

Kepa Astorkiza

Department of Applied Economics V,
University of the Basque Country,
Bilbao,
Spain
✉ ebpasikk@ehu.es

Ikerne del Valle

Department of Applied Economics V,
University of the Basque Country,
Bilbao,
Spain
✉ ikerne.delvalle@ehu.es

Changing the Total Allowable Catch (TAC) Decision-Making Framework: A Central Bank of Fishes?

Summary: The difficulties that the current model of TAC regulation generates in the current system of EU fisheries are analysed. Although the production structure of the TAC has been set up in collaboration with ICES, the determination process lacks short-term contributions from the field of biology. Once these inputs undergo the decision process of the EU, the resulting TACs are significantly biased in relation to the initial recommendations. To solve this problem, a different institutional model with the addition of a Central Bank-like of Fishes is proposed.

Key words: Common Fisheries Policy (CFP), Individual Transferable Quota (ITQ), European Union (EU), Central Bank-like of Fishes (CBF), International Council for the Exploration of the Sea (ICES).

JEL: Q22, H12, L16, K23.

The fisheries sector in the main fishing countries of the EU has been gradually losing economic and social relevance in relation to other sectors. From the point of view of its relative importance in the percentage of GDP of these countries it is very small, like that of primary sector activities on the whole. However, the economic theory has had many problems in the domain of definition of the property rights, on the definition of transaction costs of different governance models taken in fisheries activities, in the field of information asymmetries etc.

Many Achilles heels can be found in the fisheries sector regarding positive and normative economics which make the activity hard to analyse. This activity takes place in a common pool resources area for a number of countries. In the case of the EU, member states share common sea waters corresponding to the Exclusive Economic Zone (EEZ) in the European Union (EU) covering in most cases 200 nautical miles. In this way, the ownership of the fish species located in the EEZ cannot be regulated following the criteria of ownership of goods and services typical of economic activities on land.

Even when in the marine environment property rights are established on certain characteristics of the stocks - for example on the catchability of fishes of certain characteristics regarding size, age or breeding conditions, by means of ITQ (Individual Transferable Quota) or other forms of restricted access frameworks, the rights acquired by fishermen on the population of stocks, are not on the same level of ownership that is usually found on goods and conventional resources.

The models of the Arrow-Debreu (A-D) type and the development of bio-economic models based on the (A-D) assumptions, find it very hard to explain the problems and its scenarios because the assumptions they are based on are difficult to find in the ocean environment. In this regard, many conventional economic models offer answers raised under hyper-rationality assumptions which heavily clash with the fishing reality.

Moreover, in fisheries, output and capital converge in the same population, which is why regulators have great difficulty in separating the population that goes to capital and the share that goes to the catch. Scientists and regulators are extremely wary of establishing the specific characteristics of the cohort or portions of the total population that must be captured and cohorts that should be left as reproductive capital in the ocean. Both parts of the population are conditioned by the characteristics of the growth laws specific to each of the species. Each stock and each species has its own functions regarding growth, biological and reproductive characteristics. To add further difficulties to the task, the size of the stocks and their variations are not directly observable and are most often assessed by means of external indicators (John T. Schnute and Laura J. Richards 2001).

All the above makes the analysis of fisheries in the marine environment very difficult, so that the rationality of the theory is constantly confronted with the apparent irrationality of reality. Hyper-rationality in many complex models clash with the hyper-reality of events.

To address the said difficulties some forms of organization and institutions of specific fisheries have been created. These organizational models are relatively different from others found to solve the problems of economic activities common in other economic sectors (Jon Elster 1984; Elinor Ostrom 1990; Kepa Astorkiza et al. 2006; Ikerne Del Valle and Astorkiza 2007). Models of Governance in the fisheries sector have converged in most developed countries, but the establishment of the continental market in the EU has adopted at the same time specific organizational forms; the institutional organization of the European fishing industry has had some peculiarities which should be taken into account.

In the Section 1 we illustrate the system of governance of fisheries for policy coordination at European level. In the Section 2 we provide the vision of the Green Paper on the reality of European fisheries. In the Section 3 we present the organizational model used to establish the scientific TAC developed in the EU. In the Section 4 we incorporate a central bank-like of renewable resources, in this case, a central bank-like of fishery resources. In the Section 5 we present the typology of the CBF, what is being sought is a type of bank whose aim is the correct management of natural resources. In the last section we arrive to conclusions.

1. Governance of Fisheries in the UE

In the organizational model of the EU, Common Agricultural Policy (CAP) and the fishing industry have been the first and only to be placed under the aggregate sovereignty of the EU. In 1983 the Member States returned sovereignty of the fisheries in the EU to create the centralized Common Fisheries Policy (CFP) under the overall sovereignty of the Union.

The system of governance for policy coordination at European level has been developed through an institutional structure articulated at different and multiple levels. In this institutional model, the historic structures of the member states co-exist and interact with the newly created structures developed to coordinate and develop the Union. Through the needs generated by the institutional model under construction, a polycentric decision making system was created and organized at different levels, regional, national and European, which differs from traditional decision-making models of individual member states. The processes of taking and implementing decisions become much more complex processes.

The current model of institutional arrangements in the EU is not that of a traditional state, nor is it that of a federation nor a confederation in the conventional sense, although some provisions are common to them all. Alternately, the EU doesn't have the means to face the goals laid out in conventional states to decide and implement economic policies and public policies in general. In situations of serious conflict and faced with paradoxes that arise in the process of the European construction, the battery of means available to the EU is not usual in the nation states.

The decision-making process used in the EU has created a complex coordination structure among the institutions involved and in the different levels of horizontal and vertical governance. In the space of a few decades a continental scale public policy making has been created. The coordination process at various levels has led to a model where local and regional levels in the base interconnect with the highest European level at the top. In many sectors and especially in the fisheries sector this has led to command and control strategy. Traditionally the fisheries sector has been managed by a top-down vertical model of decision-making (Svein Jentoft 2005; David Symes 2005). This has led to important constraints in developing public policies.

To solve the problems of the special features arising from the fisheries sector, some of which have been noted in the introduction, specific institutional and governance frameworks have been developed. But in the EU level, the governance model that has unfolded has been problematic and generally inefficient (Sebastián Villasante et al. 2011). At present a considerable part of the resource income is dissipated into the intricate European network of fisheries governance system. The result of this is that it has led to policies ensuing in strong need for credibility and inefficient. So it's necessary to put into action other alternative forms of decision-making and implementation mechanisms, with greater orientation on efficiency and resting either directly on the markets, or in the co-management mechanisms.

Simultaneously with regional and global type of co-management like Regional Advisory Councils (RACs), other local variety of co-management, capturing fishers and stakeholder's collective action can provide a greater level of efficiency and legitimacy. Undoubtedly it would be useful to articulate a coherent combination of all of them in a dimension not currently contemplated.

To realize the extent of the problem one just needs to examine the outcomes of the diagnostic analysis that the European Commission makes of the reality of the sector in the Green Paper (Commission of the European Communities 2009).

2. The Diagnosis of the Green Paper on the Reality of Fisheries Sector

In order to give direct testimony of the spirit that is conveyed by the vision of the Green Paper on the reality of European fisheries, an explicit diagnosis on the current status and on the short- and long-term sector is transcribed below:

“However, the Commission believes that a whole-scale and fundamental reform of the Common Fisheries Policy (CFP) and remobilisation of the fisheries sector can bring about the dramatic change that is needed to reverse the current situation. This must not be yet another piecemeal, incremental reform but a sea change cutting to the core reasons behind the vicious circle in which Europe’s fisheries have been trapped in recent decades” (Commission of the European Communities 2009).

The Green Paper makes it clear that especially in Europe, fish stocks in the European EEZ have been overfished for decades, and that fleets are still oversized, so that too many ships are capturing almost depleted populations. Therefore, the activity of the sector as a whole is unsustainable from an economic standpoint. It also notes that the result of this imbalance has resulted in the decrease of the proportion of food fished in European waters and in the increasing dependence on imported fisheries. Concurrently it mentions the deterioration of the situation due to the increase in prices of key inputs, especially of rising fuel prices. On the other hand it states that the economic crisis has exacerbated the poor performance of the fisheries.

The report determines that the initiatives taken to correct the situation, such as improving product quality, quality of consumer information, adjustment between supply and demand, aimed at achieving economic viability of the sector, have been clearly insufficient (Commission of the European Communities 2009).

The diagnosis is staggering:

“European fishing activities must be clearly based on economically rational principles. Fleets must improve their economic resilience and adapt to changes in the environment and markets” (Commission of the European Communities 2009).

Undoubtedly the continued increase in the price of energy inputs, industry and services, together with the liberalization and internationalization of fisheries markets have had a negative impact on the sector. However, the sector is mainly burdened by its own endogenous problems. On the one hand the model of governance and bureaucratization have led to low levels of legitimisation of the decision model among key stakeholders in the sector, which weighs heavily on their efficiency. This lack of legitimacy leads to an inefficient enforcement of fisheries regulations, to the extent that the CFP is perceived as an inappropriate strategy. The sector is experiencing a highly vertical CFP structure, with little room for dialogue and limited stakeholder participation. This perception persists although the EU Commission has launched 6 Regional Advisory Councils (RAC) to correct these deficits. The RAC is as a consultative body of the decision process in which the most important stakeholders in the sector are invited to take part at EU Commission level.

RACs provides a new form of participatory arrangement and support in CFP. In this sense, they are stakeholder-led organizations and they correspond to management units based on biological criteria that have adapted their structure to the specific

characteristics of the fisheries and regions concerned. Under the generic denomination of Stakeholders, RAC put together the interest of shipowners, small-scale fishermen, employed fishermen, producer organizations as well as, processors, environmental organizations etc. They are conceived as an advisory body under the EU Commission umbrella to gather bottom-up inputs in the decision making process. Their decisions and proposals are taken by consensus preferably.

The RAC have brought an undeniable progress over the previous situation. Before RAC arrived, the institutional organization of the fisheries policy was structured exclusively on the top-down framework, and it had little legitimacy among fishers and other stakeholders. The introduction of the RAC marked the opening of a different strategy more in accordance with the needs of fisheries activity and the needs of public policies. These Advisory Councils have opened a path for the development of bottom-up policy strategies and they have achieved a new degree of stakeholder's involvement in the processes of design and implementation of public policies. Among their achievements it can be posted many examples of long-term plans and multi-annual TACs developed under RAC sponsorship. In any case the strengthening of bottom-up strategies often stumbles and stagnates in the complex organizational and institutional structure in the EU. These complexities make it difficult yet to get through and overcome the glass ceiling of top down dominant decision structures.

On the other hand, the EU and governments of the states are defraying very large amounts in the management costs of a receding industry, trying to protect fishermen from the results of administrative mismanagement, from the overcapacity of the private sector and from overfishing, leaving the public sector with the most important burden part of the costs and dissipating a substantial part of the resource rent.

The continental scale of the stocks and the consequent institutional organization level requires an EU centred management, but the inadequate institutional structure creates a counterproductive incentive structure and finally the current governance model of the EU in the fishing sector fails to provide an acceptable alternative to maintaining a sustainable exploitation of the activity (Commission of the European Communities 2009).

There are endless problems that lead to the inability to provide a sustainable alternative. One of the most important problems is the institutional organization model of the sector. We take in account the proposal coming from transaction costs an institutional economics approach that institutional framework "matters". Following this premise, the main proposal of this work is to focus on one of the most serious problems of the current organizational model.

As a result of this study, an alternative organizational model will be offered that will allow introducing other approach to address the same problems differently.

3. Governance of the Total Allowable Catch: ICES and Regulators

The core of the European regulatory system begins with the stock assessment and the establishment of management units. From that initial stage, the elements to determine

the Total Allowable Catch are set. This is an evaluation process which requires high levels of science and technology.

The organizational model used to establish the scientific TAC developed in the EU is comprised of an inclusive system which in turn is divided into several levels (Francesc Morata 2002; Astorkiza et al. 2006). At the base of the pyramid are the institutes and fisheries laboratories from Member States. In principle, these organizations are public entities or publicly funded bodies. They are laboratories or fishery institutes (generally marine and oceanographic) that have traditionally depended on the research departments of the fishery ministries concerned. They are currently still dependent on fishery ministries or corresponding government departments but as a result of the creation of different agencies, they take various legal statuses, which make them be placed formally between public and private.

These institutes and laboratories are the basic unit of production of the assessment of fish stocks and are actively engaged in the creation and development of new biological and population assessment methods to obtain better estimates of the fish at sea. In these organizations lies the basic contribution of labour and scientific resources. The international scientific organizations (mainly ICES but also STECF at regulatory levels) work mainly on coordination, control and scientific consultancy rank. STECF intervenes in the implementation of the CFP, that requires the assistance of highly qualified scientific personnel, particularly in the fields of marine biology, marine ecology, fisheries science, fishing gear technology and fishery economics. For that purpose the Scientific, Technical and Economic Committee for Fisheries (STECF) was established by Commission Decision 93/619/EC, renewed in 2005 by Commission Decision 2005/629/EC amended by Commission Decision (2010/74/EC) and Commission Decision (2012/C 72/06). In any case it isn't designed or intended to fulfill the role we are analyzing.

ICES has the historical prestige and background and is renowned for its credibility regarding scientific rigour acclaimed by all the parties involved in the fishing industry. All industry stakeholders accept and recognize the key role it plays in the scientific assessment of TACs (Helen M. Rozwadowski 2002). This has been one of the key deciding factors of the EU when including ICES as a central figure of the governance mechanism of the Common Fisheries Policy (CFP).

The EU Commission understood that ICES was the institution that should deal with the validation and coordination of the work carried out by the institutes and fishery laboratories of each Member State in the process of stock assessment. From ICES and the inputs coming from the institutes mentioned, advice and recommendations on TACs for the whole fishing system in EU waters of the North Atlantic would be obtained.

The stock assessment and proposals of the scientific TACs are carried out by means of direct and indirect procedures that may also be interpreted as both independent methods of the fisheries and fishery-dependent methods.

Indirect methods are used to create the population pyramid of each species from the catches of both current and previous catches (Ray Hilborn and Carl J. Walters 2002). This method is usually suitable for species that live many periods and the catches for each period are used to reconstruct the virtual population with their dif-

ferent cohorts. This assess the population size and growth dynamics which enables to determine the scientific TAC and the relevant recommendations on the general condition and on the characterization of the fishing effort better suited to the particular situation of the stock. Following these inputs, the regulator establishes the criteria of quotas by fleets, the sizes of the nets and other fishing gear, as well as the most adequate strategies to discriminate the catch according to volume, age, size reproductive conditions, etc.

One of the problems of the indirect process is that in many pelagic or short-lived species as well as highly variable natural mortality, establishing an age pyramid is not easy. These species tend to have large fluctuations in recruitment. Given these problems, the population is evaluated by means of direct methods, either by acoustic estimation of relative abundance in the sea or through egg counts during the peak spawning period (Susan J. Picquelle and Gary Stauffer 1985; Jürgen Alheit 1993; John R. Hunter and Nancy C. H. Lo 1993). This solves some of the problems of the indirect process.

Making use of either one methodology or the other, the TAC is evaluated for each case and each species, and ICES makes the appropriate recommendations to the regulator on the TAC of the catch and the characteristics of the catch regarding size of the specimens, cohorts, etc. Ultimately the recommendations are made from a strictly biological and population dynamic standpoint for each species and periodically, usually on an annual basis.

A key issue is that catches are based on TAC and on recommendations from biologists. Economic and social considerations are secondary in this framework. In this regard the organizational model followed by the EU regarding the regulation of fisheries can be regarded as a poor and short-sighted system of governance. This is a governance model that prioritizes biology and the short term goals of annual TACs and ignores or underestimates the impact of economic variables that determine the size and the evolution of stocks and fishermen. On the other hand there are numerous species of fish for which there is no scientific data to allow for reliable quantitative assessments. In these cases ICES recommends the use of the precautionary principle, although the regulator frequently does not take it into account.

Finally, it is important to realize that the officially appointed TACs, once the Council of Fisheries Ministers take their decision in December each year, are systematically superior or significantly higher to the TAC's recommended by ICES, which, on the other hand, are elaborated based on the population status and biology of the species. In fact, Villasante et al. (2011) estimated the differences between the fishing quotas and the ICES recommendations to be 19% after the first CFP reform (1992–2001) and 21% after the second one (2002–2008). Therefore, the process of developing the TACs needs to be entirely restructured from the point of view of the inputs taken into account to decide on its determination. This system requires a profound restructuring so that the shares offered relate to the realities of the stocks and fishermen. We are confronted with the “darkness” of the process of one of the most essential links of the CFP (Del Valle et al. 2006).

4. Why a Central Bank-like of Fishes?

Despite the complexity of the theoretical and empirical issues that have been mentioned in the introduction, it has also been highlighted that institutional and governance factors can also explain important aspects of management failures in the TAC. One of the key elements - but not the only one - when accounting for the inability to ensure a sustainable exploitation of resources, must be sought in the institutional organization of the fisheries sector in the EU.

The establishment of the TACs is a crucial element of the supply of fish to the market and of the reproductive capital that remains at sea.

The complexity of the institutional structure operating in the EU shows that TACs are not exogenous - that comes given - and that the regulator receives it as such, coming from the status of fish populations. In fact, even on the assumption that it was an exogenous element, passing through the network of the institutional framework renders it an endogenous variable. Regulators do not consider it an element that is given by the recommendations of ICES and to which they must adhere to. Persistently, the recommendations received from ICES and the official administrative TACs are different, and the differences are typically of the same kind of upward bias. From these findings it must be understood that the governance model actually turns the TAC into an endogenous and is a variable that is allowed to manipulate (Del Valle, Inmaculada Astorkiza, and Astorkiza 2003).

The importance of the institutional structure in determining the TACs, as well as the finding that they are political TACs that do not respond to the recommendations and advice coming from the natural sciences, shows that the dominant inputs of the natural sciences in the decision framework on the one hand, and of the Governance network on the other, generate systematic biases in one of the key variables determining the fishing supply. Finally, a discretionary bias in the allocation of the last stage is produced (Fernando González Laxe 2010; Villasante et al. 2011).

The version of the natural sciences regarding the allowable quotas making up the offer of fish to catch is inadequate, if not accompanied by the effect it has on the behaviour and work of the fishermen along with the rest of the stakeholders of the activity. Furthermore, the network governance causes an additional difficulty by generating a systematic bias, which as shown in the green book is near to be a systemic bias.

It is essential to address a problem that has the features of a congenital element in the process of determining the fish offer in the EU. The criteria for determining administrative TACs are often relatively far from the actual behavior of fish populations and behavior of fishermen and other relevant actors in the activity. That's a problem at the base of numerous imbalances of the fishery system (Apostolos Karagiannakos 1997; Christian Lequesne 2001; Symes 2005; González Laxe 2010).

The drifting of the TACs are at the basis of a relevant part of the overcapacity of the fleets and the race for the catch. Obviously, to the extent that there is a part of the TAC that is a virtual offer and does not correspond to reality of populations, incentives are generated to deploy a competitive rivalry to capture the quotas established by the legal TACs. Thus, what is rational in an individual context turns out to be harmful in the aggregate. The impacts that this system is having on the resources

and the different economic subsectors dependent on fishing are not being taken into account. However, the vectors of these perverse incentives come from the governance and institutional pattern of determination of the TACs.

The current path of the structure of decision making on the TAC is negatively affecting the progress of the whole industry and all the bureaucracy involved provides continuous room for discretion in the final decision. The methodology of the Harvest Control Rules (HCR) was developed as an alternative solution to address these levels of discretion. This strategy stems from a set of well-defined laws that are used to determine annual catch quotas (Ewen D. Bell, Gunnar Stefansson, and Ragnar Arnason 1998; Victor R. Restrepo and Joseph E. Powers 1999; Toshio Katsukawa 2004). Thus clear objectives are formulated in a context of consensus. In the HCR strategy, a set of rules is identified; for example, a constant catch rate establishing an invariable fishing pressure setting; the beginning of the catch once it has exceeded a certain level of biomass or other similar combinations of the above. These biological reference points, related to some of the aspects of the stock, enable all stakeholders to know the TAC first hand, without third party intervention, once the stock has been assessed by the ICES.

When accepted, these HCR strategies serve to circumvent and / or minimize the possibility of intervention by the EU bureaucracy and the problems derived from political and administrative TACs. If a management policy can be expressed as an HCR, HCRs then provide the means for determining the TAC unambiguously as a function of the size of the stock given by ICES.

The advantage of a simple rule in the case of HCRs is that it is easy to describe and interpret but has the problems of lack of flexibility and in any case it is an assessment from biology (MYS, MAY...) and does not take into account bio-economic issues. It is an interesting alternative as we have a partial solution to the underlying problem, but the social and economic aspect of TAC setting are pending.

The HCR rule offers the possibility for building a bridge to transit the differences, minimizing the incidence of those biases. In any case, the European institutional construction establishes that the final decision on the TAC corresponds to the Council and the formulas HCR-like have not priority to overcome the Council's decisions. Even taking the problem at its source, the HCR cannot solve the problem at its root. In that sense this pathway may offer an interesting strategy meanwhile the Council agrees to accept and support it, and there isn't necessarily the case.

Faced with this issue, a thorough study is needed of institutional developments that will address, in depth, the structural anomalies of the current institutional setting in the European fishing industry. Certain aspects that must be resolved through the new governance model are the elimination of discretionary incentives and the establishment of a decision framework that is capable of generating TACs from a decision framework that meets biological, economic and social development elements. It needs an appropriate framework that will provide the necessary elements for making short and long-term decisions. Under the current decision-taking framework, key inputs come from the advice of the ICES and undergo the review of the STECF but there is no truly effective framework for bioeconomic decision-making. It is from this perspective that this paper proposes a model of governance that simultaneously

incorporates a central bank-like of renewable resources, in this case, a central bank-like of fishery resources.

One of the most important institutional reforms of recent decades has focused on providing public agencies with high levels of autonomy. The central monetary banks were the main protagonists of this evolution (Alex Cukierman 1992, 2007; Alberto Alesina and Lawrence H. Summers 1993; Alan S. Blinder 1998, 1999), and that trend has also been demonstrated in other types of organizations within public administrations.

For example, some environmental and sectoral agencies within the public sector have changed from an initial situation in which they were part of the state administration itself, to another where they have their own constitution that guarantees a greater capacity for independence in decision-making. Delving into the literature that promotes the independence of the agencies responsible for natural resources, we see the emphasis on the need for an independent institution whose primary goal must be to ensure the sustainability of resources.

Facing the current governance model in EU fisheries, which is immersed in a number of institutional uncertainties, agency relationships with different stakeholders, generating and supporting opportunistic behaviours and perverse influences in the area of the TACs, an alternative supported by an intergovernmental organization, non-profit, linked to the public sector but also with independent status for design and action is being considered. That organization has to encompass the whole of the EU and tackle the problems of the stocks that live between the administrative boundaries of several states and / or migrate to the continent, or have a metapopulation origin in its population.

Potentially the Central Bank-like of Fish needs to be a tool that removes / neutralizes the current bureaucratic process, and deal with changing what has been called the "TAC Machine" (Kåre Nólde Nielsen 2008). The "TAC Machine" is an allegory to reveal the extent of the problems arising from the very beginning of setting TACs in the field of biology, which later in the process of management and regulation worsen even more.

The Central Bank-like of Fish would have to work on clearly conveying signals of abundance and scarcity of quotas in the final allocation system, to improve the income of all stakeholders in the sector - currently dissipated - including of course, the earnings of the owner of the resource. In that way it would be a mechanism that has an overall level of centralization at the top but a decentralized organization at the same organizational levels typical of the EU, linking continental with regional whilst keeping close to specific situations. This entity must deal with sending signals to both the private and public sectors on the situation of the stocks and quotas. And it must be done considering not exclusively the population and biological status point of view, but also economic and social variables and scenarios.

In this framework of the CBF, criteria must be entered not only to pivot and respond only to notions such as the Maximum Sustainable Yield (MSY), Maximum Average Yield (MAY) and the like, that come only from the population dynamics. With this kind of units, TACs and quotas are set that meet biological criteria. It is important to restore units that are also present in the determination of the TACs as

well as elements collected at the vectors of the resource inputs of the kind (Optimal Sustainable Yield) and the like, which are also usually lower quotas than the (MSY) and take in account other aggregate economic, ecologic and social inputs. This type of units incorporates economic and social data that helps to manage a more reasonable exploitation from the economic and social viewpoint. Evaluations stemming from biology, as has been noted, start from egg counts in the peak spawning period or in the reconstruction of the virtual population pyramid, and from here, eventually the population is evaluated in terms of T_m . Basically, ICES proposes the so-called scientific TACs following these methodologies. But the CBF also has to introduce the element of the values in the form of quantities and prices and proposing a new vector in the input to be used for the setting of the TACs.

There is currently no agency in charge of coordinating the process of regulation or of developing a similar task in the UE to which is posed to BCF. The STECF theoretically deals with something relatively similar to that kind of work, but by its very definition is concerned with reviewing the TAC provided by ICES in a different way, more empirical and qualitative. Unlike this scenario, the Central Bank-like of fish has to introduce the economic and social rationale at the core of the decision process of the supply available for the catch at the same level than ICES. At the same time it has to compare the supply and demand to have the appropriate view of the value of quotas.

Undoubtedly, the work of ICES and of the evaluators of different populations is essential, regardless of their internal organizations or the coordination techniques employed. In all cases it is essential to know the approximate number of fish of each species in the ocean, and is therefore essential to perform stock assessments. Furthermore, in all the possible cases and species, it is important that the regulator has in its decision framework an institutional structure that requires the economic and social rationality criteria. It is also necessary to make projections and long-term simulations of population dynamics and sustainability of the species. This way long term macro and micro plans can be made in the areas of investments, etc., on criteria of economic rationality, and not only short term annual decisions.

Evidently the incorporation of this variety of central bank-like would mean a change in the form of governance in the sense that it needs to de-emphasize or even eliminate the role of discretionary elements in the allocation of TACs. An entity of this type incorporates the signals of supply and demand for quotas in the form of relative prices of the quotas between different species and different fleets and may establish criteria for quotas with less friction and obstacles than those generated in the model today. In some cases, the criteria and quotas are set directly according to the prices of the quotas of the ITQ, or as shadow prices for sectors that are not in the ITQ sector and operate under a traditional model by limiting entry and inputs or outputs without considering ITQs. It is expected that both systems, ITQ and traditional, will coexist for a long time in the European framework. The shoal has to address the needs and demands of both parties.

To avoid that through the operation of this entity similar problems to the ones trying to be solved, regenerate, it is essential that it is governed by particularly strict and well defined rules of operation. Opportunistic behaviours that may arise in this

kind of institutions and drifts on the system through distortion or manipulation of the variables it handles must be eliminated. In this sense, rules versus discretion of action need to be set, especially in an area as sensitive as is the fishery system. Opportunistic behaviour is a very powerful argument to introduce a rule-based operation. Rules reduce behaviour volatility and ultimately this is a defence strategy that will allow the activity of these central banks and keep them away from external pressures in their decisions on quotas. In parallel to what is happening with ICES, this entity must be protected from rent seeking activities to gain credibility and consensus of stakeholders in its task of providing estimates of quantities and values of the quotas.

To the extent that such a consensus is crystallized and the corresponding credibility in the performance of this new entity, the whole fishing system should, in theory, gain credibility in the decisions and the effectiveness of the results, in a context in which the all stakeholders face a less uncertain future. The elimination of discretion should reduce temporary inconsistencies in the decisions (Finn E. Kydland and Edward C. Prescott 1977) and improve the chances that the evaluations of quotas and TACs assigned from this entity, are imposed before the current strategies, which more politicized TACs and a stiffened management system.

5. Which Kind of Central Bank?

This paper does not propose the creation of a conventional central bank, such as those found in the financial system. In the central banks of the financial system, some of the main elements are money management. The banks play a special role as instruments of the monetary policy of the economic system. The rest of the banking system is made up of banks of different characteristics, the vast majority of which are privately owned but in some cases there are also public banks. In their relationship with the rest of the system, these banks have a multiplying effect on money and the whole system in the banking system is geared towards channelling savings to investment. In that sense the idea of a central bank and the rest of the banking system is not raised here as central bank for the fisheries sector. For these reasons we refer to as a central bank-like of fisheries.

In the case of CBF, what is being sought is a type of bank whose aim is the correct management of natural resources and in our case a substantial improvement of marine resources through the establishment of TACs that take into account the biological, economic and social aspects of the fisheries. In this regard, the materiality of T_m in the ocean is replaced by its equivalent in bonds, so that its value may be expressed in monetary units or other similar accountable units (Philip Arestis and Peter G. A. Howells 1996).

While it is clear that the problem at hand is not the same in each case of each of these areas, financial and fishery resources, the fact is that they also share common or convergent aspects. If one looks at the similarities between them, one would have to go back to the late nineteenth and early twentieth century, under the model of central banks ordered according to the "Golden Standard" and not like the current central banks. The idea of central bank of fishes that is being considered here does not have much to do with the central banks of the financial system we know today. These types of banks operate with Fiat Money, which is capable of generating new means

of payment. Fiat money has a multiplier effect in that it is able to increase the existing amount of money in the economic system. In the case proposed we aim to avoid the creation of new means or titles in order to better manage the resources.

Introduction of requirements for reserve ratios in financial banks generates expansions and contractions of the money supply (Jean François Goux and Charbel Cordahi 2007). In the fishing stocks scenario these expansions and contractions lead to situations of exploitation or squandering of fish resources. We would find short-term variations that would have an accordion effect on the amount of fishing quotas and allocations of the TACs, so by means of different mechanisms in each case, we would end up suffering similar situations as we have today. This is why the operational management of the bank needs to stem from strict rules. The establishment of rules in front of discretion and voluntarism are in this case essential to prevent the cure from being worse than the disease.

As noted in the introduction, the fish are both output and capital and to ensure a sustainable reproduction of the stock, part of the population must be captured as output while the amount and cohort of parents required to renew the population must be left at sea. For this reason the TAC, in relation to the whole population, needs to be clearly lower than the unit and the multiplier effect typical of central banks with “Fiat Money” when transferred to natural resources area, has to be unity. CBF’s role is that of determining, together with ICES, the amount of quotas and TACs required to ensure the sustainability of each resource and to obtain the income that will allow all stakeholders to meet their expectations.

The CBF seeks to promote the study of a different governance formula through a more substantial institutional framework than the current one. This is to prevent the systematic appearance of non-existent quotas and virtual TACs. Simultaneously, we aim to introduce a new institutional framework for fisheries management entering the EU that is much more economically rational. This use of economic rationality has to directly reach the methods used by ICES and similar organizations to assess the stocks and dynamics of the populations. Many often relative prices of different cohorts of the same species have very different values on the market, and fleets clearly discriminate them in their catches. In these cases, discrimination of what is understood as output and capital is determined by market prices in each age group, and therefore the stock assessments and TAC settings must take these elements into account both from ICES and from this new entity.

Variations in stock may come from external factors such as changes in the conditions in oceanography, or adverse or beneficial conditions in the food chains or the consequences of climate change. However, the endogenous changes stemming from within the management system are precisely those that are proving more difficult to control. Ultimately, the dominant patterns in the EU are proving to be unlikely effective “path dependence” and this kind of institutional change could be a vector to improve the current decision framework.

The objective of this entity is not to establish property rights in any level of the system. It should not either take on the responsibilities of determining who is entitled to access the fishery and how the activity has to develop. These are not its duties. Neither should it deal with the implementation of fishery plans or enforcement of decisions.

Its goal is to be part of the TAC setting process in close cooperation with ICES, to put an end to the autistic dichotomy that currently occurs between the recommendations drawn from biology concluding in a skewed final result of the TACs after the regulation process.

An added task of this entity should be closely linked to the development of procedures and knowledge of formal and empirical models aimed at regulating the social sciences and in conjunction with models stemming from the natural sciences. This kind of knowledge has a long tradition in the academic field as well as in applied fishery science. The scientific and technical procedures that simultaneously design the procedures for obtaining TAC quotas better suited to each fishery, have a relatively long tradition, but it is not the kind of knowledge that is most widely employed in the regulatory process or in making final TAC decisions in the EU. In the structure of decision taking made up by the ICES-EU Commission - EU Council, who has the final say on the assigning of TACs, these procedures are currently dominated by the recommendations of ICES and by a very particular process of decision making that take place in the Council every December.

It's about changing the direction of the dominant "decision framework" and "knowledge framework" decision processes of the TACs and eventually of the whole of the fishery system. This entity, together with the ICES, should provide the necessary elements for long-term plans of the various commercial fisheries, whether it is the ITQ system, restriction of entry or other forms of access regulation.

In time and in light of the progress made by the regulatory model framework, the CBF may assume new tasks, but initially its mission must be clearly stated and governed by strict operating rules. To successfully implement this kind of entity it needs to be provided with a statute and a status enough robust to perform. Its implementation could lead to a highly stimulating critical review of the conventional management of the current regulatory model.

To the extent that this entity is not intended to define property rights or the methods of the rules of use and exploitation of stocks, but to determine quotas and TACs from a different perspective than today, it creates ample room for co-management and participative forms of user implication in the terms of use of the resource (Ostrom 1990; Jentoft 2005). Under the current framework, where command and control and bureaucratic allocations of TACs prevail, this method can, in principle, reduce the types of co-management created to exploit and / or avoid underlying perverse incentives in the EU and developed around the perversions of the system as are the quota-hoping and the like. It can open new doors for other forms of co-management (Tracy Yandle 2003) stemming from the clarification of the TAC system. Along these same lines, it can place the discussion of the principle of "relative stability" -that ensures each EU member state a fixed share of the agreed TAC, on a new foundation. In the regulations by means of ecosystem methods, it is also essential to count on a rational measurement of TACs, because it is one of the fundamental driving forces of the system.

6. Conclusions

Some authors have named the current model of TAC allocations “TAC Machine” as a metaphor to highlight the problems arising from the onset of setting TACs from a biological perspective. Then, in the management and regulating processes these problems are aggravated and end up generating discordant assignments that do not correspond to the reality of fish stocks and their exploitation.

In turn, the version of the natural sciences on the size of the TAC, which make up the offer, is not acceptable unless accompanied by a research that determines the effects the behaviour and activity of fishing crews have together with the activity of the rest of the stakeholders.

This paper proposes the creation of a Central Bank of Fishes that would work in close collaboration with ICES, whose role would be to clearly transmit signals of abundance and scarcity of the final quota allocation system, introducing the element of values in the form of prices and quantities to pose a new vector in the input to be used for the setting of TACs. So, the economic and social variables that will allow for a more reasonable exploitation of the TACs will be added to the formula in the core of the decision framework.

From the CBF framework, it is necessary take in account measures that goes beyond biological notions such as Maximum Sustainable Yield (MSY), because MSY meet strictly population criteria. It is chief to restore units that when determining TAC allocations, take into account the vectors of the resource income of the Optimal Sustainable Yield and the like, which are also usually lower than the quota based on (MSY) and the like. This type of units incorporates the economic and social elements that provide a more reasonable management from the standpoint of economic and social development. To date, there is no regulation agency in the EU that is deals with what is being proposed in the BCF.

This proposal also aims to initiate a discussion that digresses from the conventional trails of such discussions, where property rights dominate the discussion and pre-established points of view become encysted. This proposal can however, generate a discussion forum that follows other approaches than the dominant paradigm of the discussion given in the EU, probably to begin protecting fishes from administrative protectors and regulators.

The implementation of this kind of instruments can definitely generate a significant amount of transaction costs, especially at its creation and in the early stages of operation. They can also present acceptance problems from state laws and bureaucracy regarding institutional changes in the EU. However, its implementation can bridge a significant gap in the current regulatory model, and help clarify a management system that ever since the inception of TAC assignments sterilizes and dissipates a very important part of the resource income.

References

- Alesina, Alberto, and Lawrence H. Summers.** 1993. "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence." *Journal of Money, Credit and Banking*, 25(2): 151-162.
- Alheit, Jürgen.** 1993. "Use of the Daily Egg Production Method for Estimating Biomass of Clupeoid Fishes: A Review and Evaluation." *Bulletin of Marine Science*, 53: 750-767.
- Arestis, Philip, and Peter G. A. Howells.** 1996. "Theoretical Reflections on Endogenous Money: The Problem with Convenience Lending." *Cambridge Journal of Economics*, 20(5): 539-551.
- Astorkiza, Kepa, Ikerne del Valle, Inmaculada Astorkiza, Troels J. Hegland, and Sean Pascoe.** 2006. "Participation." In *The Knowledge Base for Fisheries Management*, ed. Lorenzo Motos and Wilson C. Doug, 109-114. Amsterdam: Developments in Aquaculture and Fisheries Science, Elsevier.
- Bell, Ewen D., Gunnar Stefansson, and Ragnar Arnason.** 1998. "Biological Reference Points and the Performance of Some Harvest Control Rules." EU-Project FAIR-CT95-0561, Multi-Species Bioeconomic Models.
- Blinder, Alan S.** 1998. *Central Banking in Theory and Practice*. Cambridge: MIT Press.
- Blinder, Alan S.** 1999. "Central Bank Credibility: Why Do We Care? How Do We Build It?" National Bureau of Economic Research Working Paper 7161.
- Commission of the European Communities.** 2009. *Green Paper Reform of the Common Fisheries Policy - COM(2009)163 Final*. Brussels: Commission of the European Communities.
- Cukierman, Alex.** 1992. *Central Banks Strategy, Credibility and Independence*. Cambridge: MIT Press.
- Cukierman, Alex.** 2007. "Central Bank Independence and Monetary Policymaking Institutions: Past, Present, and Future." *Panoeconomicus*, 54(4): 367-395.
- Del Valle, Ikerne, Inmaculada Astorkiza, and Kepa Astorkiza.** 2003. "Fishing Effort Validation and Substitution Possibilities among Components: The Case Study of the VIII Division European Anchovy Fishery." *Applied Economics*, 35(1): 63-77.
- Del Valle, Ikerne, Ellen Hoefnagel, Kepa Astorkiza, and Inmaculada Astorkiza.** 2006. "Right-Based Fisheries Management." In *The Knowledge Base for Fisheries Management*, ed. Lorenzo Motos and Wilson C. Doug, 55-83. Amsterdam: Elsevier.
- Del Valle, Ikerne, and Kepa Astorkiza.** 2007. "Institutional Designs to Face the Dark Side of Total Allowable Catches." *International Council for the Exploration of the Sea - ICES Journal of Marine Science*, 64: 851-857.
- Elster, Jon.** 1984. *Studies in Rationality and Irrationality*. Cambridge, UK: Cambridge University Press.
- González Laxe, Fernando.** 2010. "Dysfunctions in Common Fishing Regulations." *Marine Policy*, 34(1): 182-188.
- Goux, Jean François, and Charbel Cordahi.** 2007. "The International Transmission of Monetary Shocks in a Dollarized Economy: The Case of USA and Lebanon." *Panoeconomicus*, 54(3): 303-324.
- Hilborn, Ray, and Carl J. Walters.** 2002. *Quantitative Fisheries Stock Assessment: Choice, Dynamics, and Uncertainty*. Norwell: Chapman and Hall.
- Hunter, John R., and Nancy C. H. Lo.** 1993. "Ichthyoplankton Methods for Estimating Fish Biomass: Introduction and Terminology." *Bulletin of Marine Science*, 53: 723-727.

- Jentoft, Svein.** 2005. "Fisheries Co-Management as Empowerment." *Marine Policy*, 29: 1-7.
- Karagiannakos, Apostolos.** 1997. *Fisheries Management in European Union*. Avebury: Ashgate Publishing Company.
- Kåre Nolde, Nielsen.** 2008. *Boundary Construction in Mandated Science. The Case of ICES' Advice on Fisheries Management*. Tromsø: Norwegian College of Fishery Science.
- Katsukawa, Toshio.** 2004. "Numerical Investigation of the Optimal Control Rules for Decision-Making in Fisheries Management." *Fisheries Science*, 70: 123-131.
- Kydland, Finn E., and Edward C. Prescott.** 1977. "Rules Rather than Discretion: The Inconsistency of Optimal Plans." *The Journal of Political Economy*, 85(3): 473-492.
- Lequesne, Christian.** 2001. *L'Europe Bleue. A quoi sert une politique communautaire de la pêche*. Paris: Presses de Sciences Po.
- Morata, Francesc.** 2002. "Gobernanza multinivel en la Unión Europea." Paper presented at the VII Congreso Internacional del CLAD sobre la Reforma del Estado y de la Administración Pública, Lisbon, Portugal.
- Ostrom, Elinor.** 1990. *Governing Commons: The Evolution of Institutions for Collective Action*. New York: Cambridge University Press.
- Picquelle, Susan J., and Gary Stauffer.** 1985. "Parameter Estimation for an Egg Production Method for Anchovy Biomasa Assessment." In *An Egg Production Method for Estimating Spawning Biomass of Pelagic Fish: Application to the Northern Anchovy, Engraulis mordax*, ed. Reuben Lasker, 7-16. Springfield: U.S. Department of Commerce.
- Restrepo, Victor R., and Joseph E. Powers.** 1999. "Precautionary Control Rules in US Fisheries Management: Specification and Performance." *International Council for the Exploration of the Sea - ICES Journal of Marine Science*, 56: 846-852.
- Rozwadowski, Helen M.** 2002. *The Sea Knows No Boundaries: A Century of Marine Science under ICES*. Washington: University of Washington Press.
- Schnute, Jon T., and Laura J. Richards.** 2001. "Use and Abuse of Fishery Models." *Canadian Journal of Fisheries and Aquatic Sciences*, 58: 10-17.
- Symes, David.** 2005. *Participation in Fisheries Governance*. Dordrecht: Springer.
- Villasante, Sebastián, García-Negro María do Carme, González-Laxe Fernando, and Rodríguez Gonzalo.** 2011. "Overfishing and the Common Fisheries Policy: (Un)Successful Results from TAC Regulation?" *Fish and Fisheries*, 12: 34-50.
- Yandle, Tracy.** 2003. "The Challenge of Building Successful Stakeholder Organizations: New Zealand's Experience in Developing a Fisheries Co-Management Regime." *Marine Policy*, 27: 179-192.