2 Managing fisheries

Healthy fish stocks are fundamental for maximising sustainable catch, or its value, which itself is key to providing food-security, jobs and incomes in the long-term. Healthy stocks are also vital for maintaining aquatic biodiversity, and the provision of ecosystem services on which several other sectors of the blue economy rely. With Sustainable Development Goal 14, countries collectively agreed to restore all fish stocks at least to levels that can produce maximum sustainable yield by 2020 and to implement science-based management plans. To help fisheries management authorities deliver on these commitments, this chapter provides newly assembled comparable information on the status of fish stocks as well as on how fish stocks of key species are managed, at the level of individual countries and economies.

Key recommendations

- Countries should allocate resources to assessing the status of, at least, the stocks of commercial importance for their fisheries. Data newly-assembled for this chapter shows that, for several OECD countries and emerging economies with large fisheries, stock status determination is only available for relatively limited numbers of stocks.
- Assessments should ideally allow status to be determined with respect to biological sustainability and any additional objectives (such as maximising catch volume or value within sustainable limits).
- Countries should consider revisiting their management approaches for stocks that have an unfavourable biological status, which was the situation for 23% of the 1 119 stocks for which information was reported to the OECD in 2019.
- There is further scope to manage fisheries more productively where stocks have a status that is biologically favourable but which does not allow meeting additional management objectives, such as maximising catch volume or value (or where no such additional objectives exist). This was the case for about half the stocks reported to have a favourable biological status (which, themselves, accounted for 66% of all assessed stocks reported on).
- While not pre-judging what is possible or necessary for particular fisheries, scope for improving management seems to exist where there is no direct control of how much fish can be caught or landed, nor notional total allowable catch (TAC) limits achieved through input controls.
- Scope for improvement similarly seems to exist where sets of management measures are particularly complex, potentially difficult to implement and monitor, and possibly even unnecessary following the introduction of output controls.
- To identify priorities for action more precisely, countries should continue to share detailed information on stock status and on measures used to manage stocks in a comparable framework (such as that used in this chapter). Further analysis of this data is needed to better understand how far stocks with unfavourable biological status are from favourable status, as well as which of these stocks are on positive trajectories thanks to remedial management actions that will allow stock recovery.
- To identify management practices best suited to achieving sustainable fisheries in different situations, the information on stock status will need to be directly related to the information on management to allow further empirical investigation of the effectiveness of fisheries management.

2.1. Realising the benefits of healthy fish stocks today and in the future

Healthy fish stocks are fundamental for maximising sustainable catch, or its value, which itself is key to providing food-security, jobs and incomes today and for future generations. Healthy stocks are also vital for maintaining aquatic biodiversity, and the provision of ecosystem services on which many other sectors of the blue economy rely (OECD, 2020[1]). Well-managed stocks can also increase fisheries' profitability in indirect ways, as consumers increasingly value the protection of ocean ecosystems and resources. Acknowledging and signalling the sustainability of a stock can facilitate market access and generate price premiums (Asche and Bronnmann, 2017[2]; Fernández Sánchez, Fernández Polanco and Llorente García, 2020[3]).

Recognising the benefits of sustainable fisheries management, the international community has included the objective of restoring all fish stocks at least to levels that can produce maximum sustainable yield by 2020 in the Sustainable Development Goal (SDG) 14 (target 14.4), which seeks to "conserve and sustainably use the oceans, seas and marine resources for sustainable development". SDG 14 also explicitly calls for implementing science-based management plans, pointing at the key role that this can play in achieving better stock status and associated societal benefits.

The objective to restore all fish stocks at least to levels that can produce maximum sustainable yield has however not been reached at a global level. In fact, according to the FAO (2020[4]), the overall proportion of fish stocks that are within biologically sustainable levels has deteriorated since the mid-1970s, with a slowdown of that trend over the last decade. About a third of global fish stocks (34.2%) are reported to have been at biologically unsustainable levels in 2017, up from 10% in 1974 (and slightly above the 30% estimation for 2007 in FAO (2008[5])).[1] FAO (2020[4]) also calculated that 21.3% of global landings by volume in 2017 came from stocks at biologically unsustainable levels.

These global figures however hide significant variation in status and in trends across regions and countries. The FAO estimates that 62.5% of stocks in the Mediterranean and Black Sea, 54.5% of stocks in the Southeast Pacific and 53.3% of stocks in the Southwest Atlantic were at unsustainable levels in 2017. At the same time, and in contrast, the Eastern Central Pacific, Southwest Pacific, Northeast Pacific, and Western Central Pacific had the lowest proportions of stocks at biologically unsustainable levels (ranging between 13 and 22%). Similar levels of variation are to be expected in terms of the proportion of landings coming from stocks at unsustainable levels.

The regional figures, themselves, do not do justice to the fact that significant resources have been invested to improve stock assessment and fisheries management in some countries and this has led to many stocks being successfully rebuilt.[2] Overall, where fisheries are actively managed, and assessed, the stock status appears to be overwhelmingly better, despite the influence of environmental factors (including climate change). Hilborn et al. (2020[6]) recently concluded that, "compared with regions that are intensively managed, regions with less-developed fisheries management have, on average, three-fold greater harvest rates and half the abundance (i.e. biomass) as assessed stocks". The evidence they collected also suggests "that the regions without assessments of abundance have little fisheries management, and stocks are in poor shape."

To help identify the priorities for action at the level of competent authorities, this chapter presents newly assembled comparable data on the status of fish stocks for individual countries and economies.[3] It also presents similarly structured information on fisheries management itself (for stocks of a smaller number of key species). In the absence of information on stock status, evidence of insufficient fisheries management can potentially be seen as a proxy for stock health being at greater risk. Where management appears to be overwhelmingly successful, management approaches can be a source of inspiration for fisheries managers in other parts of the world.[4]

The detailed information collected in this chapter is also a necessary input in better understanding the effectiveness of specific management approaches. Given the complexity of fish stock management, and the multitude of stocks being harvested and managed globally, empirical work trying to establish a causal impact of management on stock status (e.g. Hilborn et al (2020[12]) has often relied on estimations and overall indicators of management intensity. Linking data on assessed stock status to detailed information on measures being used to manage specific stocks would help the evidence base needed to concretely advise fisheries managers on approaches best suited to achieving sustainable fisheries in different situations.[5]

Box 2.1. Countries and economies reporting information on stock status and management to the OECD

The countries and economies contributing information on stock status and management to the OECD are: Argentina, Australia, Belgium, Canada, Chile, Chinese Taipei, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Italy, Japan, Korea, Latvia, Lithuania, the Netherlands, New Zealand, Norway, the People's Republic of China (hereafter China), Poland, Slovenia, Sweden, Thailand, Turkey, the United States, and Viet Nam.

These countries and economies accounted for 51% of global catches in 2018.

Note: Iceland did not report information on fish stock management. China, Indonesia and Viet Nam did not report information on stock status. For EU countries, information on stock status was reported with a single entry for the European Union.

2.2. The status of assessed fish stocks

Regularly assessing the status of individual fish stocks is essential to sustainable management. Determining where stocks sit with respect to key limit or target reference points – which may be quantified in terms of instantaneous fishing mortality (F) or stock biomass (B) – allows management performance to be evaluated.[6] Limit reference points identify sustainability thresholds that should not be crossed, as, beyond these the long-term biological viability of a stock is likely to be threatened. Target reference points, on the other hand, are optimal levels to be reached, determined by the management objective for the stock. Indeed, good fisheries management can deliver even greater benefits, along with fewer environmental impacts, when it ensures stocks are not only biologically sustainable, but also abundant enough to allow catch volume or value to be maximised. A commonly used objective to define target reference points is maximum sustainable yield (MSY), that is, to produce the largest long-term average (sustainable) level of catch. Maximum economic yield (MEY) is another possible objective, which aims to maximise economic productivity as opposed to the quantity of fish being produced.

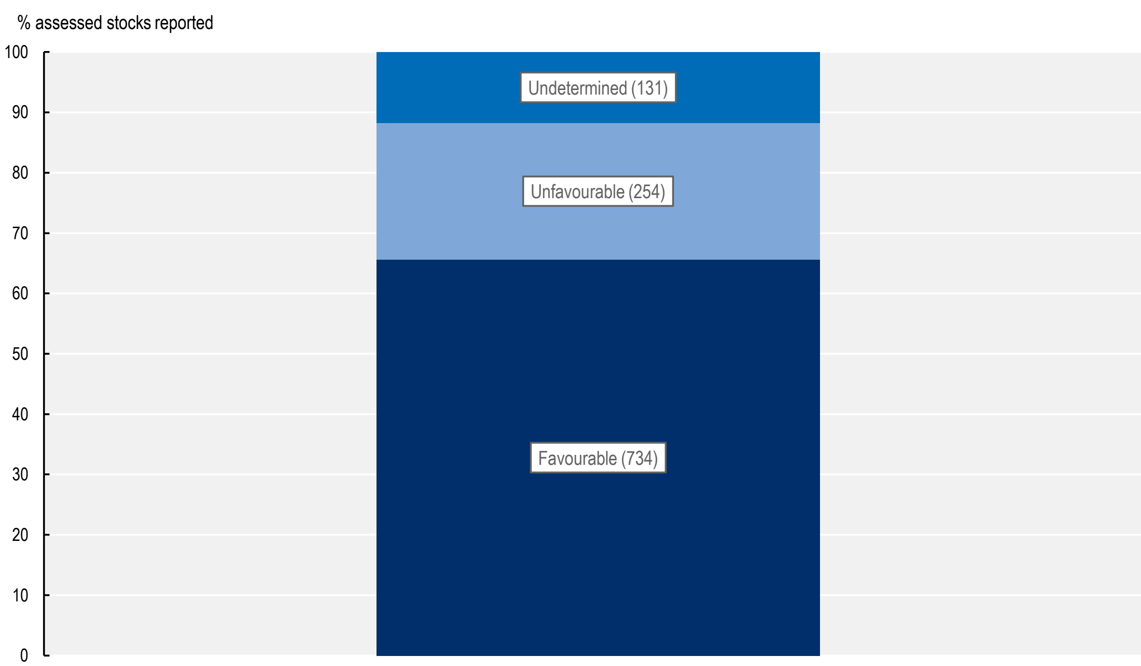
To meet the need for more accessible and comparable information on the status of fish stocks worldwide, the OECD has brought together information on the status of fish stocks that is otherwise only available in a number of different forms and locations, making it both difficult to access for the non-technical policy maker and difficult to compare across countries.

A questionnaire was sent out to collate data from participating countries and economies on the targets and thresholds[7] (that is, the key management reference points) used to manage individual stocks, and where each stock is assessed to sit with respect to these (that is, its status).[8] Data were collected at the end of 2019, and reflects the most up to date understanding of stock status in reporting countries and economies at that point in time. This, in turn, was used to produce country-level indicators on the status of fish stocks and the success of management at achieving sustainable fisheries:

- The **total number of stocks reported on**. And, of those:
- The number of **stocks with a favourable biological status** (that is, stocks within all limit reference points)
- The number of **stocks with a favourable biological status** that also meet additional management objectives (such as MSY)
- The number of **stocks with an unfavourable biological status** (that is, stocks outside one or more limit reference points)
- The number of stocks with **undetermined status** (where an assessment was attempted but uncertainty in the results prevented a determination being made).

Altogether, information on the status of assessed stocks was reported for 1 119 individual stocks.[9] Of these, 66% (734) had a favourable biological status, 23% (254) had an unfavourable biological status, while, for the remaining 12% (131), the status was undetermined (Figure 2.1). [10]

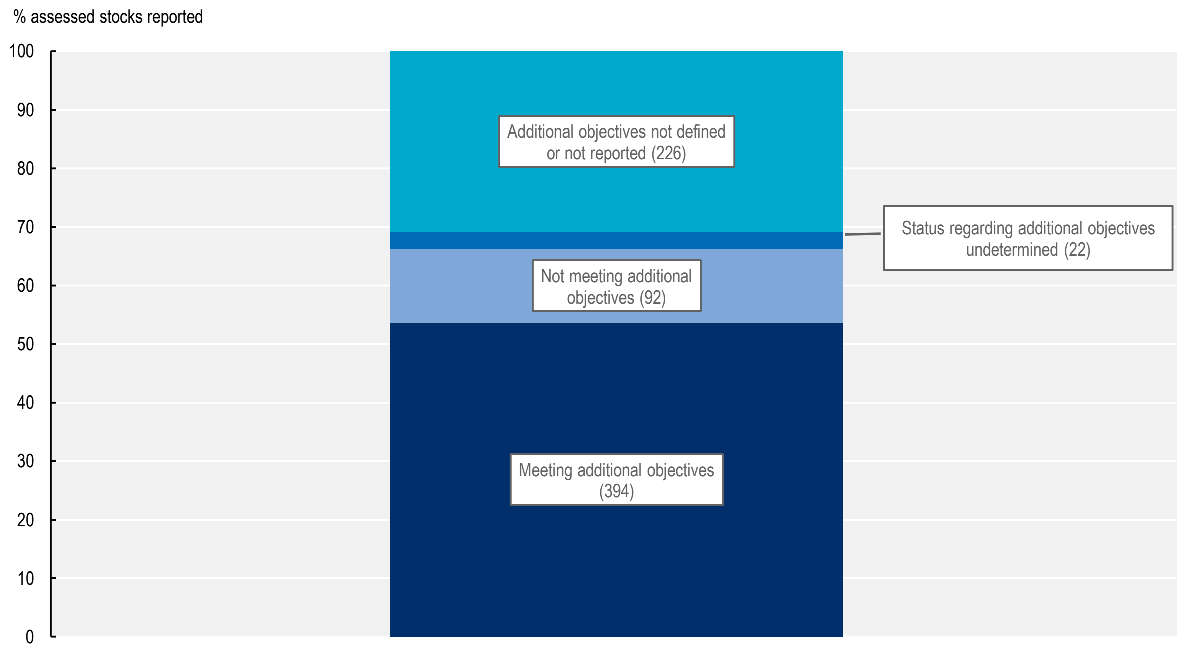
Figure 2.1. Reported biological status of all assessed fish stocks



Note: This figure displays summary information for the 1 119 individual stocks for which data were reported to the OECD. Biological status is considered favourable when a stock was found to be within all limit reference points and unfavourable when stocks were found to be outside one or more limit reference point. The status of stocks for which assessment was not conclusive, is reported as undetermined.

Within the stocks that have a favourable biological status, 54% (394) were meeting targets based on additional management objectives such as having fishing mortality and biomass at the levels required to result in MSY or MEY; 13% (92) were not meeting such targets; and 31% (226) either did not have other targets defined or they were not reported (Figure 2.2). The status with respect to such targets was undetermined in 22 cases.[11]

Figure 2.2. Reported status with respect to additional management objectives for stocks with favourable biological status



Note: This figure provides information for the 734 stocks where biological status was reported to be favourable. It reports status with regards to additional management objectives such as maximising catch volume or value.

At the level of individual countries and economies, the situation varies widely along all dimensions of the data. The number of recently assessed stocks reported by individual countries and economies varies from zero – no stock had been recently assessed by Costa Rica at the time of data collection – to 281 recently assessed stocks reported by Australia (Figure 2.3).

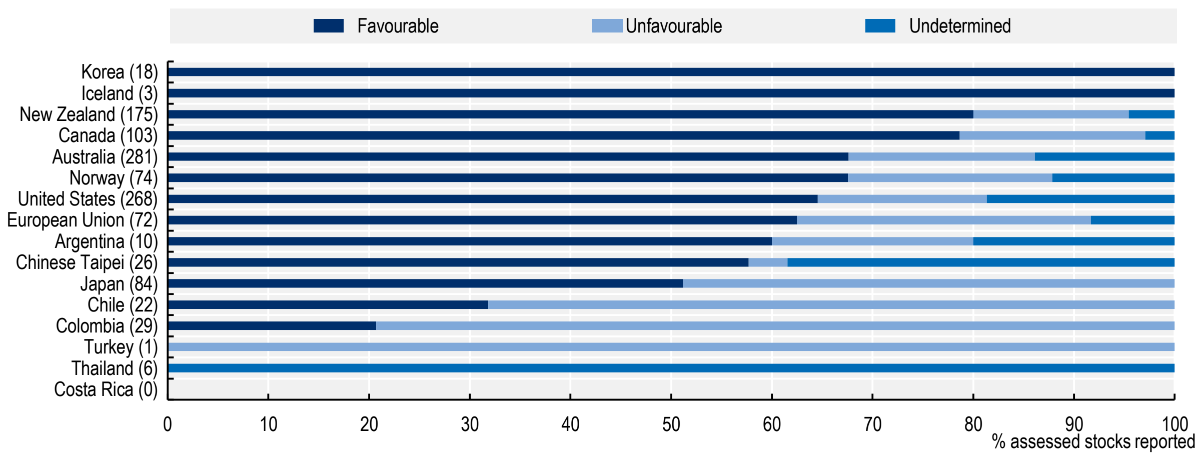
Multiple factors can influence the number of stocks a country formally assesses, including the number of species of commercial significance – which depends to some extent on the location and size of the exclusive economic zone (EEZ). For example, the contribution of key species to individual countries and economies' total landings value varies from over 90% in Argentina and Poland, to less than 20% in Colombia (Annex Figure 2.A.1). The capacity to assess stock status (including data collection) is also a key factor in explaining the total number of stocks assessed. The financial and technical resources of managing authorities varies across countries and economies, as does the extent to which assessing stock status is mandated by law (which, in turn, can influence the resources that are made available to do so).[12] The costs and benefits associated with assessing stock status in different contexts can also be a factor. For example, it can be more difficult (and it may not be either possible or pragmatic) to assess the status of all stocks in mixed fisheries that harvest large numbers of different species. While it is hard to evaluate how many stocks each country and economy should ideally assess, the large variation in the total number of stocks assessed across countries certainly points at room for improvement where numbers are low.

The proportion of recently assessed stocks that have a favourable biological status also varies widely across countries. It ranges from 100% for the three stocks reported by Iceland and the 18 reported by Korea, to less than 60% in Chinese Taipei, Chile, Colombia, Japan, and Turkey. The six stocks reported on by Thailand have an undetermined status (Figure 2.3). These contrasting results need to be considered in a country-specific context, particularly, in the context of the total number of stocks reported on. Only

11 countries and economies reported stock status with respect to additional management objectives such as MSY or MEY.

Finally, it should be noted that stock status as reported here does not account for any corrective action that may have subsequently taken place. For example, it would be expected that in countries with strong management, stocks that were found to have an unfavourable biological status have been subjected to rebuilding plans that should have put stocks on a trajectory allowing a return to a favourable biological status.

Figure 2.3. Reported biological status of all assessed fish stocks: National level



Note: This figure presents the status of assessed stocks as reported to the OECD by individual countries and economies (the total number of which is provided in parentheses). Favourable and unfavourable status refer to the stock's biological situation (signalling a stock was found to be within all limit reference points or outside one or more limit reference point). The status of stocks for which the assessment was not conclusive is reported as undetermined. The degree to which harvested stocks are assessed (and reported upon) was not reported by countries and varies significantly.

2.3. Stock management of most valuable species

At the most fundamental level, sustainable fisheries management aims to control the impact fishing has on the abundance of a stock or set of stocks to avoid threatening their long-term biological viability and, ideally, to ensure biomass is high enough to allow maximising catch volume or value. In practice, management measures aim to control either how fish are caught (with input controls) or what is caught and retained (with output controls). Input controls regulate fleet and gear characteristics (e.g. vessel size and power, gear type and configuration), along with how that can be applied (with spatial or temporal restrictions). Output controls most obviously take the form of quotas, typically through total allowable catch limits (TACs), which cap the total quantity of an individual stock that can be harvested. They are sometimes complemented by individual or community quotas, which allocate shares of the TAC to individuals or communities and define the terms under which these shares can (or cannot) been exchanged or sold. Output controls can also include measures such as minimum landing sizes (MLS), which aim to prohibit the catch of juveniles. Managers often use combinations of both input and output controls.

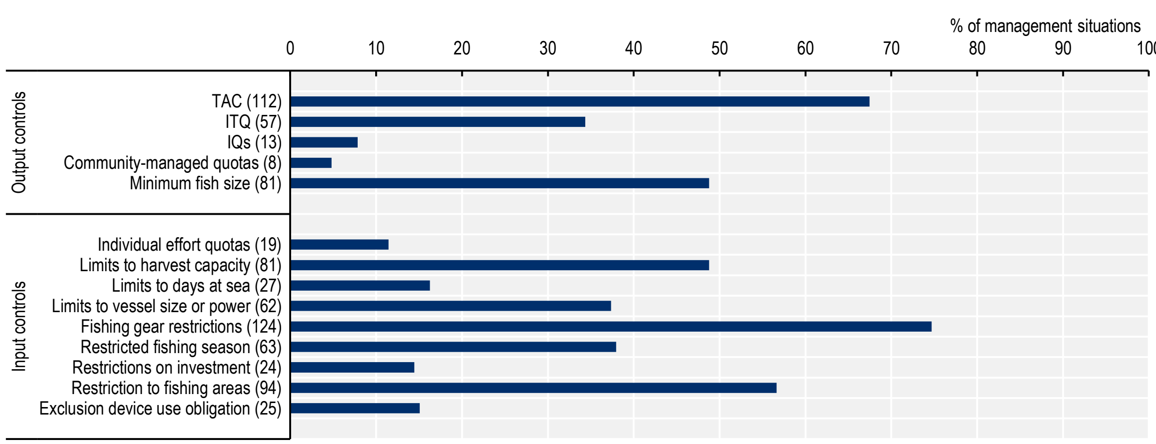
In many cases, an ecosystem-based approach to fisheries management has been formally adopted by national entities: 21 countries and economies reported having it as an objective in the OECD survey on fisheries management. This, in theory, implies a more comprehensive approach to fisheries management, where, in addition to the abundance of target species, a broader set of objectives must be accounted for.

These include minimising the impact of fishing on biodiversity and ecosystems more generally (on other species and on habitats in particular). In practice, the implementation of an ecosystem-based approach is complicated by the need to account for trade-offs when balancing multiple objectives – something that further complicates decision making while also being more data intensive. Only six countries and economies reported fully implementing ecosystem-based management. Additional social and economic objectives – such as the distribution of access to fishing resources across individual fishers or groups of fishers, or the concentration of the fleet – are also important factors when choosing management measures. Any associated trade-offs or impacts are however beyond the focus of this chapter.

To gain a clearer understanding of the management measures currently being utilised in different contexts, the OECD sent out a questionnaire to collate data on the measures countries and economies use to manage the harvested stocks of their five most valuable species at the time the questionnaire was designed.[13] While these represent a smaller subset than all the assessed stocks for which status was reported, on average, stocks of these key species accounted for 57% of the value of all landings of the reporting countries and economies. In three-quarters of reporting countries and economies, they account for more than 40% of landings by value and this proportion reaches over 90% in Argentina, Poland and Viet Nam (Annex Figure 2.A.1).

In some cases, more than one stock of a particular species was harvested and not all of them were managed with the same measures. In these cases, authorities were invited to report management measures for each stock or group of stocks managed with a common set of measures. For each management situation (that is, sets of measures applying to a stock or a group of stocks), respondents were invited to report which measures were used, as well as any relevant details regarding their implementation. Altogether, information was reported for 166 management situations. The total occurrences of use of the different measures considered in all situations are summarised in Figure 2.4.

Figure 2.4. Total occurrences of specific measures in the 166 management situations reported



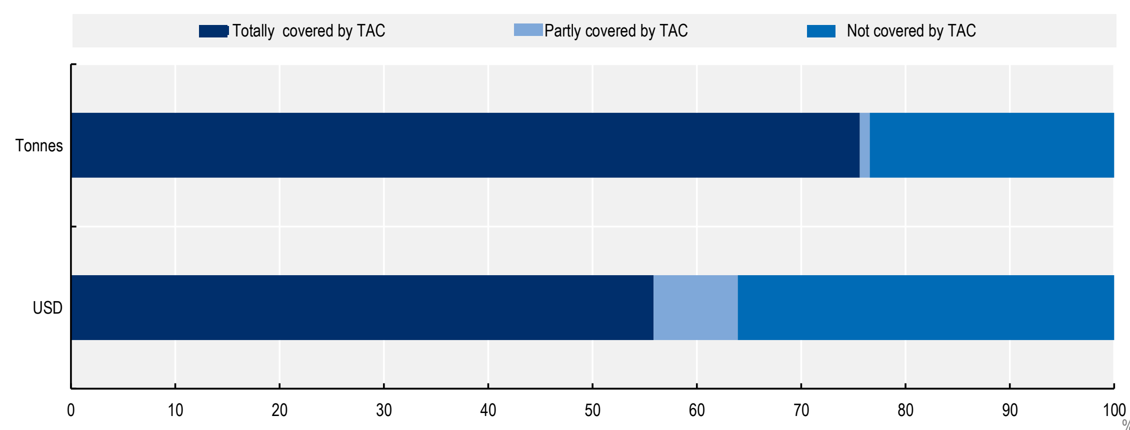
Note: The number of times each specific measure occurs is provided in parentheses. As a single stock, or group of stocks, can be managed using multiple input and/or output controls at the same time, this graph displays "occurrences" of use of particular control measures rather than percentages of stocks, or groups of stocks, managed using one or another.

Two-thirds of the management situations directly control how much fish can be caught or landed

Output-based measures typically set time-bound limits on the quantity of fish that can be caught or landed by the fishery. They are primarily implemented in the form of TAC limits. Setting and enforcing scientifically established TACs for the main species of commercial interest, at a minimum, is generally recognised as a transparent and effective way of controlling fishing impact on the species being managed.[14]

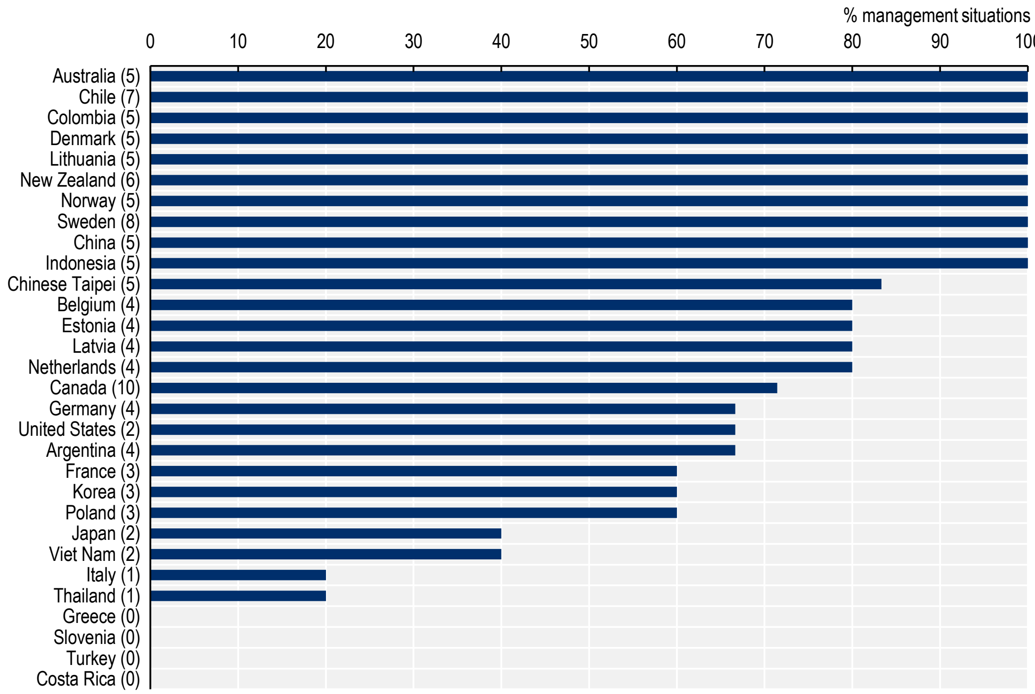
Catch was controlled with the use of TACs in 67% (112) of the management situations countries reported on.[15] For countries and economies reporting value of landings at the species level, in 2018, this means that key species under TACs produced landings worth USD 9.8 billion (56% of total key species landings value). In addition, key species partially covered by TACs produced landings worth USD 1.4 billion (8% of total key species landings value) (Figure 2.5). Partial coverage of a species for a specific management measure occurs when more than two stocks or groups of stocks exist for the same species and at least one, but not all, are managed using that measure (here a TAC). Overall, TAC-covered species accounted for 15.3 million tonnes of fish (76% of the total volume of the key species caught by reporting countries) with an additional 0.2 million tonnes (1%) produced by species partially covered by TACs. Almost a third of countries and economies reported using TACs in all management situations reported on (Figure 2.6). Conversely, four countries did not report the use of TAC for any management situation.

Figure 2.5. Use of total allowable catch (TAC) limits in managing the key species reported



Note: This figure displays the share of key species originating from species totally covered by TAC limits, partly covered by TAC limits and not covered by TAC limits, in the catch volume all key species (top) and in the value of landings of all key species.
The bottom figure (in USD) does not include China, Indonesia and Viet Nam as value of landings data were unavailable at the level required.
Source: OECD dataset 'Marine landings' (OECD.Stat), FAO dataset 'Global Fishery and Aquaculture Production Statistics' (FishStatJ).

Figure 2.6. Use of total allowable catch (TAC) limits in management situations reported: National level

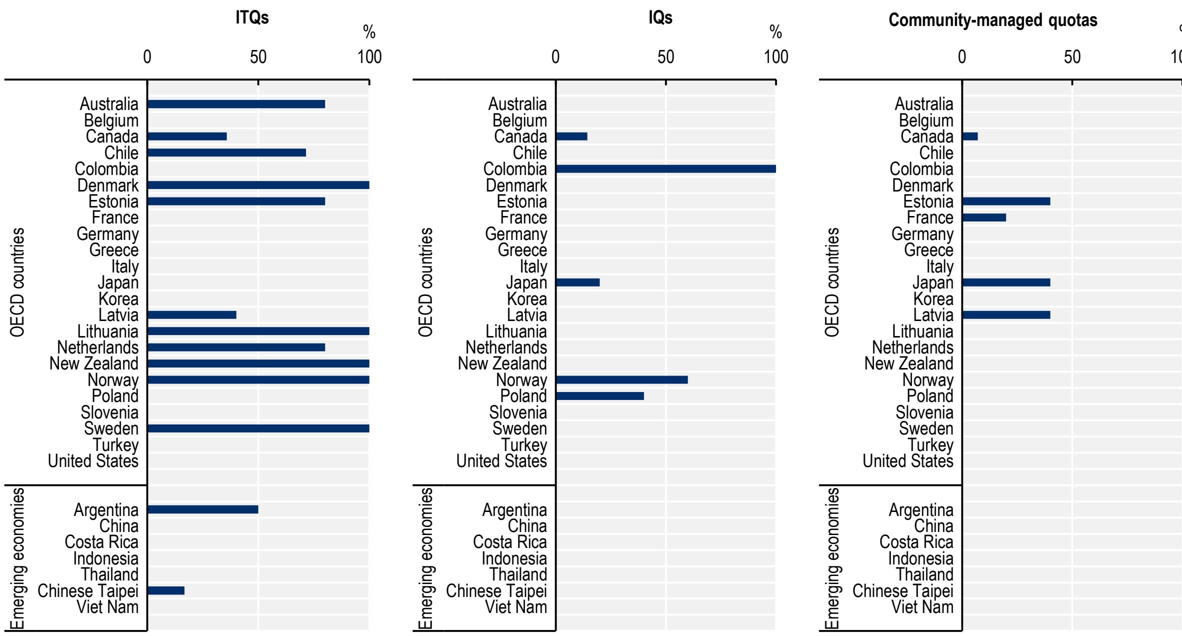


Note: The total number of management situations reported on in each case is provided in parentheses. Some countries and economies that did not report the use of TACs for any stocks of the key species considered in this Figure did report using TACs to manage other stocks.

Quotas are used in 68 (41%) situations

Individual quota allocations (IQs, ITQs) create incentives for increased economic efficiency, and improving economic performance is a common objective in the application of these measures. Sixty-eight management situations were reported to utilise quotas: ITQs were applied in 57 cases, IQs in 13 cases, and community managed quotas in eight cases. In most of these cases, TACs were also in place, and sometimes, more than one type of quota was used.[16] For example in the 57 situations managed using ITQs, in five cases, IQs were also in place. In another four cases community quotas were also in place; and, in one case, both IQs and community-managed quotas were also in place. Over half of countries and economies (57%) reported using quotas allocated to individuals or communities; six of whom did so in all management situations reported on (Figure 2.7).

Figure 2.7. Use of quotas in management situations reported: National level



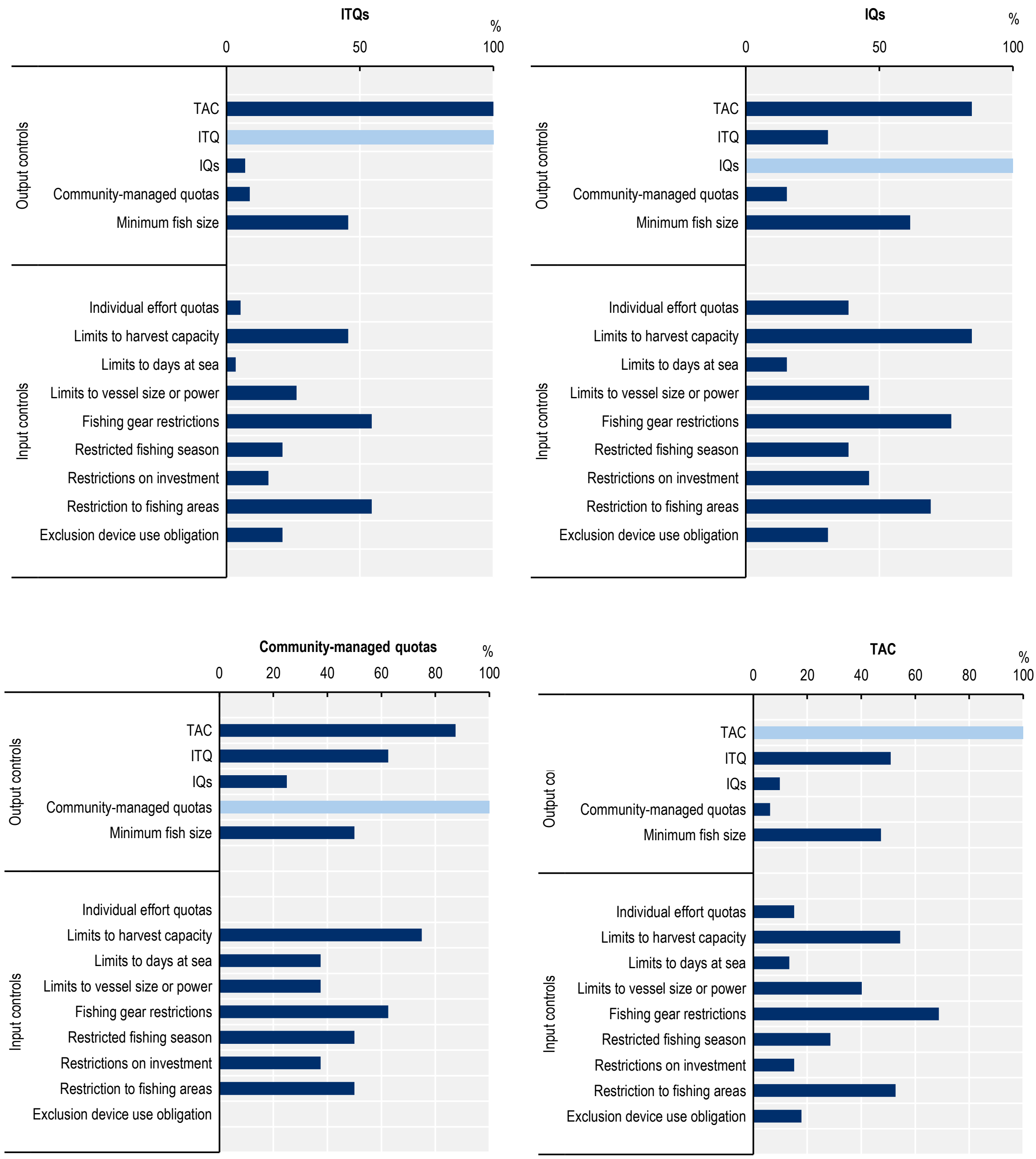
Input controls are also used in most management situations where output is directly controlled

Direct controls on how much fish can be caught or landed, whether through TACs, quotas or combinations of these measures, are combined with input controls in most cases, notably restrictions on the use of gear and limits to harvest capacity (Figure 2.8). The absence of specific input controls was reported in only five instances of ITQ use, one of which also utilised community-managed quotas. Of the stocks managed via output controls only, four are pelagic stocks (mackerel, herring, and sprat twice) and one is a demersal stock (plaice).

Where TACs are used without quotas (28% of situations), the use of input controls is even more frequent (in particular restrictions on gear, power and fishing season) when compared to situations that combine TACs with quotas (Annex Figure 2.A.2). The most frequently applied input measures in all cases (not always in the same order) were restrictions to fishing gear or areas, and limits to harvest capacity. Most countries and economies tend to mainly use combinations of both input and output controls (Annex Figure 2.A.3). Denmark and the Netherlands stand out as exceptions, with four of the five reported management situations making use of output controls only.

Simplicity of rules and reducing any unnecessary regulatory burden are key components of effective fisheries management (Belschner et al., 2019[7]).[17] An excessive regulatory burden can impede the ability of fishers to operate efficiently and complicate monitoring, control, surveillance (MCS) and enforcement. While the most appropriate set of measures tends to be context specific, a generally less frequent application of additional input controls may reflect they are unnecessary in the given context. Where ITQs are in place, an average of 2.5 types of input controls are also reported. For IQs this average is 4.5; for community-managed quotas, it is 3.5; and for situations with TACs, but no quota, it is 3.5.

Figure 2.8. Occurrence of management measures in reported situations that directly control output, by type of output control in place



Fishing gear restrictions are used in over half of situations where output is directly controlled (Figure 2.8). Such restrictions typically regulate the types and configurations of fishing gear that fishers are permitted to use when targeting the species in question and may be applied to control factors such as fishing power (to control catches), selectivity (e.g. to avoid catching target species below minimum size), or environmental impacts (e.g. to avoid damage to habitat). When their sole purpose is to control fishing power, regulation may be directly imposing inefficiencies on fishers, and thereby reduce economic performance. Limits to vessel size and power, and days at sea (generally less frequently used in combination with direct output controls) can have similar applications and impacts. Managers should review these policies on a case-by-case basis to determine whether these regulations are actually needed to address specific outstanding issues.

Controls on harvest capacity, such as a limited number of licenses or decommissioning schemes, are generally used to constrain or reduce fishing capacity and were applied in over half of all situations where output is directly controlled. Their use was less prevalent in ITQ fisheries (46% of cases) but far higher in IQ fisheries (85%). A lack of additional information makes interpreting the latter finding difficult. In all cases where additional detail was provided on controls to harvest capacity, measures were reported to be limited licensing, while one industry funded buy-back scheme was also reported to be in operation.

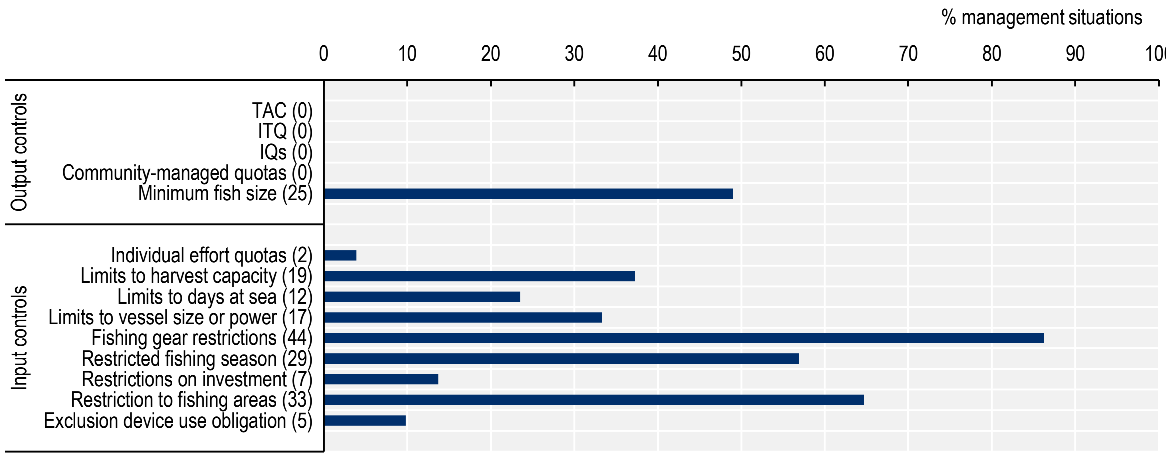
Management measures that limit the areas where vessels are permitted to operate, or the length of fishing seasons, tend to be conservation oriented. These can directly limit fishing impacts on spawning or habitats. In the absence of individual quotas (ITQ, IQ or community), limitations on fishing season length are also applied to control total fishing effort, and their use was reported in 47% of such cases (25% when individual quotas were in place). When used in this specific context, inefficiencies can arise if fishers are unable to adequately spread their fishing effort, and may induce price volatility if short seasons result in markets being flooded (over supply causing price reductions or necessitating preservation through freezing for example).

Excluder devices are conservation-specific technical measures that aim to prevent non-target species (and potentially undersized target species) being retained and killed, reducing the impact on the target or associated stocks. The use of such devices is mandated in 15% (25) of the situations reported. Their use is more prevalent in the management of benthic (predominantly prawns) and demersal species (Annex Table 2.A.2), reflecting the tendency for these fisheries to be associated with higher levels of bycatch.

Fifty-one situations (or 31%) involve combinations of input controls only

In some situations, the use of TACs and quotas can be impractical, due to factors such as the inability to adequately monitor catches and landings. In such cases, input controls, which can be easier to monitor, are used to limit catches. However, even in these situations, the measures implemented will ideally be specified with the objective of limiting catches to at least a notional total level. In 51 management situations, output was not directly controlled (other than with minimum fish sizes in 25 situations). Instead, a range of input controls are used, with an average of 3.3 input-based measures are reported (Figure 2.9). These situations mainly controlled how fishing could take place, with gear restrictions involved in 86% of situations, fishing areas in 65% of cases, fishing seasons in 57%, and minimum fish sizes in 49%. Limits on harvest capacity, days at sea or individual effort quotas were used in less than 40% of cases. When days at sea were used in the absence of TAC or quotas there was a proportionally higher use of every other form of input control (Annex Figure 2.A.4).

Figure 2.9. Occurrence of management measures in situations reported where the only output control is minimum fish sizes



Note: The number of times each specific measure occurs is provided in parentheses.

2.4. Conclusion

Stock status data was reported for 1 119 assessed stocks. It shows that almost a quarter of these stocks (23%) were found to have an unfavourable biological status. Furthermore, for just under half of the 66% of stocks assessed to have a favourable biological status, additional management objectives such as maximising catch volume within sustainable limits were either not met or not defined. Notably, some of the stocks that generate the most valuable landings for OECD countries were assessed to have an unfavourable biological status; and for others status in unknown. At the level of individual countries and economies, situations vary widely.

Information on management was reported for 166 situations, that is, sets of measures applying to a stock (or group of stocks with similar management), drawn from within the key species harvested in reporting countries and economies.[18] About two-thirds of these management situations involve direct controls on how much fish can be caught or landed. Almost a third of countries and economies reported using TAC limits in all management situations reported on, while four did not report the use of a TAC for any management situation. Slightly over half of countries and economies (57%) reported using quotas allocated to individuals or communities; six of whom did so in all management situations reported on.

In most of the situations that involve direct controls on how much fish can be caught or landed, a number of input controls are used in addition, particularly restrictions on fishing gear, areas, and harvest capacity as well as minimum fish sizes. In contrast, about a third of situations involve mixes of input controls only.

Survey results indicate that many potential priorities for action exist where fish stock have an unfavourable biological status, as well as where commercially important stocks are not conclusively assessed. Assessing the status of all stocks of commercial importance – both in terms of biological sustainability and against additional objectives such as maximising catch volume or value within sustainable limits – should be considered as a key step towards achieving sustainable fisheries.

There is further scope to manage fisheries more productively, where stocks have a status that is biologically favourable but that does not allow meeting additional management objectives such as maximising catch volume or value (or where no such additional objectives exist).

While not pre-judging what is possible or necessary for particular fisheries, scope for improving management also seems to exist where there is no direct control of how much fish can be caught or landed, nor notional total allowable catch (TAC) limits achieved through input controls. Scope for improvement similarly seems to exist where sets of management measures are particularly complex, potentially difficult to implement and monitor and even possibly unnecessary following the introduction of output controls.

To identify priorities for action more precisely, countries should continue to share detailed information on stock status as well as on measures used to manage stocks in a comparable framework (such as that used in this chapter). Further analysis of this data is needed to better understand how far stocks with unfavourable biological status are from favourable status, as well as which of these stocks are on positive trajectories thanks to remedial management actions that will allow stock recovery.

To identify management practices best suited to achieving sustainable fisheries in different situations, the information on stock status will need to be related to the information on management to allow further empirical investigation of the effectiveness of fisheries management.

Box 2.2. COVID-19 driven changes to fish stock management

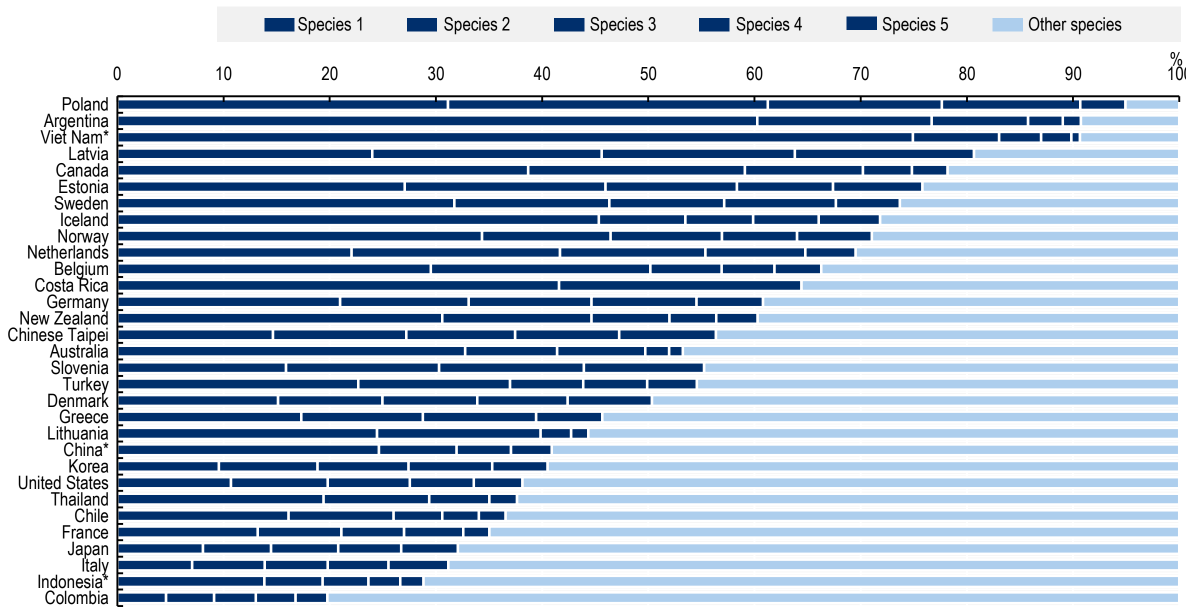
In response to the consequences of the COVID-19 pandemic, governments have adopted a series of support measures that generally aim to mitigate its impacts on seafood production, employment and the welfare of those depending on the sector (Chapter 4). While it is important to make wise use of public resources to support the fisheries sector through the crisis is only part of the story for fisheries, the sustainability of the sector – environmental, economic and social – depends on maintaining and enforcing appropriate fish stock management. This may be challenging as policy makers will face pressure to make up for losses incurred from the crisis during the recovery period and are likely to be looking for low-cost options to lessen hardship. Relaxing constraints on fishing, rather than having to disburse cash, could be seen as one such option.

Management changes have already been implemented in a number of countries. These include the extension of fishing areas and seasons as well as quota deferrals or transfers. By the end of August 2020, 16 measures that adjusted previous fisheries management rules had been identified across eight countries and economies. Shortening the fishing ban season or rearranging the period of fishing season are the most common adjustments among those measures (six measures), followed by quota deferrals or transfers (five measures) reflecting decreased market demand and the difficulty in maintaining the normal level of fishing.

Changes to management rules can be undesirable, however, if they compromise the sustainability considerations of their initial design and ultimately increase the pressure on stocks, especially where that pressure is already too high. Given the complexity of the relationship between fishing effort and the status of fish stocks, and increased pressures on fisheries from climate change, countries should adopt a cautious and evidence-based approach to management changes. This approach will become even more important as monitoring, control and surveillance capacities (in particular, observer programmes) are weakened by the need for social distancing and travel restrictions (Chapter 5).

Annex 2.A. Additional data and information

Annex Figure 2.A.1. Key species' relative importance, 2018



Note: The figure displays the contribution of key species' to countries and economies' total value of landings (or catch volume where indicated by *). The list of key species and how they were determined is detailed in Annex Table 2.A.1.
Source: OECD dataset 'Marine landings' (OECD.Stat), FAO dataset 'Global Fishery and Aquaculture Production Statistics' (FishStatJ).

Annex Table 2.A.1. List of key species: National level

Countries and economies	Key species (1)	Key species (2)	Key species (3)	Key species (4)	Key species (5)
Argentina	Argentine red shrimp (LAA)	Argentine hake (HKP)	Argentine shortfin squid (SQA)	Patagonian toothfish (TOP)	Patagonian scallop (ZYP)
Australia	Australian spiny lobster (LOA)	Southern rock lobster (JSN)	Abalones nei (ABX)	Snappers, jobfishes nei (SNX)	Flatheads nei (FLH)
Belgium	Common sole (SOL)	European plaice (PLE)	Common shrimp (CSH)	Norway lobster (NEP)	Anglerfishes nei (ANF)
Canada	American lobster (LBA)	Queen crab (CRQ)	Pandalus shrimps nei (PAN)	Scallops nei (SCX)	Clams, etc. nei (CLX)
Chile	Anchoveta(=Peruvian anchovy) (VET)	Chilean jack mackerel (CJM)	Araucanian herring (CKI)	Jumbo flying squid (GIS)	Chilean kelp (LJX)
China	Marine fishes nei (MZZ)	Largehead hairtail (LHT)	Japanese anchovy (JAN)	Scads nei (SDX)	Gazami crab (GAZ)
Chinese Taipei	Bigeye tuna (BET)	Yellowfin tuna (YFT)	Pacific saury (SAP)	Skipjack tuna (SKJ)	Albacore (ALB)
Colombia	Marine fishes nei (MZZ)	Spotted rose snapper (LJS)	Pacific sierra (SIE)	Pacific seabob (TIT)	[Brotula clarki] (OBK)
Costa Rica	Sharks, rays, skates, etc. nei (SKX)	Swordfish (SWO)	Croakers, drums nei (CDX)	Yellowfin tuna (YFT)	Crystal shrimp (CSP)
Denmark	Atlantic herring (HER)	European sprat (SPR)	Atlantic cod (COD)	European plaice (PLE)	Atlantic mackerel (MAC)
Estonia	Northern prawn (PRA)	Atlantic herring (HER)	Atlantic redfishes nei (RED)	European sprat (SPR)	Greenland halibut (GHL)
France	Yellowfin tuna (YFT)	Great Atlantic scallop (SCE)	Monkfishes nei (MNZ)	Common sole (SOL)	Norway lobster (NEP)
Germany	Common shrimp (CSH)	Blue whiting(=Poutassou) (WHB)	Atlantic herring (HER)	Atlantic cod (COD)	Blue mussel (MUS)
Greece	European hake (HKE)	European anchovy (ANE)	European pilchard(=Sardine) (PIL)	Red mullet (MUT)	Clams, etc. nei (CLX)
Iceland	Atlantic cod (COD)	Atlantic mackerel (MAC)	Golden redfish (REG)	Haddock (HAD)	Saithe(=Pollock) (POK)
Indonesia	Marine fishes nei (MZZ)	Skipjack tuna (SKJ)	Short mackerel (RAB)	Kawakawa (KAW)	Stolephorus anchovies nei (STO)
Italy	European hake (HKE)	European anchovy (ANE)	Deep-water rose shrimp (DPS)	Common cuttlefish (CTC)	Giant red shrimp (ARS)
Japan	Marine fishes nei (MZZ)	Salmonids nei (SLZ)	Skipjack tuna (SKJ)	Yesso scallop (JSC)	Scomber mackerels nei (MAZ)
Korea	Japanese flying squid (SQJ)	Octopuses, etc. nei (OCT)	Largehead hairtail (LHT)	Japanese anchovy (JAN)	Yellow croaker (CRY)
Latvia	Queen crab (CRQ)	Jack and horse mackerels nei (JAX)	European sprat (SPR)	Atlantic herring (HER)	Pacific chub mackerel (MAS)
Lithuania	Atlantic horse mackerel (HOM)	Pacific chub mackerel (MAS)	Round sardinella (SAA)	Jack and horse mackerels nei (JAX)	Beaked redfish (REB)
Netherlands	Common shrimp (CSH)	Common sole (SOL)	European plaice (PLE)	Atlantic herring (HER)	Atlantic mackerel (MAC)
New Zealand	Red rock lobster (LOR)	Blue grenadier (GRN)	Nototodarus flying squids nei (QND)	Pink cusk-eel (CUS)	Silver seabream (GSU)
Norway	Atlantic cod (COD)	Atlantic herring (HER)	Atlantic mackerel (MAC)	Saithe(=Pollock) (POK)	Haddock (HAD)
Poland	Atlantic herring (HER)	European sprat (SPR)	Atlantic cod (COD)	European flounder (FLE)	Sea trout (TRS)
Slovenia	Common sole (SOL)	Gilthead seabream (SBG)	European squid (SQR)	Caramote prawn (TGS)	Whiting (WHG)

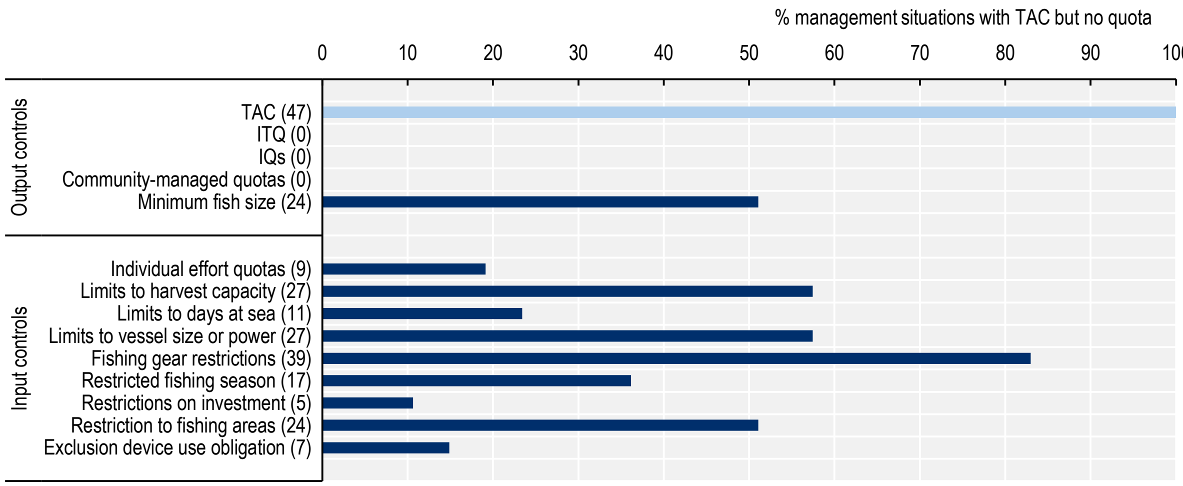
Countries and economies	Key species (1)	Key species (2)	Key species (3)	Key species (4)	Key species (5)
Sweden	Atlantic herring (HER)	Norway lobster (NEP)	Northern prawn (PRA)	European sprat (SPR)	Atlantic cod (COD)
Thailand	Marine fishes nei (MZZ)	Anchovies, etc. nei (ANX)	Common squids nei (SQC)	Sardinellas nei (SIX)	Carangids nei (CGX)
Turkey	European anchovy (ANE)	Atlantic bonito (BON)	Bluefish (BLU)	Whiting (WHG)	Mediterranean horse mackerel (HMM)
United States	American lobster (LBA)	American sea scallop (SCA)	Alaska pollock (=Walleye poll.) (ALK)	Sockeye(=Red) salmon (SOC)	Skipjack tuna (SKJ)
Viet Nam	Marine fishes nei (MZZ)	Tuna-like fishes nei (TUX)	Cephalopods nei (CEP)	Natantian decapods nei (DCP)	Skipjack tuna (SKJ)

Note: The five key species were determined based on their contribution to the value of landings reported for 2016, which was the most recent available data at the time the OECD questionnaire was designed. When the value of landings was not available, key species were determined based on their respective contribution to the 2016 catch volume (for Chile, China, Indonesia, Thailand and Viet Nam).

Annex Table 2.A.2. Occurrence of management measure use in management situations for different species categories

	Species categories				
	Pelagic	Demersal	Benthic	Other	Total
Total management situations by species category Of which the following numbers are using:	68	48	35	15	166
Output controls					
TAC	51	36	18	7	112
ITQ	24	22	10	1	57
IQs	2	6	3	2	13
Community-managed quotas	6	0	2	0	8
Minimum fish size	26	34	17	4	81
None	4	4	7	3	18
Input controls					
Individual effort quotas	4	9	4	2	19
Limits to harvest capacity	35	21	19	6	81
Limits to days at sea	7	6	11	3	27
Limits to vessel size or power	29	15	13	5	62
Fishing gear restrictions	42	40	31	11	124
Exclusion device use obligation	3	7	13	2	25
Restricted fishing season	24	15	15	9	63
Restriction to fishing areas	33	30	25	6	94
Restrictions on investment	8	8	6	2	24
None	4	1	1	0	6

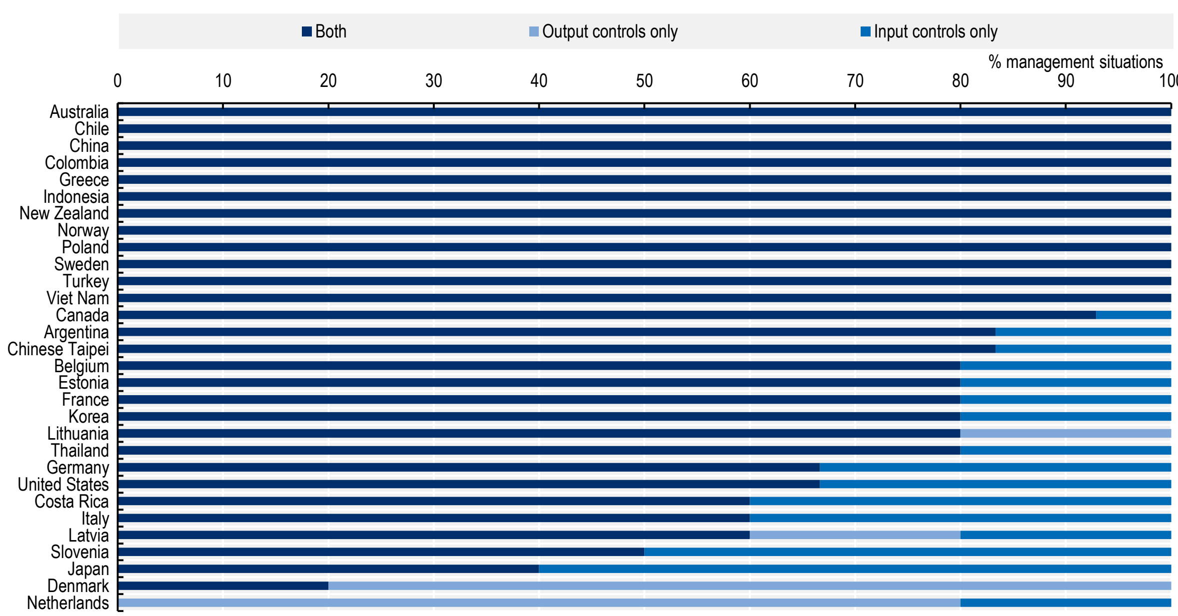
Annex Figure 2.A.2. Occurrence of management measures in management situations with TAC limits but no quota



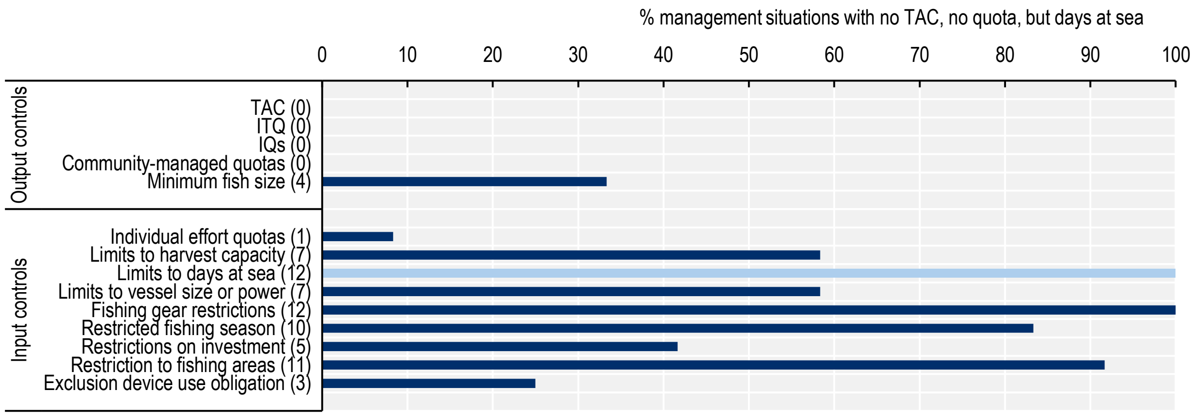
Note: The number of times each specific measure occurs is provided in parentheses.

Annex Figure 2.A.3. Sets of management measures used

Output based only, input based only, and both



Annex Figure 2.A.4. Occurrence of management measures in situations with no TAC and no quota, but with limits to days at sea



Note: The number of times each specific measure occurs is provided in parentheses.

References

Asche, F. and J. Bronnmann (2017), "Price premiums for ecolabelled seafood: MSC certification in Germany", *Australian Journal of Agricultural and Resource Economics*, Vol. 61/4, pp. 576-589, http://dx.doi.org/10.1111/1467-8489.12217. [2]

Belschner, T. et al. (2019), "Evaluating fisheries systems: A comprehensive analytical framework and its application to the EU's Common Fisheries Policy", *Fish and fisheries* 20(1), pp. 97-109. [7]

Brodziak, J., M. Traver and L. Col (2008), "The nascent recovery of the Georges Bank haddock stock", *Fisheries Research*, Vol. 94/2, pp. 123-132, http://dx.doi.org/10.1016/j.fishres.2008.03.009. [11]

FAO (2020), *The State of World Fisheries and Aquaculture 2020*, FAO, http://dx.doi.org/10.4060/ca9229en. [4]

FAO (2018), *The State of World Fisheries and Aquaculture*, http://www.fao.org/3/I9540EN/i9540en.pdf. [8]

FAO (2008), *The State of World Fisheries and Aquaculture*, http://www.fao.org/3/i0250e/i0250e00.htm. [5]

Fernández Sánchez, J., J. Fernández Polanco and I. Llorente García (2020), "Evidence of price premium for MSC-certified products at fishers' level: The case of the artisanal fleet of common octopus from Asturias (Spain)", *Marine Policy*, Vol. 119, p. 104098, http://dx.doi.org/10.1016/j.marpol.2020.104098. [3]

Hilborn, R. et al. (2020), "Effective fisheries management instrumental in improving fish stock status", *Proceedings of the National Academy of Sciences*, Vol. 117/4, pp. 2218-2224, http://dx.doi.org/10.1073/pnas.1909726116. [6]

OECD (2020), *Sustainable Ocean for All: Harnessing the Benefits of Sustainable Ocean Economies for Developing Countries*, The Development Dimension, OECD Publishing, Paris, https://dx.doi.org/10.1787/bede6513-en. [1]

OECD (2013), *The OECD Handbook for Fisheries Managers: Principles and Practice for Policy Design*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264191150-en. [10]

OECD (2010), *The Economics of Rebuilding Fisheries: Workshop Proceedings*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264075429-en. [9]

Notes

[1] FAO defines stocks that are not "within biologically sustainable levels" as "stocks less abundant than the level needed to produce MSY" ((FAO, 2018[8])) – such stocks are also sometimes referred to as being "overfished" or "fished at biologically unsustainable levels" (FAO, 2020[4]). Determining status with respect to biological sustainability on the basis that a stock is not abundant enough to produce MSY is potentially conservative given that failure to meet such a target does not necessarily mean that long-term biological viability is at risk. The calculation of the global proportions of stocks within biologically sustainable levels (and at biologically unsustainable levels) treats all fish stocks equally regardless of their biomass and catch." (FAO, 2020[4]).

[2] Examples of successfully rebuilt stocks include Norwegian spring spawning herring (OECD, 2010[9]), Atlantic scallops (OECD, 2013[10]), Georges Bank haddock (Brodziak, Traver and Col, 2008[11]).

[3] This reflects the fact that the primary actors of fisheries management are national entities, even when they implement decisions taken in co-operation with other countries as in the case of countries of the European Union or decisions taken by regional bodies such and in the case of fisheries managed by regional fisheries management organisations.

[4] While SDG target 14.6 explicitly refers to the need to implement science-based management, the extent to which this is done is not yet assessed in SDG progress tracking.

[5] The question is particularly acute where first-best options are not possible or difficult to implement, such as in data-poor fisheries and in fisheries that target a multitude of species, notably in tropical waters (Hilborn et al., 2020[6]). Much work to date indeed naturally focuses on areas where information is relatively more available, on both management measures and stock status, and these tend to be the places where there is also the capacity to manage.

[6] In advocating a precautionary approach to fisheries management, the FAO Code of Conduct for Responsible Fisheries (http://www.fao.org/3/v9878e/v9878e00.htm#7) recommends "[…] on the basis of the best scientific evidence available, inter alia, determin[ing]: a) stock specific target reference points, and, at the same time, the action to be taken if they are exceeded; and b) stock-specific limit reference points, and, at the same time, the action to be taken if they are exceeded; when a limit reference point is approached, measures should be taken to ensure that it will not be exceeded."

[7] As different types of reference points can be used (limits, targets and combinations of these; possibly based on both B – stock biomass – and F – instantaneous fishing mortality); respondents were asked for the types of reference points currently in use, for each stock, as well as for links to the full stock assessment reports. The data reveal a large degree of commonality in approaches across countries. While there are some variations in preferred metrics of success, the underlying principles are in many cases the same.

[8] The questionnaire asked respondents to provide information on every stock for which they had defined quantitative targets or thresholds and stock status with respect to those had recently been assessed. The criteria here was that only assessments completed recently enough to still be considered valid should be reported, but what that constituted in each instance was left for the reporting authority to determine. In practice, most assessments are less than three years old but may be as old as ten in some cases.

[9] Some stocks are harvested by more than one country or economy and were consequently reported against more than once. The total numbers presented in the chapter were thus adjusted to avoid double counting.

[10] Insufficient information on the contribution reported stocks make to total landings at the country level currently prevents reporting the proportion of landings from stocks assessed to be in a sustainable situation (and meeting additional management objectives). To date, value of landings is reported to the OECD at the level of individual species, not stocks. Improving the evidence base to link data on stocks status and on landings is something the OECD will be working on in the future.

[11] The data collected indicates that, in some cases, management objectives can be considered as met despite the biomass of a stock being unknown or at a level that is low enough to be of concern. For example, this can be the case where management objectives are based solely on the relative level of F, such that management objective could be considered as met where, for example, F/FMSY<1 but B/BMSY<1 or unknown. These cases are not considered in Figure 2.2.

[12] Where stocks are shared, assessments may be mandated and undertaken by regional fisheries management organisations (RFMOs) or organisations such as the International Council for the Exploration of the Sea (ICES).

[13] The determination of key species was based on 2016 landings value. When the value of landings by species was not available, the key species were determined based on their relative contribution to 2016 total catch volume (this was the case for Chile, China, Indonesia, Thailand and Viet Nam). The list of key species is detailed in Annex Table 2.A.1.

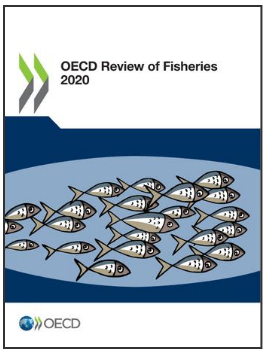
[14] http://www.fao.org/3/w7292e/w7292e05.htm.

[15] TACs have proportionally higher representation in situations managing pelagic and demersal species. IQs and ITQs are most frequently applied in the context of demersal species management (Annex Table 2.A.2).

[16] The use of quotas, without that of a TAC was reported in two instances involving IQs and one involving community-managed quotas. *De facto*, however, if the sum of individual quotas is controlled, it can be considered that output is being capped (and that an implicit TAC is consequently in place).

[17] While some level of regulation is likely always necessary, e.g. to ensure the use of conservation measures or to achieve distributional management objectives, it is not uncommon for new regulations to be introduced on top of existing ones. This can be especially relevant when output based measures are introduced to control catches, as in some cases this can result in existing input controls becoming redundant and imposing unnecessary constraints on fishers.

[18] The management survey information characterises a non-randomly sampled subset of reporters' fisheries. While these fisheries accounted for 57% of the value of landings in the reporting countries and economies at the time the questionnaire was designed, it cannot be assumed that the reported frequency of use of specific measures (e.g. TACs) is representative of overall management.



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