

The Management of Fishing Capacity: general overview and preliminary considerations in reference to the case of the Adriatic Sea

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Abstract

In 1999, the FAO Committee on Fisheries adopted an International Plan of Action for the Management of Fishing Capacity. The paper briefly presents this new international fisheries instrument and discusses the main issues which would need to be addressed to ensure its implementation. Specific attention is given to measurement aspects, management methods, fleet reduction programmes, high seas fisheries and the need for a comprehensive approach to factors which contribute to overcapacity and unsustainability. The paper concludes that implementation raises important issues that need to be further addressed at national, international and global levels. It also suggests that comprehensive research work on the management of fishing capacity is much needed, especially in relation to the use of alternative policies instruments and management methods.

1. Introduction

The issue of managing fishing capacity was raised formally in 1997 by the FAO Committee on Fisheries (COFI) in reference to growing concern about the spreading phenomenon of excessive fishing inputs and overcapitalization in world fisheries. Work undertaken by FAO on this basis led to the preparation of the International Plan of Action for the Management of Fishing Capacity (FAO, 1998a and 1998b). This International Plan of Action was adopted by COFI in February 1999 (FAO, 1999).

In simple terms, the issue is essentially one of having too many vessels or excessive capacity in a growing number of fisheries. The existence of excessive fishing capacity is largely responsible for the degradation of fishery resources, for the dissipation of food production potential and for significant economic waste. This manifests itself especially in the form of redundant fishing inputs and the overfishing of most valued fish stocks.

Excess fishing capacity affects many domestic fisheries throughout the world and, in an even more pervasive form, many high seas fisheries. The globalization of the phenomenon is illustrated by the relative stagnation of world marine catches of major species since the late 1980s. FAO data indicate that nominal fleet size seems to have peaked during the mid-1990s. However, actual fishing capacity may still be increasing if one takes into account the improvement in efficiency and refitting of older vessels.

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Excessive fishing capacity in world fisheries came about progressively as a result of various factors, such as:

- the effect of the extension of maritime areas under national jurisdiction on private and public investment strategies and of related policies of national exploitation of newly created exclusive economic zones (EEZ), generally accompanied by sizable subsidization programmes;
- the failure of fisheries management in general, and of commonly used management methods in particular, such as total allowable catch (TAC) and other methods which aim essentially at regulating the catch rather than the harvesting capacity itself;
- the relative mobility of harvesting capacity, which allowed for a pervasive spill-over of excess capital among fisheries, both within areas under national jurisdiction and on the high seas;
- the resilient profitability of fishing activities whereby technical progress and relative price inelasticity have largely compensated for diminishing yields in overfished fisheries; and
- the changing nature of the industry, which is increasingly competitive and capital-intensive, with markets that are now largely based on internationally traded commodities.

At the individual fishery level, the origin of excess fishing capacity stems essentially from the widespread tendency of overinvestment and overfishing under open-access conditions. This textbook case of market failure implies a divergence between rational individual investment behavior and societal optimality. It can be noted that imposing various constraints on harvesting patterns (*regulated open-access*) does not significantly change the incentive for overinvestment.

It is also necessary to clearly differentiate ‘localized overfishing’ from overcapacity. The first is clearly the case of excessive effort being applied to an isolated stock (with fleet size being otherwise judged appropriate); the second, after allowing for possible reallocation, is clearly one of having, throughout the fishing sector or for a large group of fisheries, excessive and redundant harvesting capacity which cannot easily be re-allocated. It is therefore a global problem which takes all its significance at national and international levels rather than at the level of individual, narrowly-defined fisheries. As such, the management of fishing capacity is a broader concern which needs to be addressed within and across various fisheries and jurisdictions.

2. The International Plan of Action

The Code of Conduct for Responsible Fisheries recognized that excessive fishing capacity threatens the world’s fishery resources and their ability to provide sustainable catches and benefits to fishers and consumers. In Article 6.3, it is recommended that “*States should prevent overfishing and excess fishing capacity and should implement management measures to ensure that fishing effort[†] is commensurate with the productive capacity of the fishery resources and their sustainable utilization*”.

[†] The quote could have referred to fishing effort *and* fishing capacity. This could be misleading as the two concepts are related but different (see Section 4, *infra*).

The International plan of Action for the Management of Fishing Capacity (IPOA) is a voluntary instrument elaborated within the framework of the Code of Conduct for Responsible Fisheries, as an element of fisheries conservation and management. The objective of the IPOA is *“for States and regional fisheries organizations, to achieve worldwide preferably by 2003, but not later than 2005, an efficient, equitable and transparent management of fishing capacity”*. The IPOA further specifies that when confronted with an overcapacity problem (*“where capacity is undermining achievement of long-term sustainability outcomes”*), States and regional fisheries organizations (RFOs) should endeavor to limit to the present level and progressively reduce the fishing capacity applied to the fisheries affected. Otherwise, the IPOA calls for States and RFOs to exercise caution to avoid growth in capacity undermining long-term sustainability.

The IPOA implicitly defines fishing capacity in terms of fishing inputs (fleets) and establishes a definite linkage between excessive fleet size and wide-spread overfishing. As such, the IPOA clearly aims at achieving a balance between fleet size (inputs) and sustainable production (output), even if it does not explicitly mention the economic waste implied by an overexpansion of fleet size that may not lead to overfishing.

Management objectives are not stipulated in the IPOA, as the definition of such objectives is clearly a prerogative of States and RFOs. Management objectives can be set with explicit reference to resource sustainability, economic efficiency and precautionary principles. A minimum standard would be to achieve a long term balance between fishing inputs and MSY (or a related target catch level aimed at ensuring sustainable resource use). Even in this context, the IPOA would allow for increased economic efficiency in the form of avoiding redundant fleet expansion beyond the level of fleet capacity required to harvest MSY. While management measures required to manage fishing capacity are not really specified in the IPOA, balancing inputs and outputs clearly requires a direct or indirect control on both fleet size and harvesting capacity.

3. The management of fisheries and of fishing capacity

A fishery can be defined as set of interacting fish stocks and fishing units which can be managed to a large extent as a separate entity - with additional considerations to be given to relevant post harvest aspects. Obviously, the more interactions between stocks on the one hand and the more interactions (actual or potential) between stocks and fishing units on the other hand, the more difficult it will be to isolate and therefore define fisheries as management units. Once fisheries are defined, it is also rather obvious that fisheries management would generally prove much more difficult for multi-species multi-fleet fisheries, such as those of the Adriatic Sea. The definition of management units has been the object of much deliberation in the General Fisheries Commission for the Mediterranean (GFCM). Geographic management units have been adopted (GFCM, 2001) and there is on-going work on the determination of operational units as defined in GFCM (2000), essentially in reference to fleets or fleet segments operating within a geographical management unit). As shown in a study undertaken for the Adriatic (AdriaMed, 2001) much work remains to be done for the effective application of these concepts for fisheries management. Capacity management considerations should add perspective to this question.

Fisheries management involves, *inter alia*, four main types of measures:

- Measures aimed at **enhancing fish stocks**. Among these are measures such as the establishment of protected area (areas permanently or seasonally closed to fishing, e.g. nurseries), mesh size and other gear restrictions, the prohibition of detrimental fishing practices, closed seasons used to protect the stock at critical periods. These measures should essentially aim at preserving and enhancing the stock quite independently of its level of exploitation.
- Measures aimed at **managing effort allocation**, e.g. by limiting the fishing effort applied to a particular stock, when effort can be applied to various stocks. Among these are total catch quotas (TACs) and individual effort quotas. These measures should essentially aim at exerting control on the allocation of effort amongst alternative stocks (forcing effort to reallocate to less exploited stocks) or at restricting fishing on fluctuating stocks that are quite temporarily threatened.
- Measures aimed at **managing fleet configuration** in terms of vessel and gear size. Among these are zones that are reserved for certain fishing units (e.g. small scale fishing), limits imposed on vessel size (such as the limit imposed by some countries in the Mediterranean regarding the length and power of trawlers) and limits imposed on the number or size of gear. These measures are socio-economic in nature and should reflect policy choices, e.g. in terms of preserving small businesses, life style or employment in coastal communities. They imply broader benefits that are not always appreciated and may involve costs (in the form of foregone profits) for the fishing units for which access and/or inputs are restricted.
- Measures aimed at **managing fishing capacity**. These involve the direct or indirect management of fleet size. It could also involve measures aimed at further delimitating fisheries by limiting stock-fleet interactions (e.g. through restrictions imposed on vessels with respect to geographic mobility and the use of multiple gear). Fleet size can be managed in various ways: (a) directly through limited entry schemes applying to the sector and to specific fisheries, (b) indirectly through the economic incentive built into individual transferable quotas (ITQs) or exclusive territorial rights (e.g. concessions for the exploitation of sedentary species), and (c) similarly at collective level, through a duly organized and empowered community of fishers (individuals/enterprises/cooperatives). The buyback of vessels (to reduce excess fleet capacity) and taxation (to reduce the incentive for excessive buildup) may be considered as complementary instruments. Overall these measures should aim at balancing inputs and output at or around some agreed upon target level of exploitation.

All four types of measure will generally be required for proper management and they are actually applied to some extent for fisheries management in the Adriatic (AdriaMed, in prep.). As mentioned above, each category of measures has a clear objective and the four objectives are generally compatible. The management of fishing capacity should therefore be seen as an integral part of fisheries management. This means, *inter alia*, that all other

management measures will have to be assessed, or reassessed when introducing measures aimed at managing fishing capacity.

In practice things are not that simple. The management of fishing capacity is essentially about ensuring effective control of access to fisheries. As such, it is politically quite sensitive and in most countries decisions have been delayed long enough for the issue to become even more difficult to address.

Typically, in the early stage of fisheries development, overcapacity is not yet an issue. If overexploitation occurs as a result of excessive effort being applied to a fishery, the excessive effort can be pushed to other fisheries through reallocation measure, such as TACs. Introducing effective measures to manage access is easier at this stage, given the fact that fleet redeployment and some controlled access are still possible.

As fisheries mature, effort starts proving difficult to reallocate; fishing capacity (in the form of fishing effort that could be applied to one or alternative fisheries) become progressively too large for the range of opportunities that exists and start threatening many fisheries. This often occurs in a cascading manner (when a stock is overexploited and brought under effective management, significant fishing effort is transferred to the next most favorable stock, which itself faces progressive overexploitation, etc.). In other words excess capacity starts creeping into the sector. If steps have not been taken earlier, one is now confronted with the problem of introducing measures aimed at controlling capacity in the presence of overcapacity – with a harvesting industry that is often in financial trouble as a result.

A key issue in fisheries management is that, short of being able to introduce an effective control on fishing capacity, fisheries management authorities have started to blur the aim of the four types of measures presented earlier. In other words, measures that are not the most appropriate for that purpose have been used increasingly to constraint fishing capacity or to counteract its impacts irrespective of basic economic considerations. Not only did these fail for the most part, but these measures also contributed to make fisheries management an even greater challenge.

A basic example is the extensive use of TACs in the northern hemisphere, with TACs being used *de facto* not only to control the allocation of available fishing effort among stocks but also to restrict its overall level of use to counter the presence of overcapacity. When TAC limits are effective, this approach results in many fleets being under utilized (meaning added cost). It may also result in excess capacity in land based-facilities, e.g. when processing plants cater for specific fisheries that are closed for a significant part of the year.

Many other measures may be used this way: from limits on vessels and gear or fishing trips that are introduced essentially for the purpose of decreasing capacity; spawning-related seasonal closure that are progressively extended to a large part of the year; and spawning-related area closures that are also progressively extended, sometimes to become actual marine

reserves[‡]. The consequences of this approach are many. *Inter alia*, it implies additional economic waste (promotion of economic inefficiency); further delays addressing the management of fishing capacity; fisheries regulations that become difficult to comprehend; and poor compliance.

The above considerations on the use of some management measures should actually be accounted for when defining and measuring fishing capacity. For a given fishery, fishing capacity can be defined as the level of fishing inputs that can be applied by the fleet, **if fully utilized**, or the corresponding catch that can be produce for a given level of stock. An indicator of fishing inputs is required that may be quite simple (e.g. GRT or HP) or more complex (standard fishing days).

Full utilization is understood here as **normal but unrestricted** use, rather than maximum use. For example, if vessel capacity is expressed in terms of fishing effort, fishing capacity can be defined, for a given resource condition, as the amount of fishing effort (e.g. standard fishing days) that a fleet could produce over a period of time (e.g. a year) if the fleet is fully utilized, that is if effort and catch are not constrained by restrictive management measures.

A fishery has been defined earlier as set of interacting fish stocks and fishing units which can be managed to a large extent as a separate entity. Another important consideration for fisheries management is that the four types of management measures which were discussed earlier do not imply a common delimitation of fisheries. This is most relevant to the difficulty of assessing and managing fishing capacity. For example, measures aimed at preserving/enhancing stocks may involve a delimitation of fisheries that is largely based on stocks showing common characteristics and related ecosystem considerations. Measures aimed at controlling effort allocation may involve a definition limited to specific stocks and related fleets. Measures related to protecting a certain mode of production will essentially be based on fleet characteristics.

Measures aimed at managing fishing capacity imply a definition of fisheries that fully accounts for main stocks-fleets interactions. At this level, a major difficulty is that these interactions are themselves the result of policy decisions. In an unregulated fisheries sector, stocks/fleets interactions will be determined by biological, technical and financial characteristics. Regulations introduced to manage fisheries may increase such interactions, e.g. when fishing effort is pushed around through TACs and other seasonal restrictions on access to specific stocks, leading for example to the proliferation of multi-purpose fishing boats. Other regulations may limit interactions, e.g. restrictions imposed on geographic mobility and access to specific stocks through gear or landing restrictions.

These considerations imply that the management of fishing capacity would not only account for existing interactions (looking at ways to balance inputs and output in each so-delimited fishery) but that it is also quite likely to aim, at least initially, at controlling some of theses interactions and therefore at redefining fisheries as management units.

[‡] In the sense of marine reserve for fisheries management, as opposed to marine reserves aimed at protecting coastal environment and biodiversity.

4. The assessment of fishing capacity

The IPOA calls for States and RFOs to monitor and assess fishing capacity. It also calls for States to establish compatible national records of fishing vessels and to support the establishment by FAO of an international record of vessels operating on the high seas - awaiting the entry into force of the FAO Compliance Agreement (FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas).

The measurement and monitoring of excess fishing capacity is a complex endeavor. For a well-delimited **simple** fishery, assessing fishing capacity requires estimating:

- the level of physical fishing inputs, e.g. effort (E), that is actually applied in the fishery by the existing fleet (V); and the corresponding production (C) given present stock size (S) ;
- the level of physical fishing inputs (e.g. potential effort PE) that could be applied in the fishery if the existing fleet was fully utilized; and the corresponding production (PC) given present stock size;
- the short-term target level of physical fishing inputs (E*) that should be applied in the fishery to achieve a short term production objective C* (e.g. a TAC aimed to stock recovery towards a long term stock target S**); short term target fleet size V* can also be estimated on this basis assuming full utilization;
- the long-term target level of physical fishing inputs (PE**) and the corresponding fleet size (V**) that could be applied sustainably in the fishery to achieve a given long term production objective C**

Overall the assessment may show several situations:

- an undesirably low level of **capacity utilization** (sometimes referred to as **excess capacity**): if PE is significantly greater than E, reflecting the impact of direct or indirect limitations on fishing activity;
- signs of **overexploitation**: if E is significantly greater than E* and even more so if PE is also significantly greater than E;
- signs of **overcapacity**: if the existing fleet (V) is greater than what it should be in the long term (V**), or if the existing fleet V is significantly greater than what it should be in the short term (V*) with a low probability of fast stock recovery.

Assessing excess capacity thus requires: a relevant delimitation of the fisheries, the selection of fleet/input indicators, some information on the status of the stocks under consideration and the definition of target exploitation levels. A range of target levels (or reference points) have been discussed in the literature, in reference to biological, economic and social concerns, as well as in reference to precautionary principle and specific fisheries (Caddy and Mahon,

1995). Present methods of capacity assessment have been relatively empirical (FAO, 2000). These are usually sufficient to estimate grossly the magnitude of excess fishing capacity, even if applied research is still required for the development of more appropriate monitoring and assessment tools.

In simple fisheries a quantitative assessment can explicitly account for the existing and potential interaction between inputs (fleet and effort) and a stock. In multi-fleet multi-species fisheries such an assessment may prove difficult to conduct (especially because the relationship between potential effort and potential catch become quite intractable). In this case, and for the case of Adriatic fisheries in general, it may be preferable to look somewhat separately at fleet and stocks.

A simple step-by-step approach combining specific investigations and expert opinion can indeed be used as follows:

1. Select two reference years (RYs) for which vessel, catch, and catch rate data are available: one being representative of the present situation (e.g. underutilization in many fleet segments and/or many stocks show signs of overexploitation) and one that is representative of a situation judged in line with more sustainable outcome (fair level of utilization, most stocks in relatively healthy condition).
2. Assess present level of utilization in selected segment of the fleet (e.g. through case studies) and its likely evolution between RYs (e.g. through interviews);
3. Estimate fleet size (e.g. in GRT or HP) for RYs, if possible by main fleet segments and its likely evolution between RYs;
4. Assess the impact of technological change over time, so as to be able to compare the relative efficiency of the indicator of fleet size in both RYs;
5. Assess the status of exploitation of main stocks for both RYs (using results of stock assessment work) as well as complementary indicators such as revenue per vessel (e.g. value of catch in RYs using a constant base-price for all species);
6. Use all available information to estimate the required decrease in fishing effort by stock or groups of stocks (in reference to agreed upon reference points);
7. Use all available information to estimate the required decrease in fishing capacity, in general and when possible in reference to major fleet segments.

An important challenge to the monitoring and assessment of fishing capacity is the lack of fleet data. But even if fleet data are available, a significant departure from present monitoring procedures is required for the purpose of assessing and managing fishing capacity.

Typically, most countries still monitor inputs and outputs in a rather disjointed manner. For example, inputs and outputs may be monitored as follows:

- A record of vessels (register) is established at national level with vessel data that may include the physical characteristics of the vessel (length, tonnage, HP, etc.) as well as information such as year built, year of first operation in the area/fishery, port of operation;
- Key economic indicators, including vessel cost, crew size, annual catch and revenue could also be gathered for each vessel;

- Complementary landing and marketing data are obtained, generally at port level;
- Catch-effort data are gathered selectively for the purpose of stock assessment, to complement the direct monitoring of stock conditions.

This approach does not easily allow for the assessment of fleets-stocks interactions and for the management of fleet capacity in general. A more precise knowledge of fleet dynamics would be required for the management of fishing capacity and for fisheries management in general.

In addition to monitoring the physical characteristics of vessels through an appropriate register, **fleet assessment** would involve looking in particular at the dynamics of fleets in terms of: (i) inter-year fleet adjustments: investment-disinvestment by fleet segment; improvement of technology and harvesting efficiency; capacity utilization; pattern of gear use; pattern in targeting specific stocks or groups of stocks; and (ii) within year fleet deployment: allocation of fishing inputs (vessels, gear and effort) in time and space, and especially among fisheries[§].

As such, fleet assessment should be considered to be as important as stock assessment. We are very far from this situation, even though both types of assessment are essential. Enhanced fleet monitoring and assessment capabilities should be developed not only at national level, but at regional and global levels, with due emphasis being given to creating appropriate fleet records and to addressing the issue of fleet mobility.

5. Capacity management methods

The management of fleet capacity involves the control of fleet size, with due consideration being given to the level of capacity utilization (Cunningham and Gréboval, 2001). Basically this can be done only in two ways: through central command mechanisms and through a mixed system of central command and economic incentives. Capacity management methods may indeed be classified in two groups: (i) those which attempt to block the incentive of open-access which leads fishers to race for fish and to overextend their investment *-incentive blocking methods*; and (ii) those aiming at changing the incentive system itself *-incentive adjusting methods* (Gréboval and Munro, 1999).

A central command approach will rely essentially on **limited entry schemes**. In this context the central authority decides on the number of vessels that will be authorized to fish. Licenses will usually be given to a specific vessel for use in relation to one or several specific gears. Attached to the license may be restrictions on the area in which the fishing unit can operate as well as restrictions on the transfer of the license to another vessel. Limited entry schemes are generally implemented in connection with other management measures such as those aimed at effort allocation.

The efficiency of this method has often been limited in the past by the conditions under which it has been implemented, such as: introduction of such schemes in already mature or

[§] When catch-effort data are gathered systematically for all vessels (or a representative sample), data can actually be used both for stock assessment (data processing based on the catch of selected species) and for fleet assessment (data processing based on vessel operation of selected fleet segments).

overexploited fisheries with rather unrestrictive conditions for initial license allocation; insufficient attention paid to input substitution possibilities; insufficient account taken of gains in productivity resulting from technological improvements; and, too often, implementation against a sectoral policy background of laissez-faire, subsidization and of prompt compromise on socially or politically sensitive aspects.

It is felt that when these issues are carefully addressed, license limitation schemes can prove relatively effective in managing fishing capacity. In this context, one may stress nevertheless the need to address carefully input substitution and the impact of technological development on fishing capacity. Interestingly enough, license limitation may take many of the attributes of incentive adjusting schemes. This is the case, for example, whenever the implementation of license schemes purposely leads fishermen to coalesce, rather than compete. Examples exist of fishers' organizations buying back vessels or temporarily limiting the utilization of the fleet (to help a stock recover or to manage the capacity applied to highly fluctuating stocks).

The indirect control of fleet size at individual (firm/enterprise) level can be achieved through the economic incentive built into **individual transferable quotas** (ITQs), with each individual deciding how to optimally harvest his quota. In principle it can be expected that the level of capacity used will be optimal, at least in the long term. A similar case can be made for **exclusive territorial rights** (e.g. concessions for the exploitation of sedentary species), under the assumption that the sole owner will face similar incentives. Both measures are of course applicable only under certain conditions.

The direct or indirect control of fleet size can be exercised similarly at collective level, through some form of **co-management** involving small-scale fishing communities or specific segments of the fishing industry. At collective level, the control of fleet size can be exercised (a) on a territorial basis, e.g. through a port-based fishermen organization managing the fleet within a given capacity quota and related limitations; (b) on a fleet basis, e.g. through an organization of trawl fishermen managing the fleet within similar constraints; or (c) on a stock basis, e.g. through a fishermen organization representing the fleet which exploits a particular stock within a given catch quota. The three approaches are not necessarily exclusive, e.g. approach (a) and (c) can be used simultaneously. It should also be noted that if applied by itself, approach (c) will only have an indirect impact on capacity if used in a rather specialized fishery or if all major fisheries can be managed through quotas. In all cases, co-management can only be exercised by a duly organized community of fishers (individuals/enterprises/cooperatives), duly empowered and receiving support and overall guidance (e.g. setting quotas) from the central fisheries management authority.

For co-management to be effective in this context, schemes must therefore imply a certain degree of empowerment, exclusivity and collective cohesion. Schemes must also specify clearly the respective role and responsibilities (i) of the central fisheries management agency, in particular regarding the way overall limits are set and adhered to; and (ii) of the fishermen organizations and (iii) of the fishers involved in collective action.

The management of capacity does require the adoption of policies which clearly specify access conditions. Rent extraction through the imposition of royalties has also been proposed as a means of controlling capacity. It remains difficult to apply, especially when entry

conditions are such that profitability is very much reduced. Nevertheless it can still prove an interesting tool for capacity management, e.g. in the case of a co-managed fishery as a way to finance effective management. While much experience has been gained over the years in the application of limited entry and ITQ schemes, other schemes based on territorial rights and co-management are less commonly used and still insufficiently researched.

Overall, the elaboration and implementation of more appropriate management schemes require that extensive consultation with stakeholders be promoted so as to ensure maximum consensus on capacity management among various user groups. Indeed, the available methods for controlling fishing capacity imply strictly controlled and rather exclusive access and a direct or indirect control of both inputs and output. Getting around such controls might involve, *inter alia*, under-reporting of catch and/or fishing inputs, illegal fishing practices, and the partial reallocation of fleet capacity to other fisheries. There are a number of steps that can be taken to avoid undesirable reactions to management, such as:

- adopting improved monitoring, control and surveillance (MCS) methods, such as vessel monitoring systems (VMS);
- opting for capacity management methods that do provide a real incentive for long term sustainability;
- promoting enhanced industry participation in each management scheme, eventually aiming at the co-management of specific fisheries;
- establishing clearer responsibilities and answerability in the management of any fishery; and
- ensuring a greater compatibility between the management of fishing capacity, the management of fisheries and the management of the industry as a whole.

6. Fleet reduction programmes

The reduction of excess capacity implies disposal of vessels and the layoff of fishers. Within areas under national jurisdiction, capacity which cannot be re-allocated to underused resources would have to be left to depreciate, to be scrapped or exported. Obviously, in countries where re-allocation possibilities have been exhausted, capacity adjustment is a rather difficult and sensitive task. Capital depreciation would generally involve too slow a joint process of capital reduction and fish stock rebuilding. Thus some induced capital reduction would generally be called for, with specific accompanying measures for labor reduction, when required.

Incentive adjusting schemes involving property rights, such as ITQs, do provide strong incentive for capacity adjustment but not necessarily for the permanent disposal of redundant vessels. In this context some form of buybacks may speed up or facilitate the adjustment process. Incentive blocking schemes, such as license limitation, do not provide such incentive and buyback schemes may be used to reduce fleet size. However buyback programmes may not be very efficient when implemented within such management frameworks. For example, the buyback of older boats can be more than compensated in terms of fishing capacity by the 'creeping' net increase in capacity which may occur in the process of subsequent fleet modernization. In other words, license limitation has to be very tight for buybacks to be

efficient. As noted by Holland et al. (1999), there are also other reasons why caution should be exercised when designing and implementing any buyback programmes.

Under rights-based management schemes, the internalization of the potential rent** should make it possible for the industry and the management authority to find arrangements to finance buyback schemes. Cost sharing mechanisms to undertake vessel reallocation or scrapping should preferably be negotiated when introducing schemes aiming at effectively controlling capacity. In any case both sides would need to be convinced that capacity will be controlled effectively, meaning that potential rent really will be transformed into actual rent.

If the industry may be expected to participate in the cost of downward capacity adjustments, it is also likely that capacity reduction schemes would involve significant subsidies. A trend in this direction is already observed. These subsidies could be considered as subsidies to the 'resource' and its sustainability. But if these subsidies failed to have a lasting impact on fishing capacity, these would amount to subsidies to the harvesting industry.

A related problem is that of vessel disposal. Short of scrapping vessels that are considered redundant from a national perspective, capacity reduction schemes may induce transfer to the high seas (e.g. outside the Adriatic Sea) or to the EEZs of other nations. The transfer of excess capacity to the EEZs of other nations may be undertaken through private sales of used vessels or in the context of international access agreements. Regarding such transfers, the IPOA only calls for States to ensure that no transfer of capacity to the jurisdiction of another State should be carried out without the express consent and authorization of that State.

This may seem insufficient in view of the impact that capacity reallocation could have on the management of capacity in developing countries. Developing countries have benefited from the possibility of acquiring cheap second-hand vessels originating from efforts aimed at reducing harvesting capacity or from fleet modernization schemes undertaken in developed countries. But the massive disposal of generally subsidized used vessels also had negative impacts in these countries: distorting input prices; exacerbating conflicts with the small-scale sector; and precipitating the rapid build-up of excessive capacity in many fisheries. The transfer of excess capacity may also take place in the context of international access agreements. While access agreements are negotiated among sovereign States, one notes, however, that such transfers are often subsidized and may involve developing countries that could be induced to compromise easily between immediate returns and long-term resource sustainability. A code of good practice may be required to ensure more cautious transfers and to facilitate the negotiation of more appropriate access agreements (WWF, 1999).

** In fisheries, the resource rent can be defined as the net benefits that can be derived from limiting exploitation at a certain level. In financial terms (the view point of the fishing firm), it takes the form of above normal profits (over the 'normal' profits that could have been expected from similar, relatively risky, investment). Under open access, the rent is typically dissipated (any above normal profits being an incitation for more investment and therefore a greater level of exploitation. Under rights-based management (including limited entry if transferable licenses have been effectively introduced) the rent that could be produced in the future is internalized, as expressed by the value of the ITQ or of the licence. The rent can be left entirely to the industry or shared with the rest of society in the form of royalties or of participation to management cost.

The transfer of excess capacity to the high seas will be easier as it does not involve negotiating international agreements. The IPOA recalled the duties of flag States to avoid approving such a transfer to areas where it would be inconsistent with responsible fishing under the Code of Conduct. Furthermore, in recognition of any eventual change of flag, the IPOA also stressed in Article 20 the need to deal with the problem of States which do not fulfill their responsibilities as flag States.

Appropriate capacity reduction is central to the successful implementation of the IPOA. Poor implementation in terms of non-lasting reduction and undesirable transfer may actually aggravate the overcapacity problem and contribute to illegal, unregulated and unreported (IUU) fishing. A major challenge is for States to ensure that reduction schemes be promoted only when effective control of capacity has been duly achieved. Another is for States to control the export or transfer of capacity outside their jurisdiction and to adopt mechanisms that would selectively prevent any transfers to fisheries and areas recognized as significantly overfished.

7. High seas fisheries

Given that GFCM members have not declared an EEZ for the Mediterranean, a significant portion of the fishing activity takes place in high seas. However, with the noticeable exception of the tuna fleet, most fishing fleets show limited geographic mobility. This allows for the fisheries of many of geographic management units adopted by the GFCM (GFCM, 2001) to be managed to a large extent on a national basis (e.g. in geographic units such as the Gulf of Lions or the South and Central Tyrrhenian Sea). The case of the two geographic management units of the Adriatic is different in the sense that it involves a significantly greater interaction between national fleets. The need for extensive international cooperation is therefore more important in terms of dealing with fisheries based on shared and straddling stocks. The following remarks are rather general and some pertain in particular to tuna fisheries.

The management of fishing capacity in the high seas does remain a challenge under existing international law. The IPOA urges States to participate in international agreements which relate to the management of fishing capacity and in particular the FAO Compliance Agreement and the 1995 UN Fish Stocks Agreement. It also calls for various measures which would strengthen international collaboration and the role of regional fisheries organizations vis à vis the management of shared stocks and high seas fisheries.

High seas fisheries may be confronted with an even greater overcapitalization problem than EEZ fisheries. This stems from the prevalence of rather open-access conditions, with coastal countries fishing increasingly in adjacent high seas areas, and from the fact that there are at present no internationally agreed measures to oblige States to control fishing capacity. Within the present legal framework of the high seas, contained in the 1982 UN Convention on the Law of the Sea, the management of capacity is very much subsumed within a catch quota system, with the regional fishery organizations administering quotas being largely unable to

limit access by vessels of participating States and to deny access to vessels from non-participating States.

The 1995 UN Fish Stocks Agreement does not specifically include provisions for reducing fleet capacity. However, it tightens the obligations of flag States to adhere to conservation and management measures imposed by regional fishery organizations and allows these organizations to monitor fleet capacity and deployment better, and to adjust limit reference points in order to account for fishing capacity considerations. Furthermore The FAO Compliance Agreement provides a mechanism for collating fleet information at global level and a basic tool for compliance and enforcement of authorizations. The IPOA recalled that improved management of the high seas requires first and foremost the urgent ratification of these agreements.

The IPOA also recommends, *inter alia*, that States:

- take steps to manage the fishing capacity of their vessels involved in high seas fisheries and cooperate as appropriate with other States in reducing the fishing capacity applied to overfished fisheries;
- recognize the need to deal with the problem of those States which do not fulfill their responsibilities under international law as flag States with respect to their fishing vessels, and in particular those which do not effectively exercise their jurisdiction and control over vessels which operate in a manner that contravenes or undermines international law and international conservation and management measures;
- support multilateral cooperation to ensure that these flag States contribute to regional efforts to manage fishing capacity;
- ensure that no transfer of capacity to the jurisdiction of another State be carried out without the express consent and formal authorization of that State; and
- avoid approving the transfer of vessels carrying their flag to high seas areas where such transfers are inconsistent with responsible fishing under the Code of Conduct.

More specific measures need to be adopted at national, international and global levels to ensure active implementation of these rather general principles. In relation to the management of fleet capacity, this may involve, *inter alia*, defining more specific conditions for: entry and participation in the fishery sector and specific fisheries; the implementation of fleet reduction programmes; access to high seas fisheries by flag vessels. Further steps may be required in the strengthening and empowerment of regional fishery organizations, the creation of new organizations to ensure full coverage of the resources concerned, and in encouraging non-members to become member of such organizations.

8. Factors of unsustainability

The IPOA recognizes that several factors do contribute to overcapacity and unsustainable exploitation of fisheries resources. In the elaboration of national plans, the IPOA urges States to assess, reduce and progressively eliminate all factors, including subsidies and economic incentives, contributing directly or indirectly to the build-up of excessive capacity. A complementary recommendation called for FAO to assist with: *a further analysis aimed at*

identifying factors contributing to overcapacity such as, inter alia, lack of input and output control, unsustainable fishery management methods and subsidies which contribute to overcapacity.

Some of these factors relate to the resilient prevalence of open access conditions, in spite of management efforts deployed to limit harvesting behavior. The lack of appropriate conditions for entry and participation, linked to the direct or indirect control of both inputs and output would thus appear to be the principal factor of unsustainability and overcapacity. Other factors appear to be secondary.

Among these factors is the difficulty of implementing fishery-specific management schemes, even if theoretically appropriate. This is especially the case when the incentive to circumvent regulations remains strong and if industry involvement remains ineffective. The present inefficiency of many MCS systems is another factor which may be addressed, directly or by adopting fishery management schemes that are more efficient in terms of incentive and industry participation. The growing imbalance between the demand and the necessarily limited supply of fish, as well as other factors affecting inputs and outputs prices may also play an important role in promoting undesired capacity expansion and unsustainability.

One such factor is the use of subsidies and other economic and fiscal incentives which have a direct bearing on fishing capacity. There is no doubt that heavy subsidization contributed substantially to the rapid and often excessive growth of the fishing fleets in the 1970s and 1980s. Although this remains insufficiently documented, subsidization programmes appear to have been significantly reduced in many countries since the late 1980s. The IPOA recommended that States endeavor to reduce and progressively eliminate subsidies that directly or indirectly promote overcapacity. Work is presently underway in FAO, in collaboration with WTO, to address this issue further by identifying the types of subsidies that contribute either to overcapacity and unsustainability or to trade distortion. This suggests that subsidies, when required in a fishery or sectoral development context, could be shifted from conventional capital to the promotion of resource conservation, human skills and institutional development. As pointed out before, it is likely that subsidies will be used increasingly to reallocate or reduce fishing capacity. Experiences in this area tend to indicate that insufficient caution is usually exercised regarding the conditions under which such schemes are implemented.

9. Conclusions

The adoption of the IPOA on the Management of Fishing Capacity is symptomatic of a radical evolution by which key elements of fisheries governance are being addressed at international and global levels, in reference to the guiding principles of the FAO Code of Conduct for Responsible Fisheries. The strengthening of fisheries governance is indeed increasingly recognized by Nations as a basic requirement for the sustainable and responsible use of fishery resources. The adoption of the IPOA is also a strong sign that increasing attention is paid to the economics of fisheries and that related policies issues are being consequently reassessed.

The management of fishing capacity raises a key issue: that of the joint control of fishing inputs and outputs - independently of which component is selected will be the prominent control variable. Excess capacity is indeed the symptom of an underlying limitation of 'conventional' fisheries management. The management of fishing capacity can only point to new avenues which directly address the conditions of entry and participation in fisheries. These are likely to be based on two emerging and related notions, that of right-based management schemes and that of active industry participation. Meanwhile related issues pertaining in particular to the reduction of fishing capacity (transition strategies) and fleet mobility will remain areas of specific concern. Applied research is much needed in these areas.

The management of fishing capacity may also benefit from: the adoption of more specific conditions for access to high seas fisheries by flag vessels; the strengthening and empowerment of regional fishery organizations; the creation of new organizations to ensure full coverage of the resources concerned; strengthened mechanisms to encourage non-members to become member of such organizations; and more effective donor support to the implementation of the IPOA and similar international agreements by developing countries.

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