Fisheries and Aquaculture in Colombia

OECD

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FISHERIES AND AQUACULTURE IN COLOMBIA

Foreword

Managing fisheries and aquaculture in Colombia is a particularly challenging task given the variety, richness and geographical spread of the country's water ecosystems and the complex situation of fishing communities. Fishing and aquaculture take place on both the Pacific and Caribbean coasts as well as in the numerous freshwater basins of this tropical and megadiverse country, which is home to one of the greatest variety of fish on the planet. Fishing and aquaculture production are often a last resort or buffer activities for populations marginalised by poverty, unemployment, remoteness or conflict.

The potential for sustainable and inclusive growth of the sector has been recognised by the Colombian government, which has put fisheries and aquaculture high on its political agenda and worked to improve the institutional and legal framework in which the sector operates. In 2011, a new executive agency was created, the National Authority for Fisheries and Aquaculture (*Autoridad Nacional de Acuicultura y Pesca*), and currently two laws are being drafted that will improve institutional mandates to regulate fisheries sustainably, and strengthen the judicial and administrative penal procedures related to illegal fishing. These two priorities were identified through a comprehensive process of stakeholder consultation.

The on-going design of new institutional and legal arrangements for the sector is a key opportunity for Colombia to align with OECD best policies and practices. The OECD Fisheries Committee's Review of Colombian fisheries and aquaculture policies aims to support domestic policy makers and regulators, as well as to inform OECD countries of the state of the country's fisheries and aquaculture.

The main challenge identified by the Review is the need for management and rebuilding plans to better address overfishing. The OECD proposes that the current regulation of fish stocks – which rests on a complex mix of controls on types of fishing and catch quotas, as well as restrictions on where and when fishing can take place – should be enhanced by the introduction of long-term objectives with clear deadlines that can be monitored. A corollary challenge is to improve monitoring and enforcement of regulations, notably in fisheries operated by small-scale and artisanal boats, the majority of which are not registered with the competent authorities. By scaling-up government efforts to incentivise fishers to obtain a license and to invest in monitoring and surveillance, including at the level of local communities, Colombia can improve the effectiveness of its regulatory approach and work to protect the sustainability of its fisheries and the incomes they generate.

Improving data collection will greatly help Colombia to design policies that integrate social and economic objectives with the need to rebuild and maintain fish stocks and ecosystems. Currently, lack of information makes it challenging to fully understand the contribution of different segments of the sector to employment, value creation, exports, or food consumption. The development of more comprehensive data sets will help the government identify the fisheries and aquaculture production areas in which infrastructure development support is most needed. It will also help with efforts to promote local employment and alternative livelihoods, and alleviate threats to food security.

There is also scope for current institutional and legal reforms to formalise the processes through which fishing rights are allocated and scientific information on the status of resources is collected and used in order to set sustainability targets. Transparent and legitimate processes will indeed become increasingly critical as the number of formal operators in the sector grows.

The Colombian government, with the support of the OECD, is working to ensure the domestic reform process takes into account the Review's findings. We look forward to working together to design and implement high quality policies that support the sustainable and inclusive growth of fisheries and aquaculture in Colombia.

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Fishing and aquaculture occur along the Pacific and Atlantic coasts of Colombia, as well as in the inland waters, notably in the major watersheds of the Magdalena, Amazonia, Orinoquia and Sinú rivers where fish is harvested for food consumption and for the ornamental market. Both industrial and artisanal fleets operate on the coasts, while fishing in inland waters is essentially artisanal. Aquaculture production is largely dominated by inland freshwater pisciculture. Artisanal fishers and farmers account for about a third of the combined capture and aquaculture production.

Even though the fisheries sector makes only a small contribution to GDP, accounting for less than 0.2% in 2012 (FAO, 2015),it provides jobs, incomes and food in rural areas where economic opportunities are scarce. These include the regions home to indigenous communities and people displaced by the internal conflicts that Colombia has known since the 1940s. Data is critically missing to understand the contribution of different segments of the sector to employment, value generation and poverty reduction and food security. It is estimated, however, that over 1.5 million people work in the sector and associated services. The sector therefore plays an important role in the local economy of poor rural and coastal regions, and has the potential, if managed appropriately, to contribute to the government's goal to promote sustainable and inclusive growth in all parts of the country. A number of challenges currently prevent it from contributing fully.

Production from capture fisheries has decreased significantly over the last ten years, mainly due to overexploitation of the main harvested species. In 2013, about 70 000 tonnes of fish were captured, down almost by half from the peak levels of the 1990s (MADR, 2014). Over half of all marine species for which information was reported are estimated to be overfished. Overexploitation is also believed to be a serious concern in continental waters, although the status of the resources on which inland fishing relies remains largely unknown.

The aquaculture sector, however, is growing rapidly, reflecting global trends. Since 2008, aquaculture has produced more than capture fisheries, with about 88 000 tonnes of fish products farmed, an almost three-fold increase from the mid-1990s (MADR, 2014). Future growth in fish production is likely to come primarily from aquaculture. However, overall growth hides intrasectoral variations. Marine aquaculture, which was essentially devoted to shrimp production, almost collapsed in the mid-2000s because of a disease outbreak. Colombia has since built reliable diagnostic laboratories of aquaculture diseases and scientific research has developed technical packages to increase productivity. Transfer of technologies and good practices could be scaled up, but the transport and storage infrastructure that could support production expansion is lacking and the sector remains largely small-scale and informal.

Fragmented decision-making has weakened fisheries governance

Governance of the fisheries and aquaculture sector in Colombia is a shared responsibility between environmental and agricultural authorities. The Ministry of Agriculture and Rural Development (MADR) and the Ministry of Environment and Sustainable Development (MADS) cooperate to design and adopt laws and regulations that impact hydro-biological and fishery resources. They also cooperate to assess the possible environmental impacts of aquaculture activities on coastal areas and inland watersheds and the design of mitigation strategies.

Responsibilities for policy implementation are similarly shared between the entities in charge of putting into effect MADR and MADS policies. The National Authority for Aquaculture and Fisheries (*Autoridad Nacional de Acuicultura y Pesca,* AUNAP) is the main entity in charge of fisheries and aquaculture management.

Decisions regarding the management of resources, such as the definition of species authorised for cultivation or the setting of catch volume quotas, are undertaken within the framework of the Executive Committee for Fisheries (CEP), an inter-agency law enforcement entity which brings together representatives of the MADR, MADS and AUNAP. Responsibility for the granting of permits and authorisations for fishing and aquaculture activities is shared between the AUNAP and the Autonomous Regional Corporations (CARs), which are responsible for implementing environmental policies and natural resource management at sub-national levels under oversight and coordination by MADS.

Such fragmentation of the mechanisms of governance and their dispersion over two ministries has sometimes led to management inconsistencies and increased transaction costs for designing and implementing policies, which ultimately weakens policy impacts and generates inefficiencies. In addition, institutions in charge of this governance have frequently been modified, which has resulted most notably in interrupted data collection processes.

Regulation should include fisheries management plans that integrate small-scale fishers

Fisheries in Colombia are currently regulated as individual species through regulated open access regimes. A varied set of controls based on effort and output controls, as well as restrictions on the areas and seasons where fishing is permitted, leads to opacity and high transaction costs. A lack of objectives with clear deadlines complicates understanding the impact and success of the measures used. A parallel problem is that management is weakened by insufficient implementation of regulation. For example, there is no reliable inventory of small-scale and artisanal boats fishing in coastal and inland ecosystems, thus making it difficult to regulate effort.

In addition, as outlined in the OECD Council Recommendation on Rebuilding, management of fisheries should not only be based on the regulation of stocks, but also address direct fisheries adjustment, local employment, regional impacts and the need for alternative employment and livelihood opportunities, as well as food security in an integrated way. To date, however, these issues are addressed mostly through support policies and are not explicitly integrated into management and rebuilding plans. The main obstacle to better integration of social and economic objectives in management and rebuilding plans is the lack of data to understand the contribution of different segments of the sector in terms of employment, value generation, poverty reduction and food security.

Managing fisheries and aquaculture is a particularly difficult task in the geographical and social context of Colombia, a tropical country with a large number of diverse watersheds and ecosystems. This richness results in one of the highest biodiversity indices and the greatest variety of fish on the planet, which implies a relatively low abundance of each species and fragile ecosystems. Moreover, for populations marginalised by poverty, unemployment, climatic events and conflicts, fishing and aquaculture production are often last resort or buffer activities. This situation makes it politically and economically difficult to restrain or regulate access to resources.

Governance reform agenda presents a key opportunity to improve fisheries and aquaculture management

The Colombian government is aware of the challenges this sector faces, and recognises that the existing governance and management framework is inadequate and outdated for the responsible and sustainable management of Colombian fisheries and aquaculture. For this reason, a comprehensive reform of the institutional and legal framework for fisheries and aquaculture is underway after a long process of stakeholder consultation. Two draft laws have being designed by the Colombian government. The draft law "which regulates the rational and sustainable exploitation of fisheries resources and the development of aquaculture" (hereafter the draft law on fisheries and aquaculture management) sets the general framework in which the sector operates and is scheduled to be presented to Congress before the end of 2016. In addition, a specific draft law "which establishes measures against illegal fishing and illicit fishing activities in the Colombian maritime territory" (hereafter the draft law against illegal fishing) was filed for review by Congress in March 2016. Policy plans have also been established for the

fisheries and aquaculture sub-sectors, which define a long-term vision for the sector and prioritise a first set of actions to be taken over the 2014-18 period.

The proposed legislation would give greater management responsibility to the AUNAP; improve mechanisms for inter-institutional cooperation; strengthen judicial and administrative penal procedures related to illegal fishing practices; and formalise the creation of intermediate institutions through which stakeholders can participate in policy-making at the national and regional levels. The proposed legislation also stipulates that the AUNAP should consider establishing rights-based fisheries management in its different modalities as appropriate, and Total Allowable Catches (TACs) for the main species harvested, implying greater use of such output control measures and less reliance on effort control.

The current institutional and legal reform is a key opportunity to integrate OECD best policies and practices into Colombian policies and practices for fisheries and aquaculture management. In this context, the OECD Fisheries Committee finds that the efforts engaged by Colombia to better govern and manage its fisheries and aquaculture sector are going in the direction of the best policies and practices it has identified, and notably the principles set out in the Council Recommendation on Rebuilding. As with many OECD countries, the challenge for the Colombian government lies in designing, and also implementing, policies that specifically put these principles into action. This report identifies a number of policy recommendations to guide the government in doing so.

Policy Recommendations

This report identifies the need for a greater shift in fisheries resources management away from a diffuse system of species-specific input and output controls to the use of multi-annual rebuilding and management plans that have clearly defined objectives and timeframes. Monitoring the progress of these plans and regularly updating measures will be key to ensuring their acceptability among fishers.

Designing such plans requires Colombia to collect and use better information. This could be achieved by expanding the geographical scope of regular data collection, increasing the number of species covered, notably in inland waters, and allowing information on socio-economic variables and the biological status of resources to be incorporated in the data system of the AUNAP.

On the governance side, current institutional reforms could formalise the process of collection of scientific information on the status of resources and the role of scientific information in decision-making, as well as establish requirements for making this information easily accessible to the public. Sustainability targets and the criteria according to which fishing rights are allocated could also be better legally defined.

The report identifies scope for strengthening monitoring and surveillance. Monitoring capacity at landing sites should be increased, and an effective real time catch and fishing effort information system for target species and by-catch created. Efforts are needed to bring fishing in inland waters, as well as aquaculture, into the formal economy to allow better monitoring and contro,l and to facilitate technology transfers by extension services. Further simplification of administrative procedures as well as better inter-institutional cooperation can help facilitate registering and licensing.

Finally, the report emphasises the potential of investment in education and qualifications in rural regions as a means to opening perspectives for alternative livelihoods in areas where small-scale fishing and aquaculture is undertaken. This would facilitate the transition to more remunerative activities while lessening the pressure on resources.

1 Consolidating the Contribution of Fisheries and Aquaculture to Sustainable and Inclusive Growth

A rich and fragile natural resource base

Fishing and aquaculture in Colombia have historically been carried out on both the Pacific and Atlantic coasts and in inland waters. Colombia has over 3 000 km of coastline and exclusive economic zones in the Pacific and the Caribbean Sea that cover over 800 000 km^2. The country has over 700 000 micro basins and more than 20 million hectares of aquatic ecosystems, such as lakes, ponds, reservoirs and channels. The main watersheds used for inland fisheries and aquaculture include the basins of the Magdalena, Amazonia, Orinoquia and Sinú rivers. The country has multiple and diverse hydrological freshwater, brackish, and marine ecosystems and a wide variety of relatively stable climatic conditions (AUNAP/FAO, 2014).

This richness results in one of the highest biodiversity indices and greatest diversity of fish on the planet (Andrade, 2011). Such a high level of biodiversity implies a relatively low abundance of each species. Fish harvests are thus relatively modest (compared to neighbouring countries like Peru, for example) and ecosystems are particularly fragile.

Colombia shares a large number of hydrographic watersheds and their freshwater fish stocks with neighbouring countries, Brazil, Ecuador, Peru and Venezuela. Some of the marine stocks harvested in the coastal areas of the Pacific Ocean and Caribbean Sea, where the main fishing ports are located, are also shared with neighbouring coastal countries, notably Ecuador, Panama and Venezuela.

Fishing and aquaculture are highly diversified

Reliable statistics, necessary to characterise the fisheries and aquaculture sector of Colombia, are critically missing. No census has been conducted in recent years and data are lacking for volumes harvested and farmed, value generation and associated employment. Estimating the competitiveness and productivity of different sub-sectors or their contribution to incomes, food security and poverty reduction is even more difficult. The largely informal nature of fishing and aquaculture production in Colombia and the dispersion of fishermen and aquaculture producers throughout the country partly explain this situation. This is particularly true for inland fisheries, where fishers operate in large regions with few urban concentrations, not only in the main channels of rivers but also in tributaries, streams, lagoons and flood plains.In addition, the seasonal nature of fishing with periods of abundance at tidal changes means that the number of fishers varies significantly over the course of a year. It is thus to be expected that existing figures are an underestimation of production and effort. According to data submitted by the MADR, Colombia harvested about 70 000 tonnes of fish, crustaceans and molluscs in 2013. The figure for 2014 is 48 000 tonnes, but according to staff in the Ministry, the discrepancy between these numbers indicates difficulties in collecting information rather than a decline in harvest. Relying on data for 2013, marine fishing accounted for about 90% of the total catch volume, most of which originated in the Pacific Ocean. The Atlantic Ocean only accounts for about 5% of the marine catch.

Over half the marine harvest is caught by the industrial fleet, which only operates along the coasts. The contribution of the artisanal fleet varies from just under 50% of the marine catch in 2013 to less than 20% in 2014 – probably reflecting data collection issues. The industrial fleet targets mainly tuna and shrimp, both largely directed to export markets. Artisanal fishers primarily target fish for local consumption both on the coast and in inland waters, where they also fish ornamental species that are exported. According to the AUNAP, in 2013 the Magdalena watershed was the main contributor to inland harvests with over 70% of the total catch, followed by the Amazonia, Sinú and Orinoquia basins (AUNUAP, 2013b).

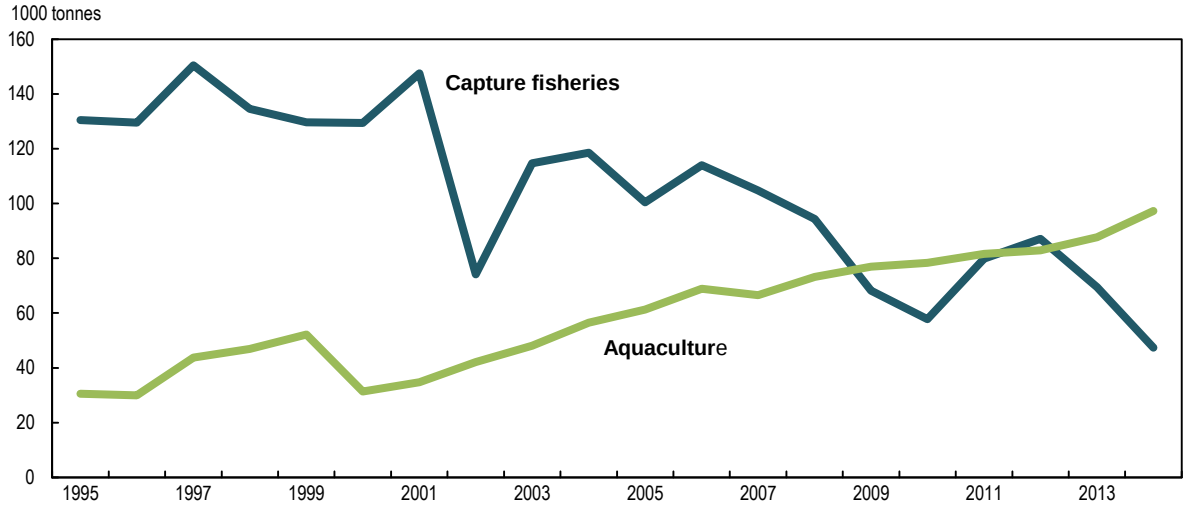
Aquaculture produced almost 88 000 tonnes of fish for local consumption and export in 2013 and 100 000 tonnes in 2014 (data submission from the MADR). The sector is largely dominated by inland freshwater pisciculture and small-scale farmers produced about a third of the total volume. Three species account for the bulk of production: silver and red tilapia contribute around two-thirds of the total volume, while rainbow trout and white and black cachama each account for around 13% (FAO, 2015a). Shrimp is the main farmed species in marine waters, but production has recently shrunk to very low levels following an outbreak of white spot disease and unfavourable exchange rates.

In terms of evolution, fisheries and aquaculture have followed opposing growth paths (Figure 1), and future growth in fish production is likely to come mainly from aquaculture. Production from capture fisheries has decreased significantly over the ten years, mainly due to overexploitation of the main species harvested. Production in 2013 accounts for only about 50% of peak level harvests in the 1990s. Aquaculture production, however, increased almost three-fold between the mid-1990s and 2013, reflecting global trends.

The sector's important contribution to often rural jobs, incomes and food remains insufficiently documented

Various documents from the MADR and AUNAP suggest that Colombia has between 67 000 and 150 000 artisanal fishers, of which about a third would operate on the coasts and two-thirds in inland waters (MADR data submission and Esquivel et al., 2014). The difference between these estimations is a reflection of differences in calculation methods, with the smallest number based on registries and the highest figure based on estimations that include non-registered fishers and informal jobs. Approximately 10 000 to 15 000 additional jobs are reported to be directly linked to industrial fisheries. Based on an estimation made by the Ministry for Trade, Industry and Tourism, the MADR believes that the aquaculture sub-sector generates about 1.2 jobs per tonne of production, and therefore estimates employment in the sub-sector to be almost 120 000 jobs, a third of which on small-scale farms.

Figure 1. Decreasing captures are made up for by growth in aquaculture, 2012

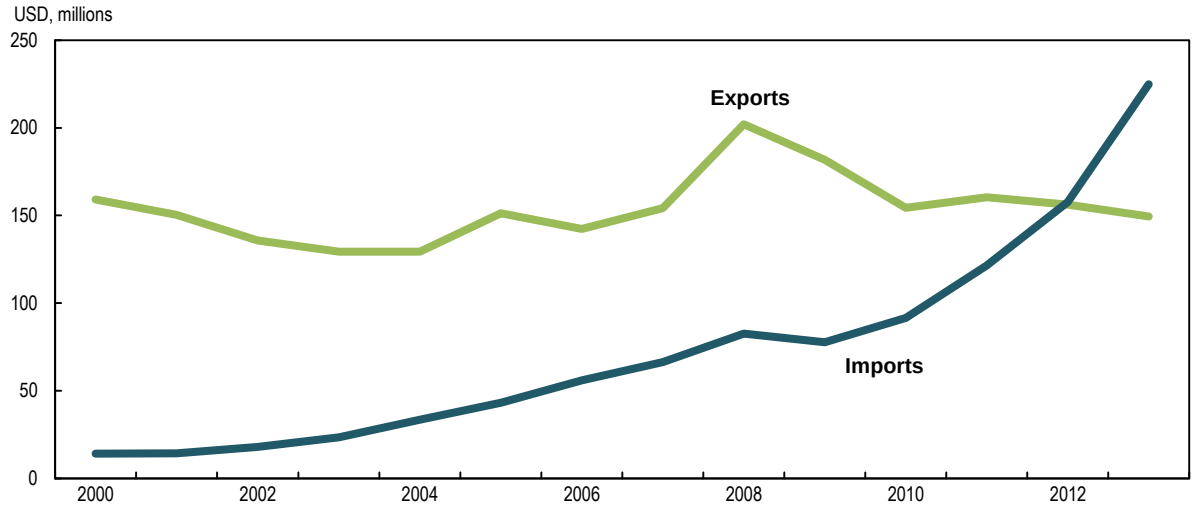


This is more or less in line with 2013 estimations of 29 000 small-scale aquaculture farmers (Esquivel et al., 2014). In addition, indirect jobs in associated activities – such as processing, fish landing, vessel maintenance, transport, trade and services – bring total employment associated with the fisheries and aquaculture sector to 1.5 million people according to the 2012 national census (DANE, 2014). This figure is slightly more than 5% of national employment. A large percentage of fishing and aquaculture activities are located in some of the poorest parts of Colombia, notably home to indigenous communities and people displaced by the internal conflicts that the country has known since the 1940s. The DANE household survey shows that half of the people involved in fishing and aquaculture production have only a basic primary education level and almost one-fifth are illiterate. Over three-quarters earn less than the minimum legal salary. It is therefore likely that many actors who engage in subsistence fishing or fish cultivation have few alternative options.

The contribution of fisheries and aquaculture to GDP in Colombia is relatively small. The sector represented less than 0.2% of GDP in 2012 (FAO, 2015a). The most valuable sub-sectors are those targeting products for export, which usually account for at least three-quarters of the ex-vessel value of fisheries output. The tuna fishery was valued at USD 120 million in 2012, and the shallow and deep water shrimp catch accounted for another USD 13.5 million. In 2013, the inland ornamental fish catch was estimated to be USD 12.5 million (MADR data submission). The value of aquaculture production was approximately USD 222 million in 2011 (Esquivel et al., 2014; MADR 2014), with tilapia accounting for more than 60%.

About 5 kg of fish is consumed annually per capita, meaning that fish is a relatively small contributor to average food consumption (FAO, 2015a). According to the FAO balance sheet for 2013, fish accounted for only 3% of total protein consumption on average, slightly more than 5% of total animal protein consumed and less than 1% of average calorie intake. However, these averages hide strong regional and household-level variations. Worldwide, fish is the cheapest and most easily accessible source of protein in many coastal areas, often available year-round including when other sources of protein are at a seasonal low. In many coastal communities it is the main source of animal protein, especially for poor and food deficient people (Karawakuza and Béné, 2011). Fish, especially when eaten whole, is also an important source of essential fatty acids and micronutrients, which are an important complement to the predominantly carbohydrate-based diets of many poor people (FAO, 2012). These micronutrients include vitamins A, B and D as well as iodine, iron, zinc and calcium. Information is lacking on the importance of fish consumption in diets in coastal and rural communities of Colombia.

Figure 2. Growing imports of seafood has created a deficit in the balance of trade



Total exports generated by fishing and aquaculture in Colombia amounted to about USD 150 million in 2013 (DIAN, 2014). The main destinations were the Franc Zone of Cartagena, the United States, Spain, France, and Ecuador (FAO, 2015a). Total imports of fish products in 2013 reached USD 225 million. Imports mainly originated from Viet Nam, Chile and Ecuador, Senegal, the People's Republic of China, South Africa, and, since 2013, the United States (FAO, 2015a). Colombia accounts for 5% of global ornamental fish trade. A deficit in the balance of trade appeared beginning in 2012, reaching USD 75.5 million in 2013 (DIAN, 2014). This is notably the result of increasing imports following trade liberalisation through regional trade agreements. Fisheries products are generally subject to a 15% MFN tariff. However, the most important source countries of Colombian imports face zero preferential tariffs. Import competition from low-cost aquaculture products sourced in Asia is a concern for the government. Protectionist policy has, however, not been used to tackle this issue; instead, promotional campaigns for the consumption of locally-produced or harvested products are being undertaken.

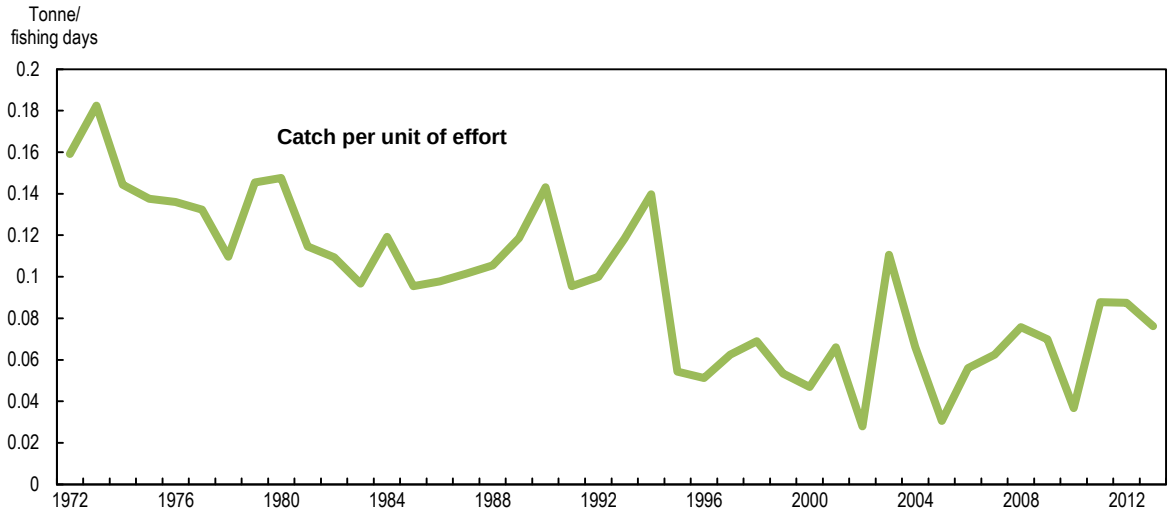
Resources are largely over-exploited

Over half of the marine species for which information was found for this study are said to be over-exploited. A further third of these species are fully exploited; that is, harvested in the neighbourhood of the maximum sustainable yield (MSY). MSY is the maximum annual catch which can sustainably be taken from a fish stock without compromising the productivity of that stock. Colombia´s overexploited and fully exploited stocks therefore constitute the vast majority of the stocks currently harvested.

One of the least sustainable segments of the Colombian industrial fleet is the Caribbean industrial crustacean fleet, which targets a number of overexploited shrimp species. Figure 3 shows how drastically the catch per unit of effort (CPUE) for these species has declined between 1972 and 1996, reducing significantly the profitability of this activity. In recent years (2007-2013), the CPUE of shrimp species seems to be stabilising and signalling a moderate stock recovery as a result of a substantial reduction in fishing effort due to lower capture rates and unfavourable export conditions. The Pacific shrimp fishery is similarly at risk: two of the three main species harvested are reported as overexploited, while the third is found to be fully exploited. Other molluscs harvested by this fleet were also found to be over-exploited.

The Caribbean Sea yellowfin tuna fishery is the only under-exploited stock where growth in catch can be envisaged. This migratory species is exploited by different countries and is regulated by the International Commission for the Conservation of Atlantic Tunas (ICCAT), of which Colombia is a member.[1] Other fisheries – both industrial and artisanal – target a mix of fully and overexploited stocks.

Figure 3. Falling abundance of shrimp species in the Colombian Caribbean



Source: Rueda et al.

According to Lasso et al. (2011), 173 species were caught in inland waters for the consumption of riverine communities in 2010; 17% of these (31 species) faced some degree of threat. These estimates have not been updated and the current stock statuses of the dominant ornamental species harvested have seldom been studied (Ajiaco-Martínez, et al., 2012).

This situation of stock status is worrying, both from a conservation and economic perspective. The environmental and economic impacts of overfishing have been widely studied. Fisheries that are overfished are less productive, less resilient and, if overfishing persists, prone to collapse. The economic and social consequences of further declines in – or collapses of – fish stocks are significant, particularly for the regions that rely on the fisheries sector for food security and broader economic activity.

The more general status of ecosystems and biodiversity is also a source of concern for the sector. The *OECD Environmental Performance Review for Colombia* found that the rich biodiversity of the country is under threat, notably because of an increasing use of land by the agricultural sector and growth in infrastructure and extractive industries (OECD/ECLAC, 2014). There is evidence that the inland ecosystems on which inland fisheries and aquaculture rely have been endangered by increasing pollution and contamination by agriculture and mining (Ajiaco-Martínez et al., 2012). In addition, a recent study on *Economic Impacts of Climate Change in Colombia* (DNP-BID 2014) shows that the frequency and intensity of extreme weather events has increased over the past decade in Colombia. Potential impacts for the sector, through changes in oceanographic patterns and species' reproductive, migratory and spatial distribution patterns as well as the human dimension effects of climate change in coastal and riverine communities however remain largely unknown.

Better management decisions require investment in improved data collection

As evidenced above, the scientific base to aid fishery and aquaculture management decisions remains insufficient. Institutional instability is one of the factors that has hindered the systematic data collection needed to monitor the evolution of the sector as data collection processes have been interrupted and modified with institutional changes. The diverse nature of the sector and the geographical spread of its actors is another. The government is conscious of the problem and improving data collection and dissemination has been one of the key objectives of the AUNAP since its creation.

Over the past few years, the AUNAP has developed the Colombian Fisheries Statistical System (SEPEC) with the support of the University of Magdalena and budgets allocated to the development of the SEPEC are increasing over time. The SEPEC contains a database and interactive software that is accessible to the public. This allows the public to consult fisheries and species-specific information collected

by the AUNAP as well as the archives of the various institutional bodies that contributed to fisheries and aquaculture management before the creation of the AUNAP.

Currently, the SEPEC displays catch and effort information for marine fisheries as well as trade data for the sector more generally. It contains little information on the aquaculture and inland fisheries sub-sectors, and no socio-economic information on the sector more generally, such as employment and value generation. Information on the status of the resources on which the sector relies is also lacking. Similarly, the recently published statistical volume *Colombia, Fishing in numbers 2014* (FAO, 2015a), which is meant to be a reference document for policy makers, does not contain information on the contribution of different sub-sectors (artisanal vs. industrial, aquaculture vs. fishing and different species) to employment and income generation, and little is known about their profitability and competitiveness. Nor is there any information on the status of resources. Improving access to information on fish stocks and ecosystems that are collected by different research centers and not directly by the AUNAP is needed in particular. Such information is difficult to find, scattered in a large number of technical documents accessible from different sources.

Expansion of the geographical scope and species covered by the data-gathering exercises feeding the SEPEC is on-going. The launch of two new data collection modules for ornamental fisheries and aquaculture on a pilot basis is a first step. Efforts remain to be made, however, in terms of variables covered. It is recommended that the AUNAP conducts a review of available sources, identifies information that needs to be retrieved by the AUNAP directly, and designs a strategy for a comprehensive and systematic information collection process. There is potential to improve the availability of information by extracting information from outside sources and incorporating it into the SEPEC in a reader-friendly way. On the status of resources, a first step might be to integrate the information collected in the Inter-Institutional Committee when designing catch quotas such as those contained in INVEMAR and AUNAP (2015). Along the same lines, some information could be extracted from outside sources such as the DANE household surveys. However, undertaking a specific census for the sector in order to have a comprehensive baseline of data seems urgent.

2 Colombia's Governance Framework for Fisheries and Aquaculture is Improving

A fragmented and frequently changing institutional framework for the governance of fisheries and aquaculture has until recently impeded adequate management in Colombia. The creation of the National Authority for Fisheries and Aquaculture (AUNAP) in 2011 and the preparation of a new law for fisheries and aquaculture management are leading to a more coherent repartition of responsibilities across Ministries and making room for stakeholder consultation. This section will recommend that the legislative reform process also strengthens the management mandate of the government and further involves stakeholders in policy-making decisions.

A historically fragmented and unstable governance framework

Governance of the fisheries and aquaculture sector is a shared responsibility of environmental and agricultural authorities. The Ministry of Agriculture and Rural Development (MADR) is given central responsibility for designing policies for the sector by Law 13 of 1990 regulating the exploitation of fishery resources and the General Law for Agricultural and Fishery Development (Act 101 of 1993) relating to the protection and promotion of the fisheries and aquaculture sector.[2] When designing policies for the fisheries and aquaculture sector, the MADR is required to follow the long-term national development objectives and medium-term targets and priorities outlined in the National Development Plan, which the Constitution requires Presidents to produce as a policy basis for each elected term. The National Development Plan also guides public spending on the basis of pluri-annual budgets.[3]

The responsibilities of the MADR are bound by the legal framework for sustainable development, defined mainly by the Constitution and the Law 99 on Environmental Management of 1993, which created the Ministry of Environment and Sustainable Development (MADS) in the aftermath of the Rio Declaration.[4] The Colombian constitution stipulates that all hydro-biological resources of which fish stocks are part are the property of the State and gives responsibility to the government to ensure their conservation and sustainable use. Law 99 gives responsibility to the MADS for environmentally ordering the use of territory and adjacent seas; designing public policies and regulations for the use, handling, conservation, restoration and recovery of natural resources in all economic and productive sectors; and to design policies, plans and programs relating to protected areas and national parks.The MADR and the MADS therefore cooperate in the design and adoption of laws and regulations that impact hydro-biological and fishery resources. They also cooperate in assessing the possible environmental impacts of aquaculture activities on coastal areas and inland watersheds, as well as in the design of mitigation strategies.

Responsibilities for policy implementation are similarly shared between the entities in charge of operationalizing MADR and MADS policies. On the MADR side, a series of entities have successively been in charge of implementing policies for the fisheries and aquaculture sector since the 1990s. Law 13 established the Institute of Fisheries and Aquaculture (INPA) in 1990. It was liquidated 13 years later when the Colombian Rural Development Institute (INCODER) was created by Decree 1300 in 2003. INCODER inherited the responsibilities of the INPA as part of a much broader mandate to implement the government's rural development policy, facilitate access to production factors, empower local authorities and their communities, and promote the articulation of institutional actions in rural areas. In 2007, Law 1152 on rural development transferred INCODER's responsibilities to the Colombian Institute of Farming (ICA). This decision was repealed by the Constitutional Court judgment C-175 of 2009, and INCODER recovered its functions. In 2011, Decree 4181 created a new entity, the AUNAP, with fisheries and aquaculture management as its sole objective.

The AUNAP is in charge of data collection, research and planning;[5] regulation and registration of fishing and aquaculture activities; allocation of fishing rights; promotional efforts; inspection, monitoring and control of fishing and aquaculture activities; undertaking administrative investigations into behaviour that violates the law; and applying sanctions as required[6] (AUNAP 2013a). The AUNAP also authorises and regulates the import or export of goods and products related to fisheries and aquaculture[7] and represents the national government and the MADR in relevant missions, commissions and international organisations.

Decisions regarding the management of resources, such as the definition of species authorised for cultivation or the setting of catch volume quotas, are undertaken within the framework of the Executive Committee for Fisheries (CEP). The CEP is an inter-agency law enforcement entity created by Decree 2256 in 1991, which brings together representatives of the MADR, MADS and AUNAP. Since 2003, decisions of the CEP are informed by the Inter-institutional Technical Committee, an *ad hoc* group now under the authority of the AUNAP, which brings together the private and public research centres and NGOs that produce scientific information on the status of fisheries and aquaculture resources. The main source of scientific support to this Committee is the Marine and Coastal Research Institute (INVEMAR), a private non-profit scientific and technological research organisation related to MADS.[8] INVEMAR is in charge of monitoring renewable natural resources and the environment in coastal, marine and oceanic ecosystems of national interest. It is notably responsible for assessing the ecological parameters of the main fisheries stocks and studying populations of marine living resources to assess the possibility of cultivating those with aquaculture potential.[9] On the basis of the information shared in this Committee, the AUNAP prepares proposals for decision by the CEP.

Responsibility for the granting of permits and authorisations for fishing and aquaculture activities is also shared between the AUNAP and the Autonomous Regional Corporations (CARs), which are responsible for implementing environmental policies and natural resource management at the sub-national levels, under oversight and coordination by MADS (Law 99).[10] In practice, operators need to request a license for water use from CARs before they can request a license to operate a particular fishing or aquaculture activity from the AUNAP.

Such fragmentation of the mechanisms of governance and their dispersion over two ministries sometimes feeds conflicts of interest among policy makers, leads to management inconsistencies, and increases transaction costs associated with the design and implementation of policies. This ultimately weakens the policy impact and generates inefficiencies. Since the adoption of Law 99 in 1993, the body of environmental laws and regulations has expanded significantly, mostly through decrees and resolutions and sometimes without adequate oversight by the legislature (OECD/ECLAC, 2014). The resulting lack of overall coherence and consistency in decisions results in uncertainty for the regulated community. The changing qualification of trout, tilapia and carp in relation to aquaculture production is illustrative of these difficulties. These species were introduced in Colombia for aquaculture purposes in the early 1980s and have become the main species produced. They were, however, defined as exotic invasive species by the MADS in 2008, which strongly constrained culture possibilities. They were subsequently authorised for exploitation by INCODER in 2009 under specific technical conditions aimed to limit escapes. The MADS and AUNAP finally agreed to declare these species domesticated in 2015, allowing for their cultivation once again.

The system also creates opacity in decision-making and lacks accountability. The mandate of the CEP is to manage fisheries resources sustainably on the basis of the best available scientific evidence (Resolution 0267 of 2009). However, the Inter-institutional Technical Committee does not have a legal basis and the objective to sustainably manage resources is not precisely defined by law, while sector stakeholders are not included in the discussions of the Inter-institutional Technical Committee.

Legitimate and acceptable governance

Governance of fisheries and aquaculture, and conservation of the ecosystems that sustain them can be understood as a process through which institutions, governments, and stakeholders of the sector and the ecosystems in which they operate, elaborate, adopt and implement policies and management strategies.

The impact of governance on fisheries and aquaculture management, and ultimately on their performance, is increasingly recognised. Governance is found to impact both the nature of policy decisions and their acceptability to different stakeholders. The Council Recommendation on Rebuilding, for example, underscores how good governance is a key element to ensure the success of rebuilding plans. While there is no optimal arrangement for fisheries governance frameworks, a few characteristics are important ingredients for success. Menard (2013) notably points to legitimacy and acceptability.

Legitimacy relates to the characteristics of the institutional arrangements through which policies are elaborated and implemented: the transparency of procedures in the decision-making process, mechanisms guaranteeing the accountability of institutions with respect to decisions made, and room for scientific information and advice.

Acceptability has to do with the perception by stakeholders of the institutional arrangements' capacity to deliver fair decisions. Acceptability relates to: the degree of delegation in decision-making processes; the space for stakeholders to share available information, express various positions including dissent, and be confident that these voices are explicitly part of the decision-making process; the capacity to integrate or change the norms and beliefs of stakeholders; and the existence of mechanisms of appeal. Building inclusive institutional arrangements oriented towards raising transversal consensus is a key to acceptability.

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New legislation for more coherent and inclusive policy-making

After sector stakeholders raised concerns about the complexity and obsolete nature of the existing governance framework, a comprehensive reform of the institutional and legal framework for fisheries and aquaculture began.[11] The reform has included a long process of stakeholder consultation. It is one of the first times such a process has been undertaken in the country, across any policy area. *Ad hoc* discussions were initially put in place at the national and regional levels in a collaborative framework with the FAO to define a new legal framework for aquaculture development. They allowed stakeholders, including ethnic groups, to identify the main constraints to sector development and suggest underlying problems that needed to be resolved. Results were consolidated at a national forum during which policy objectives and priority actions were defined. Similar consultative mechanisms were then put in place to undertake the same analysis for the fisheries sub-sector. On the policy side, these initiatives have led to the adoption of a National Plan for Sustainable Aquaculture (AUNAP/FAO, 2014) and a Comprehensive Policy for the Development of Sustainable Fishing in Colombia (FAO/MADR, 2015). Their conclusions have been integrated into the AUNAP's Institutional Strategic Plan 2014-18. These documents are discussed in the following section on management. On the governance side, the draft law on fisheries and aquaculture management is being finalised and will be presented to Congress before the end of 2016.

The proposed legislation improves governance in two respects. First, it simplifies management by exempting fisheries and aquaculture resources from the regime applicable to hydro-biological resources, whose management is under the responsibility of the MADS. It stipulates that fisheries and aquaculture resources will be defined by an administrative act of the MADR, based on suggestions by MADS with technical recommendations from AUNAP. Fisheries and aquaculture management will then be the sole responsibility of MADR and AUNAP.

Second, the draft law on fisheries and aquaculture management sets the conditions for regular stakeholder consultation by institutionalizing the discussion spaces created for the consultative phase of the reform process and adopting the concepts of integrated and differential policy-making. The integrated dimension implies inter-institutional coordination and a territorial

and participatory approach to governance, while the differential dimension requires that the interests of vulnerable people be considered, especially those victims of conflict and the black, afro-Colombian, Raizal, and Palenquero communities.[12] In this perspective, the proposed legislation establishes a Sector Roundtable, which brings together public, academic and private actors, including producer associations and representatives of civil society at the national level and gives it responsibility for policy guidance and coordination.[13] As some producer associations only have a regional scope and because it is difficult for them to participate in meetings in Bogota, the proposed legislation also establishes fisheries and aquaculture Nodes, which are local and sub-regional forums for dialogue and consultation. In addition, the Intersectoral Roundtable under the auspices of the MADR is responsible for coordination between the different government entities that have a role in fisheries and aquaculture policy-making. On the aquaculture side, the law formalises the existence of "chain organisations", which were created in 2003 and bring together actors from the production, transformation, commercialisation and distribution sub-sectors with a view to guiding public policies to achieve greater productivity.

Harnessing the reform process to create the conditions for improved fisheries and aquaculture management

To further improve the legitimacy of policy-making, the reform process should first be utilised to bring into force a legal obligation to consult scientific evidence in the policy development process, and second define clear sustainability management targets. Such reference to expertise and sustainability management targets are increasingly embedded in the procedures characterising good governance worldwide. The reform of the European Common Fisheries Policy is the most recent example of this positive trend.

The management law project already introduces the concepts of "comprehensive sustainability" but does not define what a responsible use of resources means and on which basis sustainability should be assessed. The current proposals only state that fisheries and aquaculture policies should be designed with the objective of generating sustainable income and employment to people in a way that is compatible with the responsible use of biodiversity and the services that marine and inland ecosystems provide to the country.

The proposed legislation should specify more clearly the need to base decision-making on scientific information; should make the process through which scientific information is collected from secondary sources more precise by giving a legal basis to the Inter-institutional Technical Committee; and should formulate requirements for communicating the scientific information used as a basis for decisions. The proposed legislation could also define the sustainability targets that it wishes to achieve or give an explicit mandate to the AUNAP to define such targets with precise timeframes in its management plans. This would ensure that the *ad hoc* good practice of setting the quotas on the basis of MSY targets undertaken in the framework of the CEP is not put under pressure at times of difficult political decision-making and would enhance transparency in the decision-making process.

It would also be beneficial to involve all stakeholders, and not only those that produce scientific information on the status of resources, to take part in resource management decision-making to increase the acceptability of the decisions made. This could be done by associating the Sectoral Roundtable or the Nodes to the work of the Inter-institutional Committee or the CEP directly. Specifying the responsibilities of the Sectoral Roundtable, Nodes and Intersectoral Roundtable, and clarifying how they will interact with the CEP and the Inter-institutional Technical Committee is also necessary to avoid institutional duplication and increasing the transaction costs of decision-making.

3 Strengthening management for the sustainable development of fisheries and aquaculture

The current complex mix of controls on types of fishing, catch quotas, and restrictions on where and when fishing can take place is not enough to address overfishing

Fisheries in Colombia are currently regulated as individual species through regulated open access regimes.[14] Current regulations include: the establishment of closed seasons for some species; the definition of minimum sizes for the species of greatest commercial importance; regulation of fishing gears; the use of total allowable catches (TACs) for the main species harvested by the industrial fleet; and the establishment of spatial management of exclusive areas for artisanal fishing.

The fact that over half of all marine species reported in this study are estimated to be overfished and that total catch of Colombian fisheries in both the Caribbean and Pacific Seas decreased over the last decade, indicates that current regulations are either not appropriate and/or not fully implemented. Improving fisheries stock management is probably the biggest challenge facing the MADR and the AUNAP. If stocks are not maintained at healthy and sustainable levels, fisheries will be less able to contribute to public objectives. Collapsed fisheries can mean significant economic and social costs resulting from dislocation, crisis and rebuilding costs.

A key issue for any system of regulation is that fishers have no incentive to conserve fish stocks if they have no guarantee that other fishers will do the same; they must all be able to reap the benefits of that conservation in the future. To be considered acceptable, regulations therefore need to be both clear and rooted in transparent procedures so that fishers can be confident that institutions in charge can and will enforce regulations. A varied set of controls based on effort and output controls, as well as restrictions on the areas where fishing is permitted, leads to opacity and high transaction costs.

Understanding the complexity of what is being done and the time horizons involved to measure the success of programmes is also key; this makes clarity over the objectives pursued crucial. There are many examples of rebuilding programmes that have failed to reach targets and it is important that programs embed options if the stock does not respond in the way predicted. Sometimes, this is a result of data deficiencies, changes in understanding of the biological characteristics of the stock, refinements in the models used to predict rebuilding pathways, or just broader environmental changes such as climate change. The lesson learned in most cases is that plans are likely to take longer than originally anticipated. Communication on these difficulties is important for fisheries policy-making institutions in order not to lose credibility.

Additionally, the management of resources is weakened by insufficient implementation of regulation. For example, in 2013, substantial divergence appeared between catch quotas and reported catches for some species. In some cases, catch quotas were non-binding, being high enough not to be reached by current fishing effort and stock status. In other cases, they were dramatically exceeded by catch rates.

A major constraint to policy implementation in Colombia is that there is no reliable inventory of small-scale and artisanal boats fishing in coastal and inland ecosystems, which makes it difficult to regulate effort. With the exception of the shrimp and tuna fisheries, there is no possibility to calculate the catch per unit of effort over time as an indicator of stock abundance for most species harvested by Colombia. The AUNAP is working with the FAO on the construction of a national ship registry that includes artisanal and industrial vessels. To incentivize fishers to participate in the registration campaign, the AUNAP and MADR have developed training programs and allocated support to purchase safety equipment for participating fishers associations. Fees have been reduced for small-scale fishers and the registration process with DIMAR has been simplified.

Using evidence to set sustainable fishing targets and allocate fishing rights

The Colombian government recognises that the existing management framework is inadequate and outdated for the responsible and sustainable management of Colombian fisheries (AUNAP, 2013a). For this reason, it has engaged in developing the Comprehensive Policy for the Development of Sustainable Fishing in Colombia (FAO/MADR, 2015) and the management law project adopts some of its objectives to reinforce the mandate of the AUNAP for sustainable management. The proposed legislation notably stipulates that the AUNAP should consider establishing rights-based fisheries management in its different modalities as appropriate plus TACs for the main species harvested. While expanding the use of TACs and rights-based management seems appropriate, a greater shift in management is needed towards the use of sets of measures with well-defined medium to long-term objectives over precise timeframes. On this basis, it is recommended that management of resources be shifted towards rebuilding plans for fisheries that target overfished species, notably the overexploited medium pelagic species in the Caribbean, and management plans for fully exploited fisheries.[15]

Traditionally, fisheries managers and scientists providing advice on stocks have focused on MSY as an appropriate management target. While stock management is a necessary objective of fisheries policy makers, maximising social welfare is the ultimate objective. Addressing risk and uncertainties should also be explicitly incorporated. Hence, stock status targets other than MSY are increasingly being used, for example, to maximise profits instead of production under stock conservation constraints. Alternatively, policies sometimes aim to rebuild stocks, reduce the risk of collapse or impose particular social or environmental norms. In practice, the AUNAP has been pursuing an MSY objective when proposing TACs for adoption by the CEP on the basis of the scientific information shared in the Inter-institutional Technical Committee. A recent updating of stock assessments for the main targeted species (and relevant incidental catch) by the INVEMAR in 2014 led to a revision of catch quotas for several species (INVEMAR/AUNAP, 2015). Broader discussion with stakeholders in the quota setting process along the lines suggested in the above section on

governance may lead to the adoption of more appropriate targets depending on the objective identified through consultation. There are also stocks for which reliable assessments are not available, or where there are limited data. In line with practices in OECD countries, the draft law on fisheries and aquaculture management includes a precautionary principle stipulating that in cases where evidence is lacking to assess the sustainability of resources, resources should be exploited with caution.

The second important management challenge for fisheries authorities is to choose the way in which defined fishing rights are allocated among fishers and fishing companies. Currently, the AUNAP allocates rights on the basis of five criteria: catch volumes from the preceding year; total capacity; projections of evolution; and compliance with the rules and use of vessels under the Colombian flag. How these different criteria are evaluated and how they are weighted against each other is difficult to comprehend. Ideally, transparent rules regarding the organisations or individuals to which the rights are transferred or delegated would have to be discussed extensively *ex ante* with these stakeholders, who also participate in the decision-making process on the basis of such rules. The Intersectoral Roundtable and the Nodes offer interesting fora to discuss these criteria when management and rebuilding plans increasingly involve rights-based management. Involving the Nodes, which operate at the local level, would also open avenues for community-based quota management. This would be particularly interesting for the management of inland fisheries, which are operated exclusively by small-scale fishers in rural areas that are both geographically diffuse and difficult to access, making it impossible to regulate these fisheries through individual quotas as management and surveillance costs would be excessive.

Incorporating social and economic objectives into management and rebuilding plans

In addition, rebuilding and management plans should not only be based on biological targets but incorporate social and economic principles throughout the design and implementation process in an integrated fashion, as opposed to sequentially or in isolation (OECD, 2012). Plans ideally need to address direct fisheries adjustment, local employment (including those in the processing and marketing sectors), regional impacts and/or the need for alternative employment and livelihood opportunities, as well as food security. The Comprehensive policy and the management law project recognise that efforts to rebuild fisheries should also aim to restore economically sustainable fisheries that generate profits and employment, with careful consideration of costs, benefits and their distribution. To date, however, these issues are addressed mostly through support policies and are not explicitly integrated into management or rebuilding plans.

The OECD also calls for the adoption of the now globally recognised Ecosystem Approach to Fisheries (EAF), as far as possible.[16] The EAF is defined by the FAO as "striv[ing] to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach within ecological meaningful boundaries" (FAO, 2003). This approach involves decisions to be made using a comprehensive, inclusive framework for all living resources, rather than reacting to the status of a single stock of fish. Colombia is committed to establishing an ecosystem approach in their domestic fisheries and in any international fishery in which they participate. Implementation of this approach is, however, still notional. The main obstacle to implementing the EAF is that it substantially increases the level of information and analysis required, and this level of information is not yet available in Colombia.

It is recommended that socio-economic and biological data be better integrated in order to allow for rebuilding and management plans to adopt a comprehensive approach to fisheries management, with a view to adopting the EAF in the longer term. Matching socio-economic information on fisheries with biological information on resources would be useful, for example, to identify overfished stocks of greatest significance in terms of income, employment or food security in order to better target rebuilding efforts. In addition, in the process of designing rebuilding and management plans, and especially when extending

beyond the single-species approach to fisheries management, a fundamental step is to build an operational system of indicators and corresponding reference points. Fishery indicators should provide information for assessing the biologic, economic, and social performance of the Colombian Caribbean, Pacific and Inland water fisheries. They should become an input for establishing sustainability targets over time in management and rebuilding plans. Such indicators would also greatly improve the transparency of information by making it easily accessible to all and comparable over time and species. Indicators for Colombian fisheries can be simple in conception, multidisciplinary, and based on semi-quantitative or qualitative information. They should not be regarded as falling fully within the research sector, but they should be available to stakeholders and managers in an updated and real-time fashion. In this context, fishers' knowledge could be considered as a source to enrich the information basis for policy-making (FAO, 2015b). Collection of fishers' knowledge through the Nodes, for example, could both decrease the cost of information gathering and increase the acceptability of policy decisions.

Strengthening monitoring and surveillance to reduce IUU

Effective enforcement falls mainly on institutions responsible for monitoring and surveillance. At the time of its creation, the AUNAP acknowledged that support for monitoring and enforcing compliance of regulations by competent authorities was insufficient (AUNAP, 2013a). The national entities with responsibility and functions in the control and monitoring of illegal fishing and illicit activities also requested better institutional cooperation. An increasing number of port state measures were implemented by trading partners, while increasing IUU activities by foreign vessels from neighbouring countries were signalled in Colombian waters. Inland fisheries are also barely monitored, as the majority of fishers operating in inland waters remain unregistered.

In this context, the National Roundtable on Illegal Fishing and Illicit Fishing Activities (MNPII) was created in 2012. It is coordinated by the AUNAP and brings together the Foreign Affairs Ministry, the MADR, the Navy, DIMAR, the Colombian National Nature Parks, migration and fiscal authorities, police authorities, the Presidency and the executive Secretariat of the Colombian Commission for Oceans (CCO).[17] A specific draft law against IUU fishing aimed at closing the regulatory gaps identified by this Roundtable and strengthening judicial and administrative penal procedures has been filed for Congressional review in March 2016. It notably recognizes the country's responsibility as a flag state. Vessels are subject to national regulatory requirements even beyond national jurisdiction, as wherever the ship operates is considered an extension of Colombian territory.

Meanwhile, the AUNAP is diagnosing IUU activities across the country and reviewing the effectiveness of its tools against illegal fishing. It is also developing a National Plan of Action to Prevent, Deter and Eliminate IUU Fishing with the FAO, based on the voluntary guidelines of the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU). The government is considering adhering to the FAO Port State Measures Agreement, and the AUNAP has already taken a resolution that adopts its requirements.

In 2013, Colombia created an on-board fishing observers program with the support of the IATTC, which is about to be scaled up. It also recently launched a capacity building program for fishery inspectors that aims at improving their knowledge of procedures, tests, standards and tools to better monitor and control fishing activities. A simplified procedure to file complaints about observed illegal fishing activities can now be undertaken by fishers in writing, on the phone or on-line.

The logistics to evaluate and implement these measures, however, are still lacking. Monitoring and surveillance at landing sites could be strengthened and an effective real time catch and fishing effort information system could be created for target species and by-catch. For industrial fleets, a vessel monitoring system (VMS), shared in real time between the fishing industry and AUNAP, would contribute to the spatial management of fisheries. Colombia has established marine protected areas in the Pacific and Caribbean requiring such an approach.

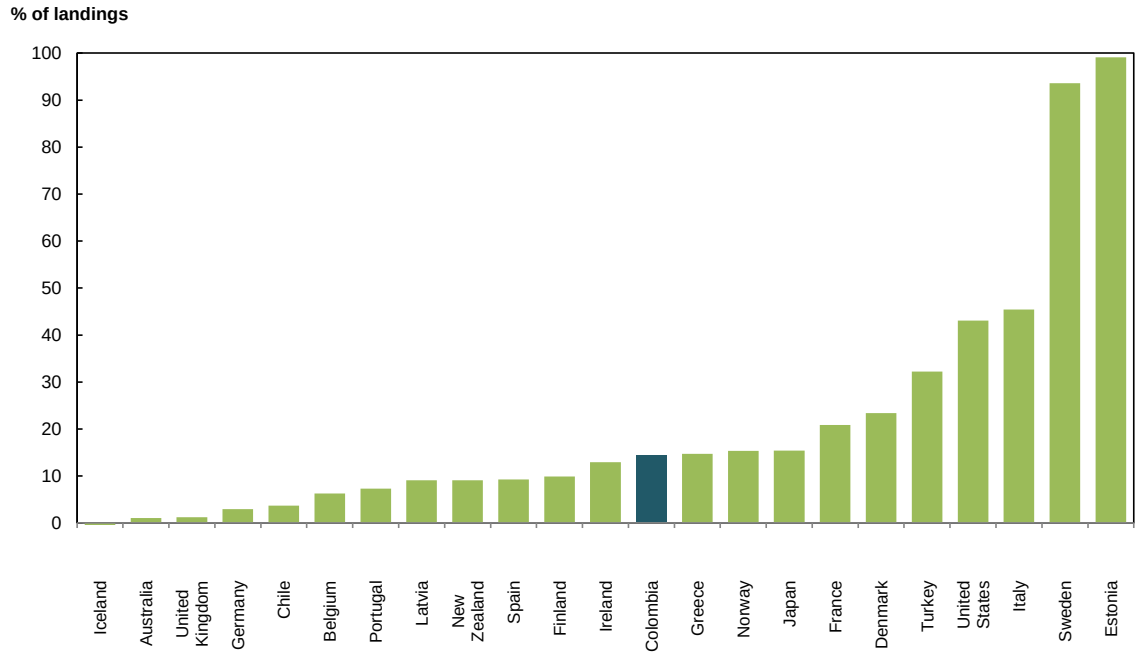
Efforts are also needed to control fishing activities in inland waters. This is a difficult and costly process due to Colombia's geography. A registry that includes artisanal fishers should greatly improve the situation. Working with communities and Nodes to delegate monitoring at the local level could open up avenues for community-based monitoring and reduce the cost of operations.

Encouraging a supportive environment for sustainable aquaculture development

The rapid growth of global aquaculture is unevenly distributed among countries. The Colombian government, as with many OECD countries, wishes to promote the further growth of aquaculture. In this perspective, a review was undertaken jointly by the AUNAP and FAO (AUNAP-FAO, 2014) and led to the adoption of a National Plan for Sustainable Aquaculture (PlaNDAS). The review found that the aquaculture sub-sector has potential to grow and create employment, notably due to an entrepreneurial momentum for investing in this sector. The PlaNDAS contains a map illustrating the areas in Colombia that are most suitable for aquaculture development. In addition, good aquaculture practices and good fish processing practices that exist at the national and regional levels can be applied to existing and potential aquaculture production. Colombia also has reliable diagnostic laboratories of diseases. The PlaNDAS led to the creation of a national program of vigilance, prevention, control and eradication of diseases and calls for improving the knowledge base for ecosystem protection regulation.

The PlaNDAS identifies low economic productivity as a key challenge for aquaculture as it affects competitiveness and reduces profitability, all of which it associates with increasing low-cost imports of fishery products competing with domestic production and a low level of domestic consumption. The PlaNDAS thus includes a strategy to increase domestic consumption of fish and shellfish through information campaigns targeting both the general public and specific audiences such as restaurant owners. An initiative was also conducted with the federation of aquaculture producers (Fedeacua) to disseminate good practices aimed at improving the quality of products for the domestic market. Deficiencies in landing points, docks and storage facilities also constrain productivity and competitiveness. The cold chain is particularly restricted compared to neighbouring countries, and competition is lacking in the transport and storage sub-sector

Figure 4. Government financial transfers to fisheries in Colombia are relatively modest, 2012



Source: OECD GFT database.

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Another key limitation to the development of aquaculture is its largely informal nature. This implies that research results and best practices are not adequately disseminated. The farming of mostly freshwater but also marine ornamental fish, for example, is under investigation; and yet only a few aquaculture production projects of these species have scaled-up to commercial levels. The extension service has thus been scaled-up in order to improve technology transfers, but it will not reach those farmers who are not registered. Informality also prevents adequate monitoring of activities and reliable environmental impact assessment.

The PlaNDAS therefore aims to achieve greater formalisation of the sector through improved licensing procedures. Following a simplified procedure, obtaining a license from the AUNAP has been greatly facilitated for artisanal producers. Inspection costs to verify the information submitted in the application form is now covered by the AUNAP. Officers in the field have also been trained to help producers complete applications and the time needed to obtain a permit has been considerably reduced. Further simplification is under consideration for larger producers. In addition, tax rebates and credit facilities have been created for licensed producers in order to provide incentives for producers to obtain licenses. The MADR has worked with the banking sector to improve their knowledge of the aquaculture sector and inform producers of credit possibilities and procedures. Scaling-up efforts to substantially accelerate the rate of formalisation should be a key objective for the MADR and AUNAP.

The procedure to obtain a water-use license from CARs, however, remains an important barrier to formalisation for small-scale producers as a result of an insufficient differentiation of procedures according to the size of the enterprise (OECD/ECLAC, 2014). Water-use licensing also suffers from coordination problems as CARs have a large degree of autonomy in policy execution and the speed of the procedure varies considerably from one region to another. Efforts have been made to reduce the administrative burden by using a single portal to request licences, but the likelihood of being granted a license still depend on regional policy preferences. The recommendations of the *OECD Environmental Performance Review for Colombia* to reinforce MADS' ability to oversee and direct the work of CARs and increase their transparency, integrity and accountability (OECD/ECLAC, 2014) is very important in terms of fisheries and aquaculture governance as it would help improve the efficiency and effectiveness of CARs in their licensing responsibilities.

Facilitating the transition to a more efficient sector and promoting inclusive growth with targeted state support

Colombia does not have a history of providing high levels of support to the fisheries and aquaculture sector. Data for 2012 shows a level of support relative to the size of the sector in line with median levels witnessed in the countries of the OECD (Figure 4). Support to aquaculture has increased between 2012 and 2014 from 13% to about a third of the support to the sector, mainly in the form of grants for aquaculture development. Direct payments have also increased over the same period from about 15% to over 40%, while fuel tax concessions have decreased from about 55% to about 40% of the total. The minimal share of support allocated to general services reflects a lack of data on the budgets allocated to different management, research, enforcement and infrastructure services. This situation is common to many OECD countries.

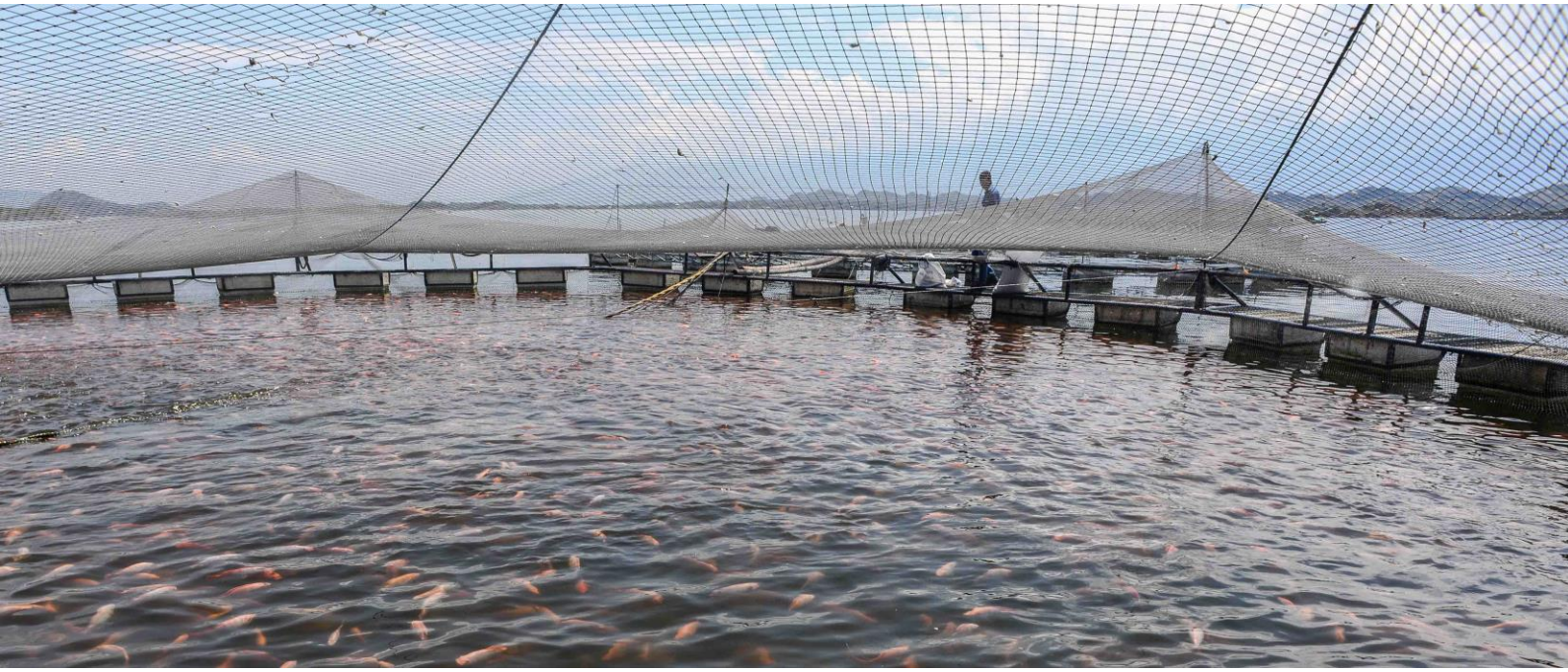
The draft law on fisheries and aquaculture management defines a number of priorities to promote the productivity and competitiveness of the sector. Some of them appear to be in line with a green growth strategy as encouraged by the OECD, such as incentives for increased formalisation; development of extension services; diffusion of best-practices in production and manufacturing, processing and marketing; promotion of domestic consumption; structuring of research programs; and investment in education and qualifications.

It is recommended the government focuses on investment in education and qualifications as a means to open perspectives for alternative livelihoods in areas where small-scale fishing and aquaculture is undertaken. This would facilitate transition to more remunerative activities while lessening the pressure on resources and is in line with the 2014-18 National Development Plan *All for a New Country*. The three development objectives – peace, equity and education – all imply particular efforts targeted at rural areas, which are the most directly affected by armed conflict, poverty and the fewer opportunities for social mobility. Better socio-economic data collection on rural areas will support better targeting to make sure that segments of the population are not excluded, while ensuring that efforts are not diluted given the diversity and spread of the fisheries and aquaculture sector.

The draft law on fisheries and aquaculture management further calls for the development of special credit lines for fishing and aquaculture, and programs to improve and modernise equipment and supplies to fishermen and fish farmers. These types of support may have disputable impacts on resources where management is not sufficiently strong. It is recommended to consider such support measures with caution. To date, Colombia does not have decommissioning schemes and the country does not have a history of using them. However, there have been calls to create such schemes in the shrimp fishery. The Colombian government has stated its willingness to implement the principles set out in the Council Recommendation on Decommissioning should such schemes be considered in the future.

Looking ahead

Incorporating these policy proposals into its ongoing policy and reform agenda will ensure Colombia increases the effectiveness of its regulatory approach. This will help protect valuable national resources and also harness the fisheries and aquaculture sector to secure the government's objectives of sustainable and inclusive growth.



Notes

1. FAO (2015a) lists all the RFMOs of which Colombia is a member, the international agreements the country has signed, the international instruments it applies as well as the Neighbourhood and integration committees it has set-up with neighbouring countries.
2. The Directorate of Fisheries and Aquaculture (DPA) was created within MADR with the Decree 4909 of 2007, as the highest entity responsible for formulating fisheries and aquaculture policies; promoting sustainable resource use; and concluding cooperation agreements with public or private, national or foreign agencies for the strengthening of the sector.
3. The *OECD Public Governance Review for Colombia* (OECD, 2013) compares the National Development Plan to the government's policy blueprint. The Plan serves as the manual and roadmap for the Administration, legitimising the main strategic orientations of the government.
4. Together, these laws form "a solid policy and institutional framework for modern decentralised environmental management" (OECD, 2013). The Constitution establishes sustainable development as a national goal (Article 80) and calls for the inclusion of environmental objectives in national development plans. It includes provisions for the transparency of environmental information and for public participation and access to justice on environmental policy making issues. Law 99 also created the National Environmental System (SINA), which is responsible for implementing a set of guidelines, standards, activities, resources, programs and institutions that respect the environmental principles contained in the Constitution. Decree 3570 redefined the structure and objectives of the MADS in 2011.
5. The Colombian Institute of Farming (ICA) is in charge of the surveillance and control of health, biological and chemical risks to animal and plant species. It also issues sanitary and phytosanitary regulatory measures.
6. Monitoring and enforcement are undertaken in coordination with several State institutions. The Maritime Directorate of the Ministry of Defence (DIMAR) is responsible for controlling sea-related activities and promoting the maritime development of the country. It controls ports, ships and crew, and monitors pollution and the illicit exploitation of natural resources. The Navy is the guarantor of national sovereignty and resource use in the National jurisdiction. The National Nature Parks controls activities in marine protected areas. Immigration authorities and the Ministry of Foreign Affairs control the entry of foreign crew. The Fiscal administration is responsible for the penal prosecution of illicit fishing.
7. The Ministry of Commerce, Industry and Tourism is responsible for the registration of import and exports of all products, including in fisheries and aquaculture through the Foreign Trade Service Office.
8. Other research institutions in Colombia that contribute to the ITC are the Colombian Corporation for Agricultural Research (CORPOICA), a mixed private-public scientific and technological research organisation related to MADR, the Research Institute of Biological Resources "Alexander von Humboldt" (IAvH), the Institute of the Pacific Environmental Research "John von Newman" (IIAP), the Amazonia Institute of Scientific Research (SINCHI) and the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM).
9. More generally, INVEMAR also carries out studies and research together with other relevant entities related to establishing parameters on pollutant emissions, discharges and other factors of environmental deterioration that may affect the marine, coastal and insular environment or renewable natural resources. It is also implicated in advancing the Colombian marine flora and fauna inventory and establishing information needed to strengthen national policies on biodiversity.
10. According to the OECD (OECD/ECLAC, 2014), the way in which different levels of environmental governance bodies work together is challenging. The Constitution grants CARs high responsibilities and a high degree of autonomy in administrative and fiscal terms but few accountability constraints and controls. In addition they often lack human and financial resources and their system of governance leaves them vulnerable to capture by local interests.
11. The reform process also took place in the context of broader governance change as a result of the adoption of the Political Constitution of the country in 1991. Good governance was notably one of the highest priorities for addressing the country's national development objectives in the 2010-14 National Development Plan, Prosperidad para Todos. The Public Governance Review for Colombia (OECD, 2013) finds that significant progress has been made in implementing successive waves of a good-governance agenda, aiming to strengthen institutions and promote sustainable and inclusive growth throughout the country. This is encouraging in terms of the general capacity of the Administration to implement reforms
12. This principle puts into practice Article 79 of the Constitution, which links the right to enjoy a healthy environment with the right of "the community to participate in the decisions that may affect it" and Law 99, which recognises the right of prior consultation for indigenous and Afro-Colombian communities when an activity involving exploitation of natural resources may cause an impact at an economic, environmental, social or cultural level

13. There are around 154 fisher organisations in the Caribbean and 49 in the Pacific (Rueda et al. 2014a and b), many of which participate in the co-management of their fisheries. The country counts about 1200 cooperatives and associations of which about a third of Colombian fishers are members (FAO/MADR, 2015). For aquaculture, there are several regional and two national private organisations (FEDEACUA, that brings farmers together, and ACUANAL, which brings shrimp producers together).

14. Regulation of the tuna fishery is an exception as the access and exploitation rate of this fishery is set by the ICCAT.

15. A plan for sharks, chimeras, and rays has recently been developed and established under Decree 1124 in 2013.

16. The importance of the ecosystem approach to fisheries was recognised in 2001 by 47 countries participating in the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem. The signing parties declared that in an effort to reinforce responsible and sustainable fisheries in the marine ecosystem, they will individually and collectively work to incorporate ecosystem considerations into the management of their fisheries (FAO 2002). The Food and Agriculture Organisation of the United Nations (FAO, 2003) further developed an interpretation of these and other efforts in the form of a rationale and a definition. The rationale is, “The purpose of an ecosystem approach to fisheries is to plan, develop, and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options of future generations to benefit from the full range of goods and services provided by the marine ecosystem.”

17. The CCO Ocean Commission is an intersectoral body bringing together representatives of almost all the ministries (with the exception of the Interior Ministry and the Tax Office), as well as the Navy, the DIMAR, the National Planning Department, and Colciencias, the public entity in charge of national science, technology and innovation policy. The CCO elaborates the national ocean and coastal policy and defines the institutional arrangements for integrated marine and coastal management. It coordinates the actions of the government and defines orientation related to the strategic, scientific, technological, economic and environmental development of Colombian seas and their resources

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