU on high valued species • No aquaculture	• Reduction of the anthropogenic impacts on marine enviromnment is needed	• Sharing of data on environmental parameters is weak, • Common methods weak/absent, • No legal measures and framework programs on environmental management, • Weak involvement to scientific collaboration and solve regional problems,	• Weak infrastructure development, • Old fishing fleet and technology,
Ukraine	• Poor/insufficient fisheries management, • Weak fishing rules and tradi*ons*,	• Fast spread of exotic/invasive species (*M. leidyi, R. venosa*) • Worst environmental state in the North-west	• Insufficient international corporation, • No recent data due to lack of monitoring and survey programmes, • Use of too old scientific methods	• Loss of importance of fisheries and increase in unemployment,
Romania	• Rules for Regional Fisheries Management is insufficient and needs to be improved, • For the improvement, rules of CFP need to be strictly settled, • Legal fishing rules need to be common regionwide, • Insufficient Regional Fishery Organisations to solve fishery problems, • There are problems about IUU and reliable landing data, new actions is needed to control illegal and unregulated fisheries, • There is need to increase roles of the stakeholders and NGOs, • Other user activities should be balanced with the fishery activities, • Free fisheries trade zones should be established, • Coastal artisanal fisheries need to developed	• Reduction of marine pollution, • Restoration of marine coastal habitats, • Limiting increase of the gelatinous zooplankton, • Reduction of untargeted catch, • Enforcing the use of more selective fishing gears/ mesh size applications, • Starting up monitoring programs for all exploited stocks, • Starting discussions on possibilities and ways of ecological rehabilitation actions,	• Increase efforts towards regional collaboration on stock estimation of migratory fish species, • Preperation of comprehensive data base program for fishery research/stock estimations, • Application of ecosystem based approach in fisheries • Starting collaborative/regioal rehabilitation studies on endangered species,	• Support/improve traditional fishing/ processing • Provide sustainable employment in the sector, Establish better management models for small fishery organisations by means of administration and finance, • Rehabilitation of working conditions in fishing vessels, • Bringing up sectoral problems of local fishing communities, • Increase fishing capacity of the fleet, • Increase the role of women in the sector, • Protection/sustaining traditional culture of small fishery groups, • Supporting coastal fisheries by economic compensations,

Table 1. Continued

Country	Legal/Structural	Environmental	Scientific	Social- economic
Bulgaria	• Unsatisfactory legal measures inline with the CFP in all riparian countries • Weak applicable control collaborations and mechanisms, • IUU at unneglettible levels, • Not fully applied CFP	• Reduction of untargeted and non-commercial catch, • Use of unselective fishing gears, • Destructive fishing operations disturbing ecosystem, • Detruction of the natural state of benthic biocenosis, • Increasing levels of nan-native/ invasive species,	• Implementation of better data collection programs, • Innovative fishing / selectivity techniques, • Support to increase marine farming, • Determination and taking care for genetic differentiation in populations,	• Increase economic efficiency of fishing fleet, • Unsufficient reliable data collection/flow from fishing vessel owners, • Lack of economic stability in fisheries, • Weak attempts to make professional fisheries attractive for young generations and failures on protective supporting measures, • Lack of progress on the capacities of the stakeholders and raising the awareness of the public, • Increase employment in the sector,
Georgia	• Weak/unsatisfactory fisheries management, • Weak legal state on the transfer of anchovy quotas to Turkish fishing vessels by bilateral agreements, • Responsibility of the 4 different institutions and high bureaucracy in fisheries management, • Lack of control services,	• Better than other countries in the region at present,	• Unsufficient international collaboration, • No fisheries research under national policy, • More efficient for the conservation of biodiversity in a local protected area (Batumi)	• Sea food industry collapsed after the end of Soviet Union, • Industry mainly established on anchovy fishing, • Majority of the anchovy stocks has been exploited by Turkish fleet for 15 years, • Main fishing ports are Poti (20 of 26 vessels are active) and Batumi (10 of 17 vessels are active), • There is no credit scheme to support fishermen to invest in the sector, small trawlers are used to catch anchovy instead of equipped purse seine vessels
Turkey	• Need harmonized measures/actions with CFP • Weak collaboration between countries / governments, • Unefficient Regional Organisations, • Problems on reporting and control of landings, illegal and unreported catch, • Need to increase roles of stakeholders and NGO's	• Pollution from river discharges, • No marine protected areas, • Solid wastes, • No efficient control of marine traffic,	• No information about the size of fish stocks, • Unsufficient quantitative and qualitative data on fishery operations, • Use of non-actual scientific methods,	• No financial and other economic subsidises to support fishermen due to collapsed fisheries, implementation of new measures (increased catch/mesh size) and against environmental problems (climate change, invasion of predator species), • Lack of finance to monitor fish stocks, • Limited efforts to raise public avareness for ecosystem problems, • No trainings to fishermen,

(2) Environmental Problems:

- High land based pollutants,
- Increased habitat losses,
- Solid wastes,
- Intensive maritime traffic,
- Impacts of invasive species on the Black Sea ecosystem,
- Climate change,

(3) Scientific Challenges:

- Lack of harmonised data collection methods,
- Need for the application of ecosystem based fisheries management,
- Absence of common stock assessment methods for major fish species,
- Intention to increase efforts to carry out common fishery surveys,
- Willingness to improve mariculture technologies.

(4) Socio-Economic Status

- Lack of financial supports to fishermen,
- Need to rehabilitate fishing fleet,
- Absence of finance for stock monitoring programs,
- Initiative to increase market demand for mariculture products,
- Unemployment in the sector,
- Uneducated fishermen, increase public awareness for the impacts of ecosystem problems,
- Bringing up the sectoral problems of local fisher communities.

After determination of these country specific problems, all of the issues were discussed by the experts and prioritised for the whole Black Sea (Figure 1).

Priorities and Solutions for the Problems

Solutions for the problems under each subtitle are actually linked to each other. For example, prevention of pollution in the "*environmental problems*" subtitle is closely related with the administrative/governance action plans discussed under "*legal/structural*" problems.

Legal/Structural Priorities and Solution Proposals

Overall conclusion is the establishment of "International Regional Fisheries Management Organisation". In order to provide data and information, establishment of thematic advisory committees with wide range of stakeholders are essential. Planning and implementation of national and international projects/surveys and preparation of necessary legal measures for applications is strongly needed (Figure 2). At present, Advisory Committee for the Black Sea Region (AGFOMLR) is still active as a subsidary body of the Commission on the Protection of the Black Sea against Pollution (BSEP).

Key message was the strong need for regional regulations and legislations in fisheries and ecosystem management. Especially, new and efficient communication tools are needed to develop regional management strategies between EU member and other riparian countries in the Black Sea. In order to sustainable exploitation of the resources with common initiatives, applicable management actions/ strategies are essential. Impacted fish stocks can be restorated by the implementation of successful fisheries and ecosystem management in the region. Systematic communication ways can play an important role to solve the conflicts between fishermen and other stakeholders.

Environmental Priorities and Proposed Solutions

Planning the new actions to reduce current pollution resources is vital in the region and Balast *Waters Convention (2004)* should be ratified by all riparian countries (*in relation with legal/structural*

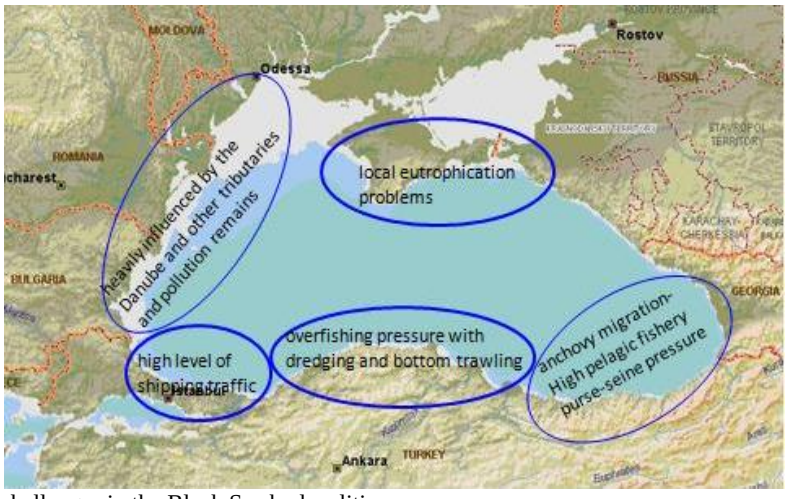

Figure 1. Identified challenges in the Black Sea by localities.

actions). In order to reduce the impact of invasive species, biological control measures should be taken (*related with scientific capacities*). Some other regulations are urgent for the protection and conservation of the environment; i,e rehabilitation and protection of spawning and marine or riverine areas (*related with legal/structural problems*).

In order to support ecosystem and biodiversity, establishment of marine protected areas (*related with the legal/structural actions and Biodiversity Convention*). Harmonisation/rehabilitation of legal measures for fishing is needed (*linked to legal/structural actions*). Concerted sanctions to reduce dumping of solid wastes are very important (*related with the legal/structural actions*). New technologies are needed to reduce marine pollution (*related with the scientific/structural actions*) (Figure 3).

It was concluded that it is necessary to increase progresses on authority sharing and capacity utilization for pollution control by intensive data exchange and communication to convince decision makers. Marine and coastal ecosystems are very fragile in the Black Sea, so strict/powerfull national and international conservation legislations are needed. The Black Sea functions need to be rehabilated on greater extent due to reach good environmental state (GES).

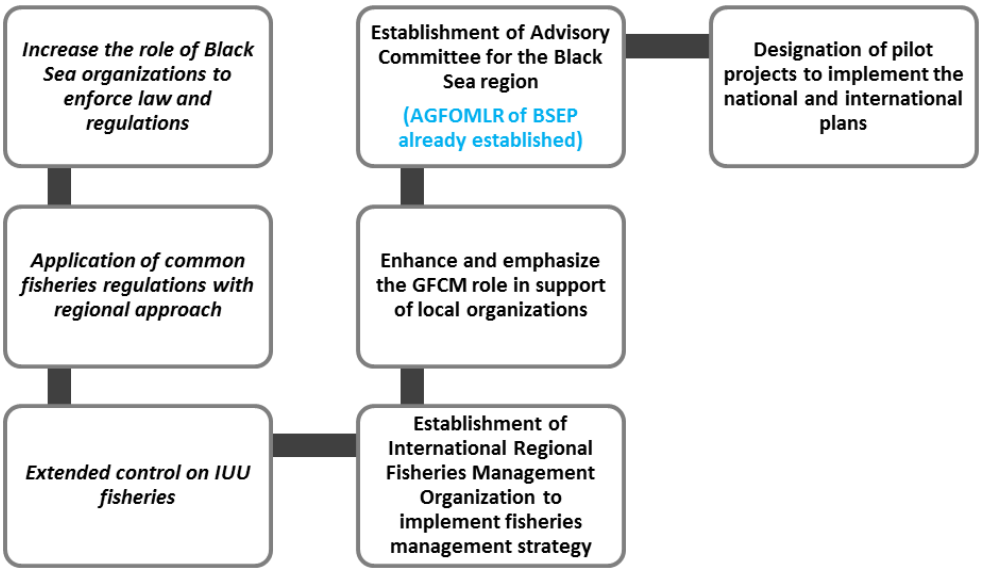

Figure 2. Flow chart of the legal/ structural priorities and proposed solutions.

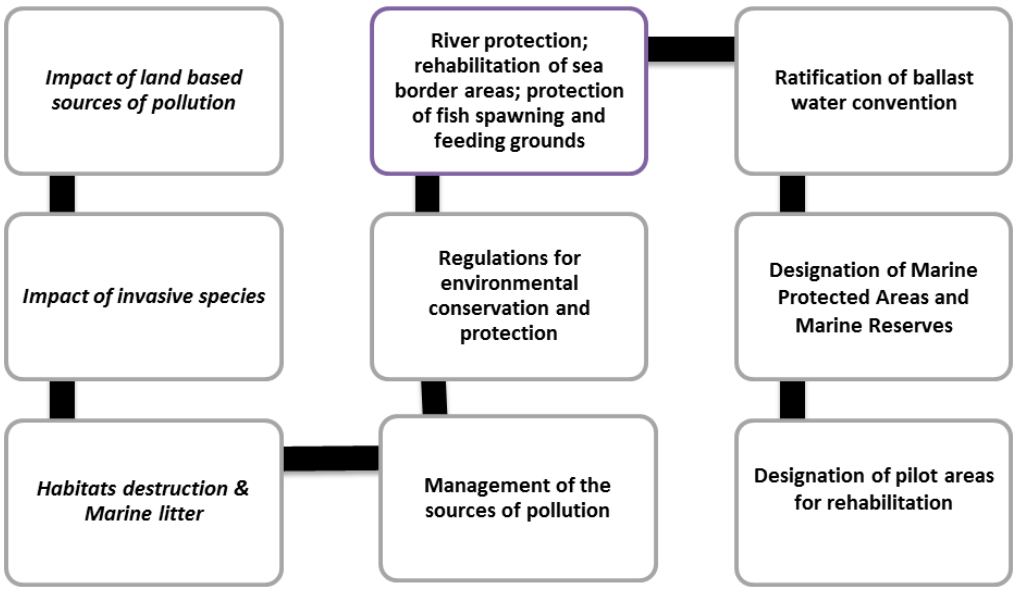

Figure 3. Common environmental challenges and proposed solutions.

Scientific Priorities and Proposed Solutions

It was concluded that common/harmonised data collection methods are necessary. EU Commission may support this initiative in order to carry out common assessments with the special care to the shared stocks to be managed with harmonized fishery regulations (Figure 4).

Research studies providing information to support initiatives should have priority to implement, and may support to decision makers with good scientific advices and reliable data, and encourage them to increase their efforts to conduct crossborder collaborative surveys.

Socio-Economic Priorities and Proposals for the Solutions

The most important progress may be the foundation of "The Black Sea Fund". At present Bulgaria and Romania use European and Maritime Fund (EMFF) while the other riparian states benefits their national budgets. Defined solutions for the main social problems are; (1) the training of the fishermen to create new opportunities, (2) increasing role of the traditional fisheries, (3) raising public awareness in fisheries.

Key social challenges include; need to increase the capacities of the industry and raise public awareness, reduction of bycatch, more support for aquaculture (no progresses obtained other than Turkey), supporting artisanal-coastal fisheries, bio-economy based collaborative fisheries management, benefits to transfer information on new methods and technologies for the public advisory councils, need to support to improve coastal socio-economic life (Figure 5).

Future "expectations" for the Black Sea fisheries are the need for regional common actions and collaborations (1) to solve the existing regional problems and new approaches and alternative proposals for the better solutions, (2) to bring majority of the stakeholders from different visions and expectations to the common point for the solution of the challenges, (3) to increase expectations and networking capacities for regional corporation, (4) to share usable/useful fisheries data, to use scientific outputs for socio-economic decisions, (5) to produce common solutions for the common problems.

On the other hand "concerns" are the existance of different bureaucracies/management systems and difficulty to expect changes/progresses in short term period, availability of special/indispensable expectations by countries, existence of common communication problems, and time limitations to address different challenges, weaknesses/deficiencies to generate wider information/data, and the last political conflicts and lack of intentions to held regular meetings to solve regional problems.

Results and Discussions

It is widely accepted that challenges in the Black Sea fisheries are related with the weaknesses of institutional capacities, lacking of common regulations and MCS services. Countries are unable to conduct surveys regularly due to financial problems. On the other hand, use of old methodologies reduces the data quality and reliability of the surveys. Moreover, there is no common database and data exchange between countries. All these challenges do not allow to carry out assessments on stock biomasses of targeted species. Finally, these failures do not permit effective management measures and stocks can not be protected (STECF, 2013).

There is very weak national/international links to

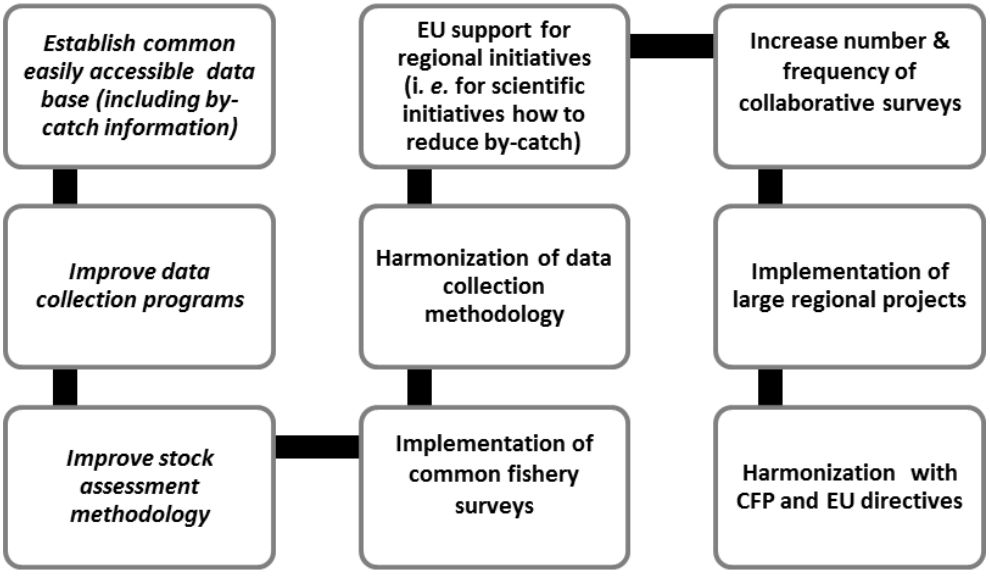

Figure 4. Scientific priorities and proposed solutions.

protect environment. Specific and common problems like improving sea water quality, implementation of marine protected areas and marine reserves, introduction of invasive species, and healty coastal areas are increasing year by year (Oğuz *et al*., 2012; Oğuz, 2014). Unemployment and low investments to the sector are the main challenges on the socio-economics of the fisheries including mariculture. There is strong need to improve employment and welfare of the fishers by supporting "*traditional coastal fisheries"* and processing industry by promoting fish consumption. One of the major problem for the fishermen is the lack of working ability on profesional scale if they want to leave fishing obligatory or voluntarily. It will be useful to find its reasons with the structure of the fisheries as profession and its past as a social phenomenon, and way of living of fishermen (Zengin *et al*., 2011).

It is better to update biological indicators in the region. ICES, for instance, has improved and use such indicators to define and assess fish stocks under "Marine *Fisheries Framework Directive" and "Strategy*". In this context, it is aimed to reach "*Good Environmental Status (GES)*" in the EU seas including the Black Sea till 2020. The target of the GES in long term period is to keep commercial fish stocks within the safe biological levels. By this way, rehabilitation of the populations by the implementation of new measures to restore age, number and size composition may also be the indicator of the healty status of the exploited stocks. Stock indicators also may serve as an important and adequate bridge between scientists and decision makers. Biological indicators may be an important reference for each country to justify its "safe status" (Düzgüneş & Erdoğan, 2008).

The most important issue for the Black Sea fisheries is the lack of "a regional joint action plan" for the management of commercial stocks. In order to conduct ecosystem based fisheries in line with the responsible fisheries principle of FAO, it is better to move from single to multi-species stock management. Size and structure of the sector is rather different in the region. Majority of the fish production has been obtained by Turkey and as fishing effort, number and technical capacities of fishing vessels/investments are the highest in the region. In line with these progresses, aquaculture and fish processing industry has been widely developed. But, there are conflicts of interest between fisher groups and other stakeholders in terms of increasing investments and capital accumulation. On the other hand, fisheries management is not efficient and rational for the biological sustainability of the stocks (Raykov & Bikarska, 2011). There is a need for national and regional/international co-operation for the better management.

Sea food consumption has been increased from 50% to %100 in the last 12 years. However, marine capture fish production has been noticeably declined except Turkey (STECF, 2013) *et al.* 2013). On the other hand, aquaculture in other riparian countries has not been improved to cover increasing demand (Zengin, 2012).

Commercial species of the Black Sea basin are anchovy, sprat, whiting, turbot and Rapa whelk and their production show continuous decline due to ecosystem, overfishing and other anthropogenic reasons. Long term landing data and mean lengths of each species by years are in decreasing trend indicating the overfishing. During the stakeholder meeting, management problems for each species have been discussed in details and common conclusion was

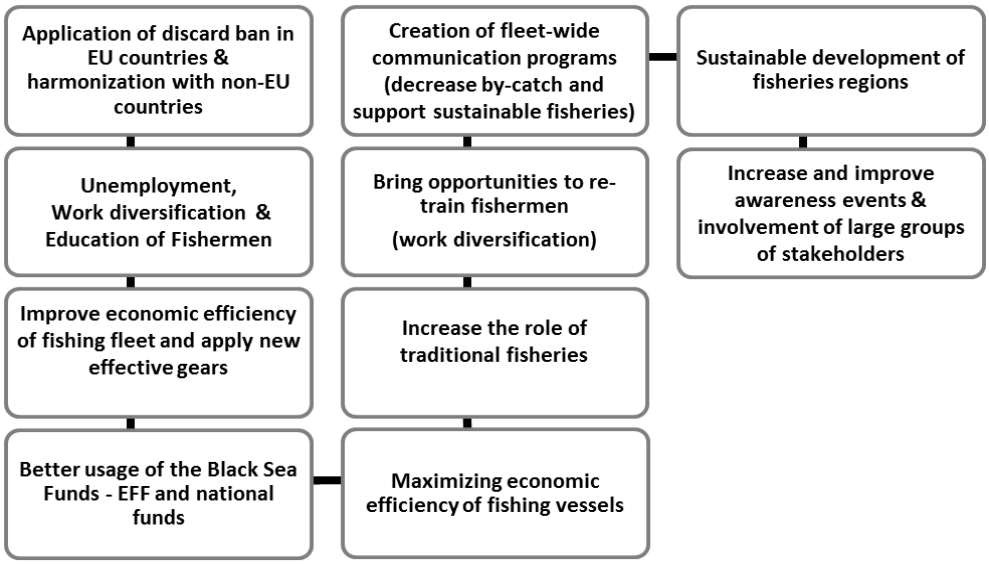

Figure 5. Social problems and proposed solutions.

reached on to evaluate local challenges by giving special care to its hydrographic, ecological, structural, socio-economic and environmental characteristics. For instance, North-western Black Sea is under the threat of pollution due to anthropogenic factors (Daskalov, Grishin, Rodianov, & Mihneva, 2007). On the other hand, near coastal waters and littoral zone in the Southern Black Sea has mostly suffered by the impact of trawl nets and dredges used for baby clam and Rapa whelk (Knudsen et al., 2010). Intensive purse seining with big vessels is the main reason used to catch anchovy and horse mackerel.

High maritime traffic and industrial fishing vessels are the main threats for the Bosphorus and its entrance in Marmara Sea. Dams and hydroelectric power plants constructed on the rivers discharged to the Black Sea basin have impacts on the migration of anadromous fish species (sturgeon and Black Sea salmon) by destructing/obstructing spawning grounds and limiting coastal habitats (ELME, 2007). Eutrification and chemical pollution have negative effects on the water quality of the Black Sea (Büyükgüngör, Bakan, & Akbal, 2014) which sums up to 80% of pollution as land based pollutants. On the other hand, increasing densities of invasive species and jelly-like organisms are the most important threats for different trophic layers of the food web and cause declines on the biomass of commercial and other species (BSEP, 2008; BSEP, 2009).

There are many weak links in the current fish stock management, i.e lack of area closures for the restoration of the stocks and failures in MSC to combat with IUU. However, there are opportunities for the solution of these problems by the close collaboration for the sustainable fisheries in the region. Similarities and differences on the local problems were identified under three topics: (1) fisheries biology (population dynamics), (2) fisheries management (human activities), (3) impacts on the fish stocks (environmental and/or anthropogenic). As a result, there is a need for more effective international measures and co-orperation in the fisheries such as ecosystem safety and common security standards, as well as restoration of infrastructures and improve communication. Model in Figure 6 may play an important role to solve recent problems by regional and international communication.

Implementation of a plan should be focused on how to transfer main messages to relevant parties in order to convince them to change their previous behaviours, to provide long term support to protect artisanal fisheries, application of appropriate material and methods, determination of the problems, solutions and priorities. Some fisher groups usually hesitate to communicate with the others due to wide range of reasons i.e conflict of interests, afraid of loosing present fishing rights, taxes, etc. Therefore, it is better to use less integrated methods to communicate with them over selection of similar or unsimilar subgroups. By this way, better/reliable results can be obtained. For example, responsibilities of the regional organisations may increase. Activation of cooperatives, regional fishery centers and local governments will be useful. NGO's in such systems may play an important role between resource and resource users. It is better to pre-define the impact and input of each stakeholder due to nature of the problem but believing that each of the stakeholders work for the same target and existent for the same principles. Finally, enriched commumunication methods as efficient and transparent campains on sustainable fisheries, eco-tourism, blue-growth strategy, slow-fish, etc. may help to raise public awareness in the region.

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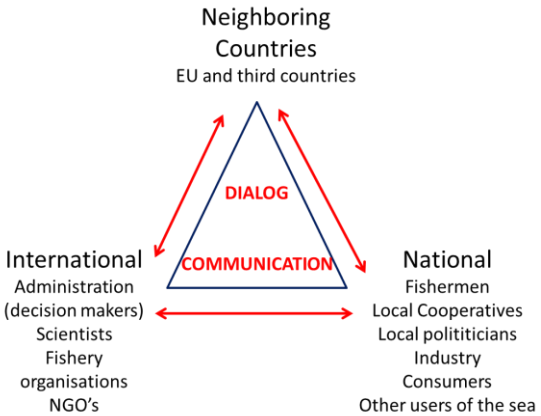

Figure 6. Effective communication model for the stakeholders on local and international level.

the participants from all riparian countries. Authors are grateful to the encouragement of the project and case study leaders (2nd author).

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