

Chapter 11.

Review of fisheries management performance since 1990

Mexico's wild capture fisheries were, in general, in relatively poor condition at the start of the 1990s. A strong government emphasis at the time on the industrialisation of Mexico's fisheries was not accompanied by suitable management policies to ensure sustainable exploitation of fisheries resources. As a result, the start of the 1990s saw the sector characterised by:

- Over-capitalisation and excess fishing effort which had been assisted by government subsidies for fishers and minimum controls on fishing effort.
- Uncontrolled expansion in the small-scale and artisanal sector as rural policies and subsidies attracted people to coastal regions with the numbers of fishers increasing by 75% in the decade prior to 1992.
- Declining catch rates in many fisheries and resource stocks under pressure due to the *de facto* open access regimes in place and the limited incentives to conserve the resource.
- Poor profitability across the sector as a result of inefficient economic operating conditions, exacerbated by the strong role played by the cooperatives which effectively stifled efficiency and masked price signals.
- Considerable uncertainty regarding access rights for fishers in the sector, compounded by the dominant role of the cooperatives.

As discussed in Chapter 10, there have been several changes in policy direction since that period with increasing emphasis on resource sustainability as well as industry development. Today, CONAPESCA has the responsibility for setting management measures, monitoring compliance with the measures, evaluating the success of the management, and proposing alternative strategies. This chapter reviews the effectiveness of fisheries management since 1990. This is done with reference to the types of management instruments that are used in wild capture fisheries, the current status of the key fish stocks, changes in stock status in recent years, and the enforcement of regulations. Key issues that are addressed are measures to control fishing effort (particularly with respect to the artisanal fleet), stock recovery planning, fisheries management plans, the choice of management instruments, and the adequacy of stock assessment and socio-economic analysis.

Management instruments

Fisheries regulations are based on three main components: the enacted Fisheries Law; the Federal government plans for fisheries and aquaculture; and the Mexican Official Standards (NOMs). The last of these, the NOMs, specify the management measures to be followed in each fishery for which a NOM has been issued. These regulations are agreed upon by the social, private, and public sectors, and are published in the Government's Official Diary. Once a NOM is published in the Official Diary, there is a 60-day period for comments by any stakeholder who has observations or remarks on the text. The promulgation of the NOMs is the central mechanism for regulating fishers' actions and the pace of the development of NOMs has increased in recent years. The main advantages of the NOM system are the legal force they provide to the regulations and the consultative nature of their development. The key disadvantage is that they are not particularly flexible and the process of modifying them is lengthy and cumbersome. For this reason, the role of the National Fisheries Chart (CNP) as a means of regularly updating management settings is essential. The CNP is updated annually and has some legal force in terms of defining fishing effort, catch limits, season closing dates and so on. Such flexibility is essential in order to be able to respond to changing environmental and economic circumstances.

In general, fisheries management measures used in Mexico consist of: technical measures governing the types of gear used, size limits and bycatch technologies; input controls relating to allowable effort, area closures, and season closures; and output controls in the form of catch limits and quotas. Table 11.1 summarises the main management instruments used in the fisheries for which NOMs have been issued, including the inland fisheries. The main mechanism for applying these measures is the system of permits. These are licences to fish a given resource at a given place and are valid for between one and four years. Permits are transferable in principle under the legislation but a system for allowing transfer has not been formally introduced. There is a degree of informal transfer among fishers, generally including in exchange for money, but the extent of this is unknown. A system of concessions is also in place. These are longer term than permits and may be issued for up to 20 years. A number of concessions have been issued in the tuna, sardine and anchovy fisheries, as well as for some area-based fisheries such as abalone and coastal lagoons. The latter set of concessions has usually been issued to cooperatives in the artisanal sector. Concessions are transferable with the permission of CONAPESCA, but the extent of such transfer is unknown. No concessions have been issued for the past decade.

Specified measures which may be comprised in the NOM are either permanent or open-ended. For example, once agreed, mesh sizes, legal sizes, or permanent closures are rather difficult to modify. In contrast, annual quotas and closure dates for certain fisheries are revised every fishing season in response to stock assessments performed by the federal government through INP.

In the case of tuna, Mexico follows the catch limits and management regulations recommended by the regional fisheries management organisations governing tuna resources in the Pacific and Atlantic coasts (ICCAT and the IATTC). Mexico actively participates in the meetings of these organisations. Furthermore, Mexico is part of the Inter-Government Agreement for Dolphin Conservation for reducing the incidental catch

of dolphins in the Eastern Pacific. This agreement has had considerable success in reducing dolphin mortality through the use of technical measures and gear changes.

The key point from Table 11.1 is the predominance of input controls as the main means of regulating fisheries. These focus on effort limits and season and area closures, all of which are widely used. These are generally supplemented by technical measures relating to gear type, mesh size and so on. Catch limits are used in inland fisheries and for recreational fisheries where they consist primarily of bag limits. Quotas are used for some shellfish species, including abalone and some species of clams. The use of management measures based on economic instruments has not been tried in Mexico to date, either in relation to output controls (such as individual transferable quotas) or input controls (for example, transferable effort quotas).

The general range of management instruments presented in Table 11.1 is complemented in some cases by additional management measures outside the system of NOMs. These relate to the use of community based management in some of the small-scale fisheries around the coast. These are supplementary to the use of effort limits, area closure and season closure and have been developed and implemented on a case-by-case basis, usually at the initiative of the local fishers through their co-operatives. Such management arrangements tend to be used for sedentary species such as lobster, oyster, and mussels. For example, the case of the Baja California red rock lobster has been cited earlier. These arrangements sometimes start out as informal agreements amongst groups of fishers that are later formalised or at least recognised by authorities.

Status of major stocks

The INP undertook stock assessments for 54 marine fisheries in 2004. Of these, 34 are fully exploited (63%), 11 are over-exploited (20%) and nine are under-exploited (17%) (Table I.2). There are no collapsed stocks. The management advice from this assessment is clear: no increase of fishing effort should be allowed. Moreover, recovery plans including effort reduction should be implemented for the over-exploited stocks as a priority. Among the most threatened stocks are: abalone, certain shrimp species in both the Pacific and Gulf of Mexico coasts, sea urchin, grouper and Caribbean lobster. A common feature of these stocks is that they are high-value, sedentary species, a combination which makes them very vulnerable to overexploitation. Several stocks, however, have potential for development: Atlantic tunas, giant squid, common octopus in Yucatan peninsula, and seaweeds although care should be exercised in any expansion of effort.

Table 11.3 provides a summary of the changes of the stock status between 2000 and 2004 for those stocks for which assessments were undertaken in both years. As the CNP was only introduced in 2000, and still clearly evolving, such a short time span between stock assessments clearly does not provide the long term changes in stock status that is often necessary to see significant changes in response to management measures. Nevertheless, the comparison serves to highlight progress in management of key stocks and identify course corrections required.

Overall, the change in stock status for the assessed stocks between 2000 and 2004 has been marginal. Of the stocks surveyed in this report, two overexploited stocks recovered to sustainable levels (blue shrimp in Sonora, lobster in Yucatan) while four stocks deteriorated to being overexploited (brown shrimp in Sinaloa-Nayarit, lobster stocks in the northern and southern areas of the Baja California Peninsula, red sea urchin in the Pacific, Queen Conch on the Banco Chinchorro). Given that the recovery of fish stocks is generally a long term process, it is not unexpected that there is little change over the four year period examined. However, there remains considerable benefit in undertaking annual reviews of stock assessment data, particularly in relation to fishery recruitment and fishing mortality in the different age cohorts.

The management advice from the CNP is unambiguous for most stocks: further efforts are clearly required to reduce the number of overexploited stocks and reduce fishing pressure on the large number of stocks that are currently fully exploited (Table 11.3). However, for a few species, the CNP states that an increase in effort can be contemplated, but only at a cautious rate and with regular reviews to determine impacts on stock status. As a result, it is unlikely that large increases in Mexico's wild capture production will be seen in the future and total catches are likely to oscillate around the 1.5 million tonnes level of the last few years.

In relation to efforts to reduce bycatch, there has been marked success in some fisheries. This has been particularly evident in the Pacific tuna fisheries where there has been a 99% decline in the number of dolphins caught per set between 1986 and 2003 through the use of selective fishing practices and technologies. The rapid and proactive introduction of turtle-excluder devices in the shrimp fisheries ensured that Mexico was not drawn into lengthy trade disputes, as was the case with the dolphin-tuna issue, and was able to maintain production and exports of this high value species. In other fisheries, bycatch reduction measures are gradually being introduced, although more remains to be done.

The status of inland fisheries remains a concern. The constant increase in fishing effort in river basins, coastal lagoons and protected areas is a direct consequence of the growth in the working age population who have few employment alternatives in communities bordering inland water zones. The river fishers tend to concentrate on the more profitable species, which permanently increases the fishing effort brought to bear on those resources. Addressing the inland fisheries issues should be a priority but will require the involvement of other policy areas, particularly with respect to rural development.

Table 11.1. Summary of fisheries management measures in Mexico^a

| Name | Location | Reference | Input controls | | | Output controls | | Technical measures | | |
|------------------|---|--------------------------------------|----------------|-----------------|---------------|-----------------|-------------|---------------------|--------------------------|----------------------------|
| | | | Effort limits | Season closures | Area closures | Quota limits | Size limits | Gear specifications | Turtle excluding devices | By-catch excluding devices |
| Abalone | Baja California Peninsula | NOM-005-1993 | X | | X | X | | X | | |
| Clam | Baja California and Baja California South | NOM-004-PESC-1993 | X | | | | | X | | |
| Crab | Pacific Ocean, including the Gulf of California | NOM-039-PESC-2003 | X | | | | | X | | |
| Lobster/Crawfish | Gulf of Mexico, Caribbean Sea, Pacific Ocean including the Gulf of California | NOM-006-PESC-1993 (modified in 1998) | X | | | | | X | | |
| Mullet | Gulf of Mexico, Caribbean Sea, Pacific Ocean including the Gulf of California | NOM-016-PESC-1994 | X | X | | | | X | | |
| Octopus | Gulf of Mexico, Caribbean Sea | NOM-008-PESC-1993 | | X | | | | X | | |
| Oyster | All coastal lagoons and estuaries | NOM-015-PESC-1994 | | | | X | | X | | |
| Red Sea Urchin | West Coast of the Pacific Ocean (the State of Baja California) | NOM-007-PESC-1993 | X | | | | | X | | |

a. Includes measures under NOMs as well as measures recommended by INP.

| Name | Location | Reference | Input controls | | | Output controls | | Technical measures | | | |
|--|--|--|----------------|-----------------|---------------|-----------------|-------------|---------------------|--------------------------|----------------------------|--|
| | | | Effort limits | Season closures | Area closures | Quota limits | Size limits | Gear specifications | Turtle excluding devices | By-catch excluding devices | |
| Sardine, anchovy, mackerel | Pacific Ocean including the Gulf of California | NOM-003-PESC-1993 | X | X | X | | X | X | | | |
| Shrimp | United States of Mexico | NOM-002-PESC-1993 (modified in 1997) NOM-EM-007-PESC-2004 | X | X | | | X | X | X | X | |
| Top shell/ Sea-shell | Campeche, Quintana Roo and Yucatan | NOM-013-PESC-1994 | X | | | | X | X | | | |
| Tuna | Pacific, Gulf of Mexico, Caribbean sea | NOM-023-PESC-1996 | X | | | X | X | X | | | |
| Inland fisheries at the "José López Portillo" area | Nuevo Leon | NOM-031-PESC-2000 | X | X | X | X | X | X | | | |
| Inland fisheries at "Aguamilpa" area | Nayarit | NOM-026-1999 | X | X | X | X | X | X | | | |
| Inland fisheries at "Cuchillo-Solidaridad" area | Nuevo Leon | NOM-001-PESC-1994 | | X | | | | X | | | |
| Inland fisheries at "José S. Noriega" area | Nuevo Leon | NOM-035-PESC-2004 | X | X | X | X | X | X | | | |

| Name | Location | Reference | Input controls | | | Output controls | | Technical measures | | |
|--|--------------------------------|-------------------|----------------|-----------------|---------------|-----------------|-------------|---------------------|--------------------------|----------------------------|
| | | | Effort limits | Season closures | Area closures | Quota limits | Size limits | Gear specifications | Turtle excluding devices | By-catch excluding devices |
| Inland fisheries at "Luis Donaldo Colosio Murrieta" area. | Sinaloa, Sonora, and Chihuahua | NOM-025-PESC-1999 | X | X | X | X | | | X | |
| Inland fisheries at "El Infiernillo" area. | Michoacan and Guerrero | NOM-027-PESC-2000 | X | X | X | X | X | X | | |
| Inland fisheries at the "Lake of Chapala" . | Jalisco, Michoacan | NOM-032-PESC-2003 | X | X | X | X | X | X | | |
| Inland fisheries at "Emilio Portes Gil" area | Tamaulipas | NOM-034-PESC-2003 | X | X | | X | X | X | | |
| Inland fisheries at "Ing. Fernando Hirriart Balderrama" area. | Hidalgo and Querétaro | NOM-028-PESC-2000 | X | X | X | X | X | X | | |
| Inland fisheries at the "Champayan Lagunar System and River Tamesi". | Tamaulipas | NOM-033-PESC-2003 | X | X | | X | X | X | | |
| Inland fisheries at "Vicente Guerrero" area, its leeway and principal canal. | Tamaulipas | NOM-024-PESC-1999 | X | X | | X | X | X | | |

| Name | Location | Reference | Input controls | | | Output controls | | Technical measures | | | |
|---|-------------------------|-------------------|----------------|-----------------|---------------|-----------------|-------------|---------------------|--------------------------|----------------------------|--|
| | | | Effort limits | Season closures | Area closures | Quota limits | Size limits | Gear specifications | Turtle excluding devices | By-catch excluding devices | |
| Inland fisheries at "Falcon" area. | Tamaulipas | NOM-042-PESC-2003 | X | X | X | X | X | X | | | |
| Inland fisheries at "Marte R. Gomez" area | Tamaulipas | NOM-043-PESC-2003 | X | X | X | X | X | X | | | |
| Inland fisheries at La Amistad" area | Coahuila | NOM-046-PESC-2005 | X | X | X | X | X | X | | | |
| Inland fisheries at Tecocomulco Lake. | Hidalgo | NOM-050-PESC-2004 | X | X | X | X | X | X | | | |
| Season and area closures | United States of Mexico | NOM-009-1993 | | X | X | | | | | | |
| Recreational fisheries | United States of Mexico | NOM-017-PESC-1994 | X | | X | X | | X | | | |

Source: Adapted from Hernandez and Kempton (2003) and updated by OECD.

Table 11.2. Overview of marine fisheries according to fish stock assessments results in 2004^a

| Species | Under exploited | Fully exploited | Over-exploited | Main management measures |
|---|-----------------|-----------------|----------------|---|
| Gulf of Mexico and Caribbean Sea | | | | |
| Tuna | 1 | 0 | 0 | Fishing gears specification |
| Shrimps | 1 | 1 | 1 | Fishing gears specification, closure, area closures |
| Crab | 0 | 1 | 0 | None |
| Queen conch | 0 | 0 | 1 | Fishing gears specification, minimum size, quota |
| Blue crab | 1 | 1 | 1 | Minimum size |
| Spiny Lobster | 0 | 1 | 1 | Closure, minimum size |
| Other fishes | 2 | 7 | 1 | Closures, minimum size |
| Grouper | 0 | 0 | 1 | Fishing gears specification, area closures |
| Octopus | 1 | 1 | 0 | Fishing gears specification, minimum size |
| Sharks | 0 | 1 | 0 | Fishing gears specification, closures |
| Total | 6 | 13 | 6 | |
| Pacific Ocean | | | | |
| Abalone | 0 | 0 | 1 | Quota, closure, minimum size |
| Gelidium seaweeds | 0 | 1 | 0 | Fishing gears specification, area closures |
| Clams | 0 | 1 | 0 | Quota, closure, minimum size |
| Yellowfin tuna | 0 | 1 | 0 | Fishing gears specification, closed season, effort limits |
| Giant squid | 1 | 0 | 0 | Permit limit |
| Shrimps | 0 | 1 | 1 | Fishing gears specification, closure, area closures |
| Crab | 0 | 1 | 0 | Fishing gears specification, minimum size |
| Conch | 0 | 1 | 0 | Quota |
| Sea urchin | 0 | 0 | 1 | Fishing gears specification, quota, area closures |
| Blue crab | 1 | 1 | 0 | Closure, area closures |
| Rock lobster | 0 | 1 | 0 | Closure, minimum size |
| Mussels | 0 | 1 | 0 | Minimum size |
| Other fishes | 0 | 8 | 2 | Closures, minimum sizes |
| Small pelagic fish | 0 | 1 | 0 | Area closures, minimum size |
| Octopus | 0 | 1 | 0 | Closure |
| Seaweed | 1 | 0 | 0 | Closure, area closures |
| Coastal sharks | 0 | 1 | 0 | Closure, area closures |
| Pelagic sharks | 0 | 1 | 0 | Fishing gears specification |
| Total | 3 | 21 | 5 | |
| Grand Total | 9 | 34 | 11 | |

a. Some caution needs to be taken in interpreting these data as they generalise across species.

Source: SAGARPA (2004).

Table 11.3. Summary table of changes in resource status for key stocks between 2000 and 2004

| Resource | Region | Species | Resource status 2000 | Resource status 2004 | Change | Issues |
|---------------------------------------|--|------------------------------------|----------------------|----------------------|--------|---|
| Tuna | Pacific | Yellowfin | At MSY | At MSY | .. | Overcapacity in international fleet |
| | Pacific | Bluefin | Above MSY | Above MSY | .. | Uncertainty on current exploitation level |
| | Pacific | Skipjack | Below MSY | Below MSY | .. | Potential for development |
| | Gulf of Mexico and Caribbean | Yellowfin | Below MSY | Below MSY | .. | Potential for development (under ICCAT rules) |
| Shrimp (Pacific) | Pacific | All shrimp | At MSY | At MSY | .. | Catches have doubled since 1992. Concerns over individual stocks. |
| | Sonora | Blue shrimp | Overexploited | At MSY | + | |
| | Sonora and upper gulf | Brown shrimp | AT MSY | At MSY | .. | |
| | Sinaloa-Nayarit | Brown shrimp | At MSY | Deteriorating | - | Stock exhibiting signs of deterioration |
| | Sinaloa-Nayarit | Pacific white, blue, blanco shrimp | Overexploited | Overexploited | .. | |
| | Gulf of Tehuanutepec | Pacific seabob, blanco sur | Overexploited | Overexploited | .. | |
| | Western coast of Baja Calif. Sur | Brown, blue, rock shrimp | Overexploited | Overexploited | .. | Stocks showing signs of recovery |
| | Tamaulipas and Veracruz Campeche Bank | All shrimp | At MSY | At MSY | .. | Catches decreasing steadily |
| Shrimp (Gulf of Mexico and Caribbean) | Campeche-Tabasco, coastal areas | All shrimp | At MSY | At MSY | .. | |
| | Quintana Roo: Contoy Island | All shrimp | Overexploited | Overexploited | .. | Edge of stock distribution as it is shared with southern countries and also experiences natural stock fluctuations. |
| | Pacific | Pooled species | Populations steady | Populations steady | .. | |
| | Gulf of Mexico and Caribbean | Pooled species | At MSY | At MSY | .. | Catches declined significantly since 2000. Need to diminish current fishing effort and apply precautionary principle. |
| Sardines and minor pelagics | Pacific | Pooled species | Populations steady | Populations steady | .. | |
| | Gulf of Mexico and Caribbean | Pooled species | At MSY | At MSY | .. | Catches declined significantly since 2000. Need to diminish current fishing effort and apply precautionary principle. |
| | Baja California Peninsula, central region | All species | At MSY | At MSY | .. | Recommended to not increase nominal fishing effort |
| Lobster (Pacific) | Baja California Peninsula, northern and southern areas | All species | At MSY | Deteriorating | - | |
| | Other states | Pooled stocks | At MSY | Undetermined | .. | Effort could increase gradually |
| | | | | | | |

| Resource | Region | Species | Resource status 2000 | Resource status 2004 | Change | Issues |
|--|------------------------------|---------------------|--|--|--------|---|
| Lobster (Gulf of Mexico and Caribbean) | Yucatan | Pooled stocks | At MSY | Stabilised at level below MSY | + | Recommended to not increase current fishing effort |
| | Quintana Roo | Pooled stocks | Overexploited | Overexploited | .. | Recommended to not increase current fishing effort and reduce fishing mortality. |
| Abalone | Pacific | Green, pink Abalone | Overexploited | Overexploited | .. | Catches have declined 80% since early 1990s. Recovery plan in place with some local successes. |
| Octopus | Pacific | All species | n.a. | n.a. | .. | No NOM in place |
| | Gulf of Mexico and Caribbean | Maya octopus | At MSY | At MSY | .. | Recommended to not increase current fishing effort |
| Clams and scallops | Gulf of Mexico and Caribbean | Common octopus | At MSY | Below MSY | + | Potential for further development. |
| | Pacific | Scallop | At MSY, but overexploited in Baja California Sur | At MSY in Sonora, overexploited in Baja California and Sinaloa | .. | Recommended to not increase effort. |
| | Gulf of Mexico and Caribbean | All species | n.a. | n.a. | .. | No NOM in place. Potential for development but no increase in fishing effort is recommended until stock assessments undertaken. |
| Sea urchin | Pacific | Red sea urchin | At MSY | Overexploited | – | Need to reduce fishing effort and not grant new permits. |
| | | Purple sea urchin | At MSY | n.a. | .. | Recommended to not increase current fishing effort |
| Crabs | Pacific | All species | At MSY | At MSY | .. | Recommended to not increase current fishing effort |
| | Gulf of Mexico and Caribbean | All species | At MSY | At MSY | .. | Recommended to not increase current fishing effort |
| Skates | Pacific | All species | n.a. | At MSY | .. | No NOM in place. |
| | | All species | n.a. | At MSY | .. | No NOM in place. |

| Resource | Region | Species | Resource status 2000 | Resource status 2004 | Change | Issues |
|------------------------|------------------------------|------------------------------------|---------------------------|---------------------------|--------|---|
| Queen Conch | Gulf of Mexico and Caribbean | Cozumel Island stock | At MSY | At MSY | .. | |
| | Gulf of Mexico and Caribbean | Banco Chinchorro stock | At MSY | Overexploited | – | Recommended to not increase current fishing effort |
| Oyster | Pacific | All species | n.a. | At MSY | .. | Recommended to not increase current fishing effort and to not grant new permits. |
| | Gulf of Mexico and Caribbean | American, mangrove oyster | n.a. | At MSY | .. | Recommended to not increase current fishing effort and to not grant new permits. |
| Sharks | Pacific | All species | At MSY | At MSY | .. | No NOM in place (previous one cancelled in 2000). Recommended to not increase effort. |
| | Gulf of Mexico and Caribbean | All species | At MSY | At MSY | .. | Recommendation to not increase effort. Concern over declining catches and accuracy of stock assessment. |
| Red grouper | Gulf of Mexico | Red grouper and associated species | Deteriorated | Deteriorated | .. | Recommended to not increase effort. |
| Recreational fisheries | Pacific | Dorado, dolphinfish | Potential for development | Close to MSY | – | Potential for marginal development, but recommended to not increase effort. |
| | Pacific | Marlin | At MSY | At MSY | .. | No increase in effort recommended within 50 miles of coastline and take measures to reduce bycatch of other fleets. |
| | Pacific | Swordfish | Potential for development | Potential for development | .. | Possibility to gradually increase effort according to technical assessments |
| | Pacific | Sailfish | At MSY | At MSY | .. | Do not increase current fishing effort |

+ Indicates improvement in stock status; – indicates a decline in stock status.

Source: INP 2000, 2005.

Profitability and rent generation

Increasing the economic rent from fisheries is a stated objective of the government's programme for the fisheries and aquaculture sector. However, there is no empirical evidence with which to assess the success of fisheries management policies in meeting this objective. No government surveys have been undertaken of the economic performance of the various fleets, even in the high value commercial fisheries for tuna and shrimp. Nor have any such surveys been undertaken by universities or research agencies. This deficiency is best explained by the fact that the authorities have focussed on improving stock assessments and underlying data and have directed available resources into that area. The need for economic surveys may therefore appear to be a secondary order of importance. However, there is clearly a need to generate such socio-economic data in order to better inform decision makers about the consequences of current policy and management settings for fishers. This will assist in better identifying how different management settings affect fishers' behaviour and, thus, their impact on resource sustainability.

Despite the lack of formal analysis, a number of observations can be made about the likely level of resource rent and profitability being generated in the wild capture sector. First, the fact that most fisheries are fully or overexploited, coupled with the recognition that there is too much effort in these fisheries, indicates that resource rents are being dissipated by excess effort. The level of resource rent in these fisheries would be close to zero. Some vessels will be able to earn intra-marginal profits, but most vessels will be just covering their operating costs. The commercial shrimp fishery is of particular concern as the excess capacity in this high value fishery is reducing the resource rent below the level that could be generated. The use of limited entry and season closures in this fishery exacerbates this situation because the fishing season becomes shorter and less predictable as management authorities attempt to maintain stocks. This in turn creates an incentive to further increase effort, with further impacts on resource rent and profitability. The use of a vessel decommissioning scheme in the shrimp fishery is an attempt to break this cycle and reduce fleet size to levels which may generate resource rents. It is too early to judge whether the scheme has been successful. Around 400 applications were received from vessel owners and only 222 vessels were given payouts. So there is clearly a strong demand for assistance to exit the industry, indicating a low level of resource rent and profitability in the fishery. It is unlikely that the decommissioning scheme will be sufficient to restore resource rents in the fishery without the use of additional management measures to restrict expansion in effort following the exit of the scrapped vessels and the introduction of measures to control the artisanal fleet (see below for further discussion of decommissioning schemes).

Second, there is anecdotal evidence from industry interviews that the tuna industry is generating intra-marginal profits and many vessels have good prospects for maintaining profitability in the future. The characteristics of the tuna fishery management measures tend to support this observation. There is limited entry into the fishery, the fleet is well regulated with respect to fleet numbers and the size of vessels, although there is scope for input stuffing, technological creep and effort expansion within these limits. This combination of management measures effectively closes the fishery and creates conditions within which rents can be generated. Rent generation potential could be increased further if an element of permit transferability was introduced into the fishery. Indeed, the tuna fishery has potential for the introduction of individual transferable quotas

to further improve efficiency and rent generation in the fishery. This underscores the importance of economic surveys of costs and earnings in key fisheries and fleets.

Third, it is highly unlikely that any resource rent or profits are being generated in the artisanal fisheries. The open access nature of these fisheries, with little control on vessel numbers, effort and catches, almost ensures that resource rents are fully dissipated. Rent generation may not necessarily be a primary objective in this sector, with rural poverty alleviation being the major focus for broader government policy (see Chapter 13). However, ignoring rent generation possibilities in the sector may be short-sighted and governments should investigate the use of alternative management mechanisms (such as area-based or community-based management). This is starting to be developed in some artisanal fisheries with some successes, most notably in the Baja California rock lobster fishery.

Key fisheries management issues

The review of the effectiveness of fisheries management since 1990 has raised a number of important issues that need to be addressed by fisheries management authorities. These include the need to take further measures to control effort, institute stock recovery planning, develop integrated management plans, and expand the choice of management instruments (particularly the potential for the greater use of market instruments). Clearly, these issues are inter-related to varying degrees, and are also linked to the broader fisheries policy issues raised in the previous chapter.

Controlling fishing effort

Measures to more effectively control fishing effort are urgently required in order to reduce the fishing pressure on overexploited stocks and ensure that pressure does not increase on the stocks that are currently fully exploited. The implementation of such measures is made more difficult by the current heavy reliance on the use of limited entry, technical measures, and area and season closures as the major means of regulating fisheries. It is well recognised that these types of input controls suffer from a number of flaws that make it harder for management authorities to effectively predict and control the impact of fishing activity on stocks (Beddington and Rettig, 1984; OECD, 2006). Input stuffing and the expansion of effort along uncontrolled dimensions results in effort creep in the fleet. This has been estimated to be as much as 3% a year (Cunningham and Greboval, 2001; FAO, 2004). The situation becomes even more difficult in the case of the open access regime that governs the artisanal fishery. Conflicts over access to resources between the artisanal fleet and other fleets that are regulated will exacerbate competition for resources and accelerate increases in fishing pressure.

There are five key steps that the government can take to more effectively control fishing effort. First, there is a need to permanently reduce the size and power of some fleet segments. This can be accomplished through the use of decommissioning schemes and the retirement of permits. A decommissioning scheme was trialled in the shrimp fishery in 2005 and the experience from this trial can pave the way for extending decommissioning schemes to other parts of the sector (Chapter 10 provides a description of the shrimp vessel decommissioning scheme). Decommissioning schemes are widely regarded as a panacea for excess capacity problems. However, they need to be carefully designed and implemented as they can quickly become embedded in the expectations of fishers, resulting in perverse incentives to stay in the industry to wait for a government

payout to leave and thereby reducing industry flexibility. The schemes should be credibly announced as being “one-off” schemes for each fishery and the availability of decommissioning payments should be strictly time-limited. Cost-effectiveness of the schemes can be improved by using auctions, rather than fixed payments per vessel, to identify vessels to be scrapped. The cost to government of decommissioning schemes can be reduced through the use of innovative financing arrangements including, for example, industry co-financing (perhaps through soft loans under FIRA-FOPESCA or BANCOMEXT). Such arrangements have been successfully used in other OECD countries, but in conjunction with management changes that ensure the remaining industry participants reap the benefits from their investment in capacity reduction (OECD, 2006).

The retirement of permits is more problematic. There are legal problems with such a process in relation to compensation and issue of rights, making it difficult and expensive for the government to revoke or resume permits. The existence of a large number of inactive permits compounds the problem. The fact that most permits are of short duration (generally two years), are almost automatically renewed, and have no formal market value makes it difficult to undertake a permit buyback programme. The government also faces political difficulties in not renewing permits unless the permit holder has been found to have engaged in illegal fishing activity.

Second, it is very important that decommissioning schemes are introduced together with other measures that will effectively prevent capacity and effort increasing in a fishery once the initial impact of the decommissioning scheme has finished. The current reliance on input controls in Mexico flags this as a potential problem. Limited control over total effective effort in many fisheries, coupled with effort creep in the more regulated fisheries, means that the benefits from decommissioning schemes may be quickly dissipated. Ideally, the management regime should encourage fishers to “self-regulate” their investment and participation in a fishery following a decommissioning scheme by responding to market signals about entry and exit from the fishery. This will be facilitated if the access right in the form of the permit, quota or vessel was transferable, but this is not possible under the current management settings. An interim solution would be to also retire the permit that is attached to a vessel as was done in the case of the shrimp fishery decommissioning scheme. As the permit is not formally attached to a vessel at the moment in Mexico, some changes to management regulations would be required to do this in other fisheries.

Third, there appear to be few rules on the replacement of vessels. This increases the scope for effort creep as permit holders can replace older vessels with more modern vessels with greater catching power. While fleet modernisation has been seen as a desirable process in the past, it is appropriate to consider introducing restrictions on the allowable increases in engine and catching power of new vessels, including elimination of subsidies for engine purchase and modernisation. Linking permits to vessels would also be a good step towards instituting restrictions on vessel replacement.

Fourth, enforcement efforts can be augmented through the increased use of observers and vessel monitoring systems (VMS). The use of observers could be extended within the high value fisheries, with the costs being at least partly recovered from the industry. In principle, the use of observers should only be instituted where the societal benefits in terms of improved compliance with management measures outweighs the cost of the schemes. The innovative financing schemes used to run observer programmes in the tuna, swordfish and shrimp fisheries provide a good model and should help ensure the cost-

effectiveness of such programmes. The tuna fishery has 100% observer coverage which is funded from a financial foundation. The cost of the private observer programme is around USD 1.5 million a year, and the Pacific tuna fleet provides USD 1 million a year, the Gulf of Mexico fleet USD 0.4 million and the Mexican government USD 0.1 million. Around USD 1 million in government financing helped to establish the foundation. The swordfish fishery has 25% observer coverage while the Pacific and Gulf shrimp fleets have a target of 10% coverage with vessels being monitored by observers on a random basis.

In addition, the use of VMS should be made obligatory in the commercial fisheries. VMS has recently been introduced in several fisheries on a limited basis, covering around 450 vessels, of which around 280 vessels are located in the Gulf of Mexico. The current VMS system links to control centres and databases in CONAPESCA and in the Navy (Mexico City). Cost recovery for the installation and operating costs (estimated at USD 2 500 initially plus USD 650 a year) should be instituted to ease the cost to government.

Fifth, better targeting of financial support should be a priority. The use of funding under *Alianza Contigo* for engine purchase and modernisation for some fleet segments tends to work against other management efforts to control effort. In 2005, a total of MXN 21.5 million was provided for engine modernisation to fishers in Baja California Sur, Sinaloa and Sonora under the *Plan de Acciones para el Ordenamiento*. While the total amount appears quite small relative to the total expenditures of *Alianza Contigo*, the effects on resource sustainability can be disproportionately high. The existence of the diesel subsidy programme also contributes to excessive effort and reforms to this subsidy programme are clearly warranted.

An overarching concern in the issue of controlling effort is the growth in the number and power of the artisanal fleet. This is especially the case in the shrimp fishery, but also in many fisheries in the poorer coastal regions and inland waters. This is a classic case of too many fishers chasing too few fish, as well as a high level of illegal, unreported and unregulated (IUU) fishing. As will be discussed in Chapter 13, the current policy of keeping these fisheries as *de facto* open access fisheries will only serve to augment rural poverty in these dependent populations and will lead to long-term resource depletion. Regaining adequate control of the artisanal sector requires a long-term approach as there is no quick fix to the problem. Nevertheless, there are a number of steps that the government can take to begin addressing the issue:

- Institute a nationwide vessel register to determine the size of the problem. At the moment, there is no clear data on the artisanal fleet and this would be a necessary first step in determining the magnitude of the task confronting the government.
- Extend the process of installing VMS on small scale and artisanal vessels with cheaper, new generation VMS units. This will assist in monitoring this segment of the fleet, and will help support future efforts to control the location and intensity of effort.
- The use of decommissioning schemes for the artisanal sector is unlikely to be successful without some means of restricting those who leave the sector from re-entering. The cost of *pangas* is so low that such re-entry is quite feasible. Indeed, it is possible that any payments from decommissioning will be reinvested in the fishery.

- The feasibility of local governance mechanisms should be closely examined in particular fisheries as discussed below with respect to community based management.

Stock recovery planning

In addition to measures to control overall fishing effort, immediate attention should be paid to the development of recovery plans for overexploited stocks. There is nothing to be gained in delaying action on this important resource sustainability issue. Declining catches and catch rates will merely further reduce fishers' profitability, generate pressure for financial support, encourage a shift of effort to other fisheries, and increase pressure on other stocks. To achieve stock recovery, the government should develop and implement integrated management plans for overexploited fisheries with specific, measurable goals for stock recovery based on scientifically-derived reference points. Stronger enforcement of existing regulations for remaining fishers should be an integral part of stock recovery plans.

Such management plans should also incorporate measures to permanently reduce effort and fishers in these fisheries as discussed above. So, while immediate effort reduction measures should be undertaken (including, where appropriate, extended closed seasons, fishing moratoriums and suspension of licences), further management reforms for affected fisheries are required, such as strengthening access rights and introducing time-limited vessel decommissioning and licence buyback schemes (see below for further discussion of decommissioning schemes).

The fact that five of the 11 overexploited stocks are sedentary species should make the development and enforcement of stock recovery plans and enforcement of regulations more feasible. Indeed, some of these fisheries have already had been subject to recovery plans and this experience, though unsuccessful to date, will facilitate the development of further recovery plans. In particular, the concept of recovery plans is now embedded in the mindset of some fishers and this can be used to advance stock recovery efforts.

The development of stock recovery plans for shrimp, grouper and other fishes is more challenging as they are subject to greater conflicts between users. The Pacific shrimp fishery, in particular, has a large artisanal component that increasingly competes directly with industrial fishers. While the fishery has a management plan in place, it has not proved to be particularly effective in reducing conflict and easing fishing pressure. The use of more innovative management measures is required to address fundamental resource conflicts in this fishery. Consideration should be given to the use of transferable effort quotas and co-management arrangements, coupled with significant control on further expansion of the artisanal fleet and the introduction of more innovative management measures (such as co-management) for the artisanal sector.

Integrated fisheries management plans

More generally, a system of fisheries management plans should be instituted. A few fisheries have management plans in place (*Planes de Manejo*), including the Gulf of Mexico lobster, shark and Pacific shrimp fisheries and some inland reservoirs. A number of other management plans are being developed by CONAPESCA. However, these are developed on a voluntary basis and are not legally recognised as yet. As a result, they have generally been *ad hoc*, fragmented and effective in only some cases (especially in some inland waters).

A system of comprehensive management plans could build on the current system of NOMs and the National Fisheries Chart, and would provide a mechanism for long-term planning for individual fisheries. Their development and implementation could be undertaken within the consultative framework that is already established and functioning for a number of fisheries. They would, however, require some legal status in order to be meaningfully enforced. The major benefit to such an initiative would be to unify the sources of management advice, provide a holistic approach for managers, and improve transparency and certainty for fishers.

Choice of management instruments

There is a heavy reliance in Mexico on the use of limited entry, season closures, area closures and technical measures to control effort in fisheries. This is unlikely to be effective in the longer term. In a number of fisheries, this has resulted in a regulated open access situation where technological creep and input stuffing have increased fishing pressure. Altering the economic incentives faced by fishers, and harnessing the power of the market to efficiently allocate resources, will improve the economic viability and adjustment capabilities of the sector. However, at present, there are no examples of market-based instruments being used within the formal management system, although limited informal market-based arrangements have developed in some areas and fisheries. Neither institutional reform nor legislative changes in Mexico have tackled this problem of poorly defined access rights to fish resources.

Market-based instruments could therefore be introduced for those fisheries where the necessary biological, economic, legal and social conditions combine to increase the probability of a good management outcome. It should be recognised that there is a wide range of market-based instruments and that individual transferable quotas are not the only available economic instrument for managing fisheries. A range of innovative management mechanisms have been successfully used in other OECD countries and the conditions are ripe for their selective use in Mexico's fisheries. Some stakeholders may consider it premature to consider the introduction of market based management into the Mexican fisheries sector, particularly given some of the challenges currently presented by the issues of judicial enforcement, overfishing, and excess capacity. However, experience has shown that there are significant benefits in combining capacity reduction programmes with market based management measures as they tend to be mutually reinforcing if properly designed.

A necessary condition for the use of market-based instruments is a strong system of clearly-defined access rights that are exclusive, transferable, and legally enforceable. Such a system is currently lacking in Mexico at the moment where the access rights are vaguely defined, relatively short term and unenforceable. Improvements in this area may need to be part of an economy-wide reform process to improve the legal regime surrounding productive assets in general. One of the challenges facing the Mexican fishing industry in this regard is the very large artisanal fleet in the poorer regions where the application of property rights concepts may be difficult to enforce. Variants of market-based instruments, such as community based management approaches, may be useful in such circumstances.

More specifically, the tuna fishery could potentially benefit from the use of individual transferable quotas. It is a single species fishery with well-defined stocks, a small fleet, and a sound resource base. Introducing transferability into the existing quota system, perhaps with limits on quota concentration to allay fears about industry concentration,

would improve the efficiency of the fleet, enhance short and long term adjustment and improve resource rent generation.

The use of individual transferable effort quotas (based, for example, on vessels or gear units) could be considered in fisheries where the species characteristics mitigate against the use of output based quotas (for example, the commercial shrimp fishery and some single and multi-species fisheries). Sedentary fisheries would also be good candidates for such a system. For example, lobster fisheries could be managed around transferable rights to use lobster pots with the pot as the unit of management. Such schemes are successfully used elsewhere in the OECD (OECD, 2006).

Community-based management is another form of market-based management that has significant potential in Mexico. This arrangement bestows a community with exclusive long-term rights of access to a defined fishery resource, and the community then manages the resource within its members through allocating access, determining rules for exploitation, and enforcing those rules (Box 11.1) (Jentoft, 1989, 2004). Community-based management could be introduced in fisheries with well-defined access grounds, mostly fisheries of sedentary organisms such as sea urchin, abalone, sea cucumber, octopus, and lobster as these are well-suited to area-based management. Such management arrangements already exist informally in a number small Mexican fisheries and the concept could be formalised and extended. For example, a few communities have developed systems of individual transferable fishing areas on the Yucatan Peninsula that are now at least recognised, if not formalised. Miller (1994) and Castilla and Defeo (2001) describe several Caribbean lobster fisheries where co-operative fishers are granted exclusive rights to harvest within 'transferable parcels' boundaries, and although formal titles do not exist, fishers can sell, barter or trade them. Within this informal arrangement, the allocation of property rights has resulted in high catch rates and reduced conflicts over access.

The key community characteristics that will assist the development of community-based management include: the existence of a defined and contained group; no outsiders entering the fishing area (exclusivity); strong local leadership (human capital); and strong social bonds allowing for effective enforcement (social capital).

Box 11.1. Ten tracks towards implementing market mechanisms

A recent OECD study on the use of market based mechanisms to manage fisheries identified ten tracks that can help governments smooth the introduction of the mechanisms:

1. Making all stakeholders comfortable with the concept of market-like instruments.
2. Preferring an incremental or gradual implementation.
3. Not necessarily adopting a "one size fits all" strategy.
4. Carefully designing the allocation issue.
5. Pragmatically using market forces.
6. Overcoming the excessive consolidation question.
7. Using the demonstration effect and drawing on other countries' experiences.
8. Involving stakeholders in the reform process.
9. Integrating fisheries characteristics into instrument design.
10. Dealing pragmatically with tradeoffs.

Source: OECD (2006).

Experience with market-based instruments in other OECD countries indicates that the introduction of such management changes requires the active support of industry to be successful. Indeed, in many cases, industry has been one of the major proponents of reform, working in concert with government to establish a more sustainable and

profitable industry (Senqnd and Nielsen, 1996). This highlights the need for institutional arrangements to allow for extensive stakeholder consultation, with the expectation of a high degree of government responsiveness to issues raised during consultations.

Adequacy of stock assessments and socio-economic data

The transparency of stock assessments, resource status, and management measures has continued to improve. The National Fisheries Chart is now an established feature of the management landscape and serves a crucial role in improving the access of various stakeholders to information of fish stocks in Mexico. The coverage and detail of the Chart is extensive, providing comprehensive data on 96% of the species captured in marine waters.

The effectiveness of the Chart could be further improved by more closely integrating it with management plans for individual fisheries. Moreover, the body of analysis that underpins the CNP can usefully be supplemented with data on key economic indicators for key fleets and fisheries. In particular, there is a strong need to undertake surveys of costs and earnings in selected fisheries. While from a pragmatic perspective, such surveys may not be perceived as the highest priority for authorities at this stage, they would nevertheless provide important information about the economic effectiveness of different management regimes.

Conclusion

In summary, fisheries management policies in Mexico have had mixed results with respect to the status of fisheries resources and the generation of resource rent. Of the 54 stocks for which stock assessments were available in 2004, 11 stocks are assessed as being overexploited while 34 stocks are fully exploited. The change in stock status for the assessed stocks in recent years has been marginal. Of the stocks surveyed in this report, three overexploited stocks recovered to sustainable levels while four stocks deteriorated to being overexploited. Further efforts are therefore clearly required to reduce the number of overexploited stocks and reduce fishing pressure on the large number of stocks that are currently fully or over-exploited.

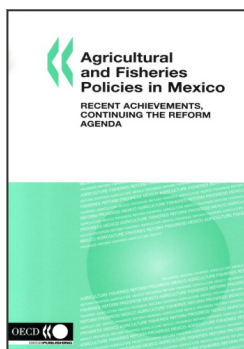
In order to address these problems, fisheries managers need to focus on changing the incentives currently facing fishers. The use of innovative capacity reduction schemes, integrated management plans, extension of enforcement programmes (including observers and VMS), market-based management instruments and community management will all help in this regard and the advantages in their application in Mexico have been noted in this chapter. However, when contemplating the introduction of one or more of these types of policy changes, it should be recognised that fisheries are a system. Changing one component of the system will have consequences for other components. This means that careful analysis is required in order to avoid perverse policy outcomes and ensure mutually supportive policies.

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From:

Agricultural and Fisheries Policies in Mexico

Recent Achievements, Continuing the Reform Agenda

Access the complete publication at:

<https://doi.org/10.1787/9789264030251-en>

Please cite this chapter as:

OECD (2008), "Review of fisheries management performance since 1990", in *Agricultural and Fisheries Policies in Mexico: Recent Achievements, Continuing the Reform Agenda*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264030251-13-en>

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