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Fisheries Science and Political Expediency: Can the Two be Reconciled?

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Social and natural scientific advice in marine renewable resource: Closing the gap between politics and theoretical ideals in fisheries management

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0. Introduction

Fisheries worldwide have been extremely poorly managed. In spite of attainable rents of up to 50 billion USD annually, they exhibit losses of perhaps 10 billion USD (Arnason 2006, Newton-Garcia 1996). At the same time the most valuable marine fish stocks have been reduced far below their long run optimal levels (FAO 2006). Thus, not only have the fisheries managers of the world been incredibly adept at avoiding generating economic benefits from the fisheries, they have also managed to hurt the world’s chances to quickly turn the situation around. This, obviously, raises the question of why.

In most countries, the fisheries are conducted by private entrepreneurs. Those, presumably, are primarily concerned with their own interests. The parameters within which they can operate are, however, set by the fisheries authorities, which are almost invariably a part of the local or national government. It is therefore political decision makers (ministers of fisheries, parliaments etc) who, with the help of their bureaucratic structures, run the fisheries management system. Those are the people responsible for fisheries management around the world.

It is sometimes suggested that the problem of fisheries mismanagement (Hannesson, 1996) may lie in the lack of understanding by the fisheries managers of the basic biological and economic relationships involved. Seen from this perspective, the scientists only have to explain this situation more clearly and convincingly to the fisheries managers — bridge the gap between science and policy so to speak — and everything will be roses.

This hypothesis holds little water. The nature of the fisheries problem and its causes has been well known and documented for over 50 years (Gordon 1954, Scott 1955). Effective methods to deal with the problem, basically property rights regimes, have been well known for over 25 years (see e.g. Christy 1974, Arnason 1977; Maloney and Pearse 1979) and in fact applied in certain fisheries with good results for at least the same time.1 During this half century or more there has been no lack of effort by the fisheries scientists involved to explain the fisheries problem and its ramifications to the authorities and the ways to solve it. At the same time international development organizations including the FAO, the World Bank and various others have actively promoted fisheries rationalization even offering money to accomplish it with little success.

No, it is extremely far fetched, even naive, to believe that the problem lies in lack of understanding of the science involved. After all lack of scientific understanding rarely deters politicians. Politicians around the world routinely allocate huge amounts of money to various endeavours whose scientific basis they have no understanding and is indeed often, unlike the fisheries problem, quite controversial. In fact, as discussed above, there is every reason to believe that politicians around the world are comparatively well informed of the basics of the fisheries problem and fisheries management. If so, are we to believe they are irrational?

Fortunately, we do not have to rely on the hypothesis of ignorant and/or irrational politicians. A much simpler explanation and one well founded in economic and social theory is readily available.

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1 IQs with some tradability were introduced in the Holland flatfish fishery and the Icelandic herring fishery in 1976. Fully fledged ITQs appeared in the Icelandic herring fishery in 1979 and the New Zealand trawl fisheries in 1982.
It is the thesis of this paper that lack of progress in solving the fisheries problem stems from neither lack of knowledge by fisheries authorities nor their lack of communication with fisheries scientists. Rather, the cause of the problem is an inappropriate allocation of fisheries management power resulting in perverse fisheries management incentives. In short, the fundamental reason for the world-wide mismanagement of fisheries is inappropriate institutional structure.

The rest of the paper is organized broadly as follows: In the next section I will apply the economic theory of government to explain why the government would not normally be overly interested in implementing effective fisheries management. In the following section I will explain an alternative arrangement, where political interests are basically removed from the fisheries sphere, an how that would promote the introduction of effective fisheries management. Finally, in the concluding section, the key results of the paper are summarized.

1. Provision of fisheries management services: Government vs. industry

As discussed in the introduction, in most countries the fisheries management system is designed and run by political decision makers (ministers of fisheries, parliaments etc) with the help of the bureaucratic structures they set up for the purpose. So, in most countries the government is the provider of the valuable goods we may call fisheries management services.

There are many reasons to expect the government to be less than perfect provider of fisheries management services. However, in this paper I would like to concentrate on most important of these, i.e., incentive problems. Much of what I have to say on the issue derives from the seminal work by Buchanan and Tullock (1962).

In a perfect market situation, the costs and benefits of any action are borne by the decision maker himself and no-one else. The decision maker therefore faces the appropriate incentives. In the case of the government this is generally not so. Government decision makers are generally allocating other people's money. They are usually not held responsible for the misuse of this money or rewarded for its prudent use, at least not fully. In addition, government decision makers are subject to political control and influence. It follows immediately that the incentives facing government decision makers are some distance from being appropriate.

We can differentiate between several types of incentive problems. Here, however, I will focus on the two most relevant ones for the problem at hand; (i) perverse incentives and (ii) misalignment of benefits and costs.

2.1 Perverse incentives

They government may choose to manage the fishery in a suboptimal way. There are various possible reasons for this. For instance, political considerations unrelated to the fishery may make it expedient for the government to forego efficient management of the fishery. One, fairly common case is where a more effective fisheries management is disliked by some political pressure group with the result that it is politically more gainful to refrain from it.

As distinct from government employees which face a different set of incentives giving rise to the usual principal-agent problems.
Another case is where there are initial costs associated with improved fisheries management and the benefits appear too late for the current holders of government offices to gain from them. The third case is where the government itself gains from ineffective fisheries management. The gains may take various forms. Continuing problems in the fisheries sector may call for repeated government assistance and therefore the opportunity for increased power and prestige, they may also generate the need for larger bureaucratic structures to deal with the problem and, of course, a greater government budget.

We can make this problem of perverse incentives more precise and hopefully clearer by considering a simple model of the political process. The model is not very realistic but comprises certain key aspects of reality and therefore highlight important aspects of the real situation. The reader should be able to see how the model applies to the fisheries management situation.

Imagine there is an exogenous flow of social benefits \( y(t) \). At time \( t \), politicians are in charge of this flow. They can allocate these benefits to themselves and their supporters or to the rest of the population. Let the rest get \( z(t) \). It follows that politicians get \( y(t) - z(t) \).

Let the instantaneous benefits to the politicians be represented by their utility function \( U(y-z) \) and that of the rest of the population as \( V(z) \) where explicit reference to time have been dropped. Finally let the social benefit be represented by the social welfare function \( W(U(y-z),V(z)) \). All three functions are taken to be increasing and concave.

At some future point of time the politicians have to face the vote. Their power from then on and, therefore, their benefits depend on the number of votes they receive. Let us express this by the terminal function:

\[
F(v(T)) \cdot e^{-rT},
\]

where \( v(T) \) represents the votes at the time of election, \( r \) the rate of discount and \( T \) the time from now until the election takes place. For simplicity write this expression as

\[
v(T) \cdot e^{-rT} = F(v(T)) \cdot e^{-rT}
\]

The votes depend on the satisfaction of the electorate (assumed to be the rest of the population) during the politicians’ term in power. Let this satisfaction be represented by the accumulated utility of the electorate according to the differential function:

\[
\dot{s}(t) = V(z(t)), s(0)=s_0
\]

And let the votes be decided by:

\[
v(T) = a \cdot s(T),
\]

where \( a \) is some positive constant.

Thus the politicians would like to adjust the sharing of social benefits so as to maximize the following integral:
\[ \int_0^T U(y-z) \cdot e^{-r \cdot t} \cdot dt + a \cdot s(T) \cdot e^{-r \cdot T}, \]

Subject to \( \dot{s} = V(z) \).

The solution to this dynamic problem is simply:

(1) \( U_z = a \cdot V_z \cdot e^{r(T-t)}, \) all \( t. \)

By contrast the socially optimal solution is:

(2) \( U_z = V_z, \) all \( t. \)

Several observations immediately follow from these results.

- The allocation of benefits to the electorate will normally not be socially optimal. The condition for that to happen is that \( t = T + \frac{\ln(a^{-1})}{r} \). This can obviously never happen unless \( a > 1 \) which is quite restrictive. Besides, if it happens at all, it happens just at an instance. So, basically, this shows that self serving politicians will not act in the social interest, even under democracy.

- The deviation of the allocation from the socially optimal is increased the further away in time elections are. If the time to elections is large enough it may even be the case that the electorate is allocated nothing whatsoever. The condition for that is that \( \int_0^T U(y-z) \cdot e^{r(T-t)} \cdot dt \geq a \cdot V_z(0) \cdot e^{r(T-t)}. \) Obviously the same would happen if \( a = 0. \)

Assuming particular utility functions we may specify the time path of allocations to the general public more explicitly. Thus let both utility functions, be identical and be logarithmic, i.e. \( U(y-z) = \ln(y-z) \) and \( V(z) = \ln(z) \). Moreover, for simplicity, let \( a = 1. \)

Then the allocation to the general public according to (1) will follow the rule:

\[ z(t) = \frac{y(t)}{1 + e^{r(T-t)}}, \) all \( t. \)

The social optimum by contrast is according to (2):

\[ z(t) = \frac{y(t)}{2}. \]

Only at the terminal time, the point of elections, will the electorate receive the social optimal allocation \( y(t)/2. \) At all other points of time it will receive less. This is illustrated in the Figure 1. Note also that higher the \( a,\)
i.e. the more greatly the number of votes is affected by satisfaction at the time of elections, the more the electorate will receive at that point, as well as during the interim.

The lessons of this model are:

1. Decision makers who are interested in their own welfare will generally not act for the social good.
2. The difference between the socially optimal and what actually happens may be great.
3. The difference increases with the time until elections are held.
4. The difference is reduced in the impact the allocations to the public have on their voting behaviour. This can be interpreted to mean that issues about which the public cares greatly will be treated more in accordance with the public’s wishes than the others.

2.2 Misalignment of benefits and costs

The groups receiving government services are often quite different from the groups actually paying for these services. Consequently, which services are provided and which are not depends very much on the political power of the respective groups. In what follows we will refer to this as the problem of asymmetric distribution of costs or benefits or, more briefly, the asymmetry problem.

The asymmetry problem can be explained with the help of the simple allocation matrix in Table 1.

<table>
<thead>
<tr>
<th>Distribution of Benefits and Costs amongst the Population</th>
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<tr>
<td>Distribution of Costs</td>
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<td>Distribution of benefits</td>
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When both benefits and costs are widely distributed (box IV in Table 2), most people benefit as well as pay. Therefore, there is a fair chance that the correct action will be taken in spite of poor government incentive structures.

Box IV in Table 2, however, is basically the only situation that warrants this level of optimism. If the benefits befall a large group and the costs are borne by a small group (box III), there is little chance that the action will be undertaken, even when aggregate benefits greatly exceed aggregate costs. The reason is that the interests of the narrow group of payees is much more focussed and can be better articulated via the political process than the interest of the wide group of beneficiaries that, moreover, usually stand to gain less individually than the payees lose. Therefore, projects belonging to box III are unlikely to be undertaken by the government even when they are socially beneficial.

The opposite applies to box II. Here the benefits befall a small group of people while the costs are distributed widely. Therefore government projects in this box stand a good chance of being carried out even when aggregate costs exceed aggregate benefits. As a result one may expect the government to provide an excessive level of such services.
Finally, we have box I where both the benefits and costs fall to narrow groups. Here everything depends on who these groups are and their relative political power. If both costs and benefits fall to the same group we are essentially back in the framework of box IV and there is not much of a problem. If the groups are different, however, which of course is quite likely, there is little chance of an efficient outcome. Given the inertia of government the most likely outcome is a stand-off, i.e. no action.

Now, increased fisheries efficiency normally requires reduced fishing capital and effort, a reduction in harvest rates at least temporarily and often a rearrangement of the fish processing and distribution sectors. The way to accomplish this, as is by now known (see e.g. Shotton 2000), is to allocate sufficiently strong property rights to fishers, which in practice generally means the owners of fishing capital. It follows that improved fisheries management very often, perhaps even typically, results in substantial gains to a relatively small group of people, the owners of fishing capital and a subset of fishermen, and a temporary and sometimes permanent loss to another group of people, the fishing industry labour and other suppliers of fisheries inputs. Thus, the proposal for improved fisheries management tends to fall into box I above, where the most obvious beneficiaries constitute a comparatively small group and those who pay the cost (the losers) constitute another small group. No wonder progress is slow.

It is of little consequence in this context that the gains far outweigh the losses or that most members of society will almost certainly gain eventually. What counts in the political process is the distribution of benefits and costs during the initial and early phase of the process.

2. An alternative arrangement

We have seen that there are fundamental reasons why the government, the traditional manager of fisheries, would not be overly interested in solving the fisheries management problem. It appears that unless there is a strong public clamour for improved fisheries management, it will simply not be in the interest of government office holders to solve this problem. This raises the question of what to do.

The fundamental fisheries management problem is not lack of knowledge and understanding. It is the lack of political will generated by socially inappropriate incentives faced by the political decision makers. These incentives, in turn, are not the product of morally weak politicians or caused by corruption. They are the inevitable outcome of a system which greatly weakens the link between decisions and consequences. The politicians, who essentially design and run the fisheries management system, generally only experience a very small part of its consequences for the fishery, irrespective of whether they are positive or negative. Therefore, totally naturally, they are not very interested in fishery aspects of the situation, but more interested in its other implications. These are often unabashedly referred to as political considerations.

So, the fundamental problem of fisheries management is one of inappropriate social organization. The institutional structure for fisheries management is wrong. Those with power to do fisheries management, i.e. the political agents of the State, gain little if anything from doing it well.
The solution to the problem is fairly obvious. Simply give those with interest to maximize the value of the fisheries the power to do so. This of course means handing the rights to the fishery to these people. These rights are inevitably property rights.

Of course, there is nothing “simple” about “simply” handing out rights to private agents in the fishery. There are many political, social and legal problems with that step. Neither will it be simple for the recipients of these rights to jointly solve the fisheries problem. After all they find themselves in a difficult bargaining game with their fellow rights holders. Most importantly, the problem of perverse incentives generated by politicians operating with other people’s money, as been eliminated. Moreover, with well defined private rights and self serving rights holders the situation satisfies most of the preconditions for a Coasian type resolution. (Coase 1960). Seen from another perspective, these rights holds will be playing a strongly positive sum bargaining game. The overall benefits of a fully cooperative solution would generally be greatly in excess of those that could be produced by any sub-coalition. Thus, the chances of a good bargaining solution would be good. Indeed, organizational steps could even be taken to minimize individual transactions (bargaining) costs and so increase the likelihood of such a solution greatly.

It matters greatly what kind of fishing rights are allocated. Most importantly the rights must be high quality ones. This means a high degree of exclusivity, security, durability and transferability (Arnason 2007). The higher the quality of the property rights the more each individual gains from cooperation and the more likely it is that an efficient cooperative agreement will be struck. Secondly, the rights issued should be as close to basic resource as possible. Even well defined fishing rights which are sufficiently removed from the basic resource — fishing licences provide a case in point — will not necessarily be sufficiently conducive to good fisheries management. The reason is that on the basis of such unfocussed or incomplete rights the fishery cannot be fully managed. It is another matter that the holders of such incomplete rights may be able to agree amongst themselves to de facto extend these rights. Thus for instance a ITQ holders may agree to take measures to protect the ocean habitat in which they have no direct rights.

To see more clearly how this is supposed to work, consider two types of individual rights in the fishery:

(1) Shares in the fishery benefits; \( \phi(i) \), \( i=1,2,\ldots, I \), where \( I \) is the number of individuals with rights. \( \sum_{i=1}^{I} \phi(i) = 1 \)

(2) Shares in the whatever TAC (total allowable catch) is set for the fishery; \( \alpha(i) \), \( i=1,2,\ldots, I \), where \( I \) is the number of individuals with rights. \( \sum_{i=1}^{I} \alpha(i) = 1 \)

The first type of rights is similar to shares in a limited company. The main difference is that the company has yet to be established and form its business strategy. The second type of rights is the more familiar ITQ system with the difference that the ITQ-holders themselves will have to set the TAC and enforce the ITQ restrictions. In both cases it would generally be facilitate the efficient resolution of the ensuing bargaining game to formally require the collection of rights holders to establish their association or company and to hold general meetings.
Let us now examine a bit more formally how this situation might work toward an efficient resolution of the fisheries management problem. We will not study the bargaining game in any detail. Here it will have to suffice to demonstrate that under certain, fairly unrestrictive situations what is best for the individual is also best for the rights holders as a group and vice versa. Obviously, in this situation the game will be very simple and virtually immediately converge to the jointly optimal solution.

Consider first rights of type (1) which is actually the simpler case. Let \( \theta \) denote the vector of all possible fisheries management actions and \( \{ \theta \} \) the time path of this vector. Then to total value of the fishery given some initial position may be written as:

\[ V(\{ \theta \}) . \]

Then obviously, individual benefits are:

\[ \pi(i) = \varphi(i) \cdot V(\theta) . \]

It follows immediately that:

\[ \max_i \pi(i) = \max_i \varphi(i) \cdot V(\theta) \iff \max_i V(\theta) \]

So, maximizing individual benefits is equivalent to maximizing total benefits. Therefore, fundamentally, each individual will want the benefit maximizing fisheries management.

Consider now the ITQ fishery. Let us for simplicity restrict our attention to the decision on the TAC. Obviously the value of fishery depends on the path of the TAC. More precisely:

\[ V(\{ \text{TAC} \}) . \]

If the quota holders differ only in terms of size (have replicable identical technologies), then each one’s benefits may be written as (Arnason 2007b):

\[ \pi(i) = \alpha(i) \cdot V(\{ \text{TAC} \}) . \]

It immediately follows that:

\[ \max_{\text{TAC}} \pi(i) = \max_{\text{TAC}} \alpha(i) \cdot V(\text{TAC}) \iff \max_{\text{TAC}} V(\text{TAC}) . \]

So, the TAC which maximizes individual benefits is the same as the one that maximizes total benefits. Therefore, each individual will want the TAC which maximizes total fishery value. It can be shown that a similar result will hold at least approximately even when the fishers are heterogeneous (Arnason 2007b).

So, at least under these rights the rights holders have every incentive and are in a good position to implement good fisheries management. However, given these results, it is
important not to forget that for fisheries rights holders to be able to effectively manage themselves, the appropriate legal framework has to be in place. Two things seem most important. First, as already mentioned, the rights themselves must be high quality ones and protected against outside encroachment. Thus, for instance the entry of new rights holders (except of course at the invitation of current rights holders) must be impossible. Otherwise any successful management will only attract new fishers. Second, the association of fishers must have the clear right to manage the fishery and charge each industry member for his proper share in the management costs. Otherwise, due to the public goods nature of the management services, the free rider problem might become unmanageable.

3. Conclusions

[To be written]
References


