



**HAL**  
open science

## Environmental crisis, food crisis and resisting fisherpersons. The case of the Magdalena River, Colombia

Carolina Hernández-Rodríguez, Nubia Ruiz-Ruiz, Sébastien Velut

### ► To cite this version:

Carolina Hernández-Rodríguez, Nubia Ruiz-Ruiz, Sébastien Velut. Environmental crisis, food crisis and resisting fisherpersons. The case of the Magdalena River, Colombia. *Espace Populations Sociétés*, 2022, 2022/2-3, 10.4000/eps.13155. halshs-04521658

**HAL Id: halshs-04521658**

**<https://shs.hal.science/halshs-04521658>**

Submitted on 28 Mar 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

# Environmental crisis, food crisis and resisting fisherpersons. The case of the Magdalena River, Colombia

Carolina Hernández - Rodríguez<sup>1</sup>

Nubia Ruiz - Ruiz<sup>2</sup>

Sébastien Velut<sup>3</sup>

## Introduction

Stretching from the Andes to the Caribbean, the Magdalena River has been from the 15th century and until the 1960s the geographical axis for colonization, settlement and integration of the actual Colombian territory. Due to the size of the watershed (273.4 thousand sq km) and the historical settlement patterns, the Magdalena - Cauca basin concentrates until this day the population and the economic activity of the country: 77% of the Colombian population, 80% of the gross domestic product (GDP), 70% of the agricultural output and 40% of the inland fishing is produced in the territory.

Despite the river's importance for food security and its cultural significance for riparian communities, it faces a complex social, political and ecological crisis. Historically, the Colombian government has managed the river as a waterway, considering that its main use was the transportation of cargo and passengers. But, although the river has been an axis of connectivity, it is a margin within the country [Bocarejo, 2018].

As a result, many projects have been implemented in different parts of the basin under a logic of extractivism [Velut, 2021]. In addition, those projects have been planned without a comprehensive view of the whole region and underestimating their effects on water dynamics and activities related to the river. The upper watershed and the highlands in the first tier of the basin have been identified as strategic areas for hydropower and two dams have been built on the river's main channel. The middle part of the basin is the historical center of oil production, the main export product of Colombia. Navigability has become strategic for the oil industry to reduce shipping costs, and to facilitate the movement of petroleum products between the two refineries of Barrancabermeja, in the middle of the Magdalena Basin, and Cartagena, on the Caribbean Sea. In this regard, since 2010, multiple attempts have been made to improve the navigability of the river. In addition, the river faces threats from pollution related to urban sewage and mining activities.

We advocate that those interventions and alterations of the ecological and hydrobiological dynamics of the river deeply affect the life of riparian communities, particularly fishing and peasant communities, in terms of destruction of their traditional ways of life and deterritorialization, creating a scenario of food vulnerability at local and national scales. We understand territorialities as "the social

---

<sup>1</sup> Ph.D. geography student at Université Sorbonne-Nouvelle and Universidad Nacional de Colombia. [carolina.hernandez@sorbonne-nouvelle.fr](mailto:carolina.hernandez@sorbonne-nouvelle.fr)

<sup>2</sup> Professor of Sociology at Universidad Nacional de Colombia. [nyruizr@unal.edu.co](mailto:nyruizr@unal.edu.co)

<sup>3</sup> Professor of Geography at Université Sorbonne Nouvelle. [sebastien.velut@sorbonne-nouvelle.fr](mailto:sebastien.velut@sorbonne-nouvelle.fr). CREDA - UMR 7227.

appropriation of space through the projection of a human intention”<sup>4</sup>[Forget, Carrizo and Bos, 2021; p. 38], that materializes through territorial management discourses and practices.

Fishing is facing different kinds of threats. Natural hazards, territorial conflicts and degradation of the water quality jeopardize the sustainability of artisanal fisheries [Camargo, 2014]. According to available data, catches are already decreasing and the Magdalena River as a source of food is declining.

The main purpose of this paper is to present the relationship between the environmental crisis of the river and food security at the local and national levels, through the situation of the artisanal fisheries in the Magdalena River. This subject becomes of notorious importance nowadays since, even if Colombia is a medium-income economy and member of the OCDE, according to the FAO the country is facing a risk of acute food insecurity in 2022 [FAO and WFP, 2022].

This paper has five parts, besides this introduction. The first part of the paper presents the methodological approach based on three strategies. The second part addresses the importance of fish production and fisherpersons in the context of food security, as well as the importance of the Magdalena River in the Colombian context. The third part characterizes the environmental crisis of the Magdalena River. The fourth part of the paper focuses on the effects of the environmental crisis on artisanal fishing communities and food security. Finally, we give a voice to the territorial claims of fishing communities, for whom water is a human right, not only for direct human use but as a territory, essential as a living and productive space.

### **1. A mixed methodological approach for a complex analysis**

Environmental and social crises are deeply intertwined in a complex territory, where land, water, people and fish are interconnected. To unravel the complexity of this entanglement, we rely on three methodological approaches.

The first one was the review of the literature that made it possible to build a general outlook of the environmental crisis of the river at the watershed scale and to identify some strategic points in terms of the importance of the fishing activity. Different kinds of literature were analyzed: scientific articles, official surveys, public policy reports and social movements documents.

The second strategy is quantitative, based on descriptive statistics and time series statistics. The main sources are the agricultural census of 2014, the census of fisherpersons carried out by the Aquaculture and Fisheries Authority - AUNAP, production statistics of national accounts, international trade statistics of UN Comtrade and microdata from the Index of Multidimensional Poverty by the National Department of Statistics - DANE.

Using this information, we present the recent dynamics of the fisherperson’s population, their living conditions, fish production and fish international trade. This data tends to show that the environmental crisis is related to declining in fishing activity, degradation of the living conditions of fisherpersons and threats to food security, especially for poor households.

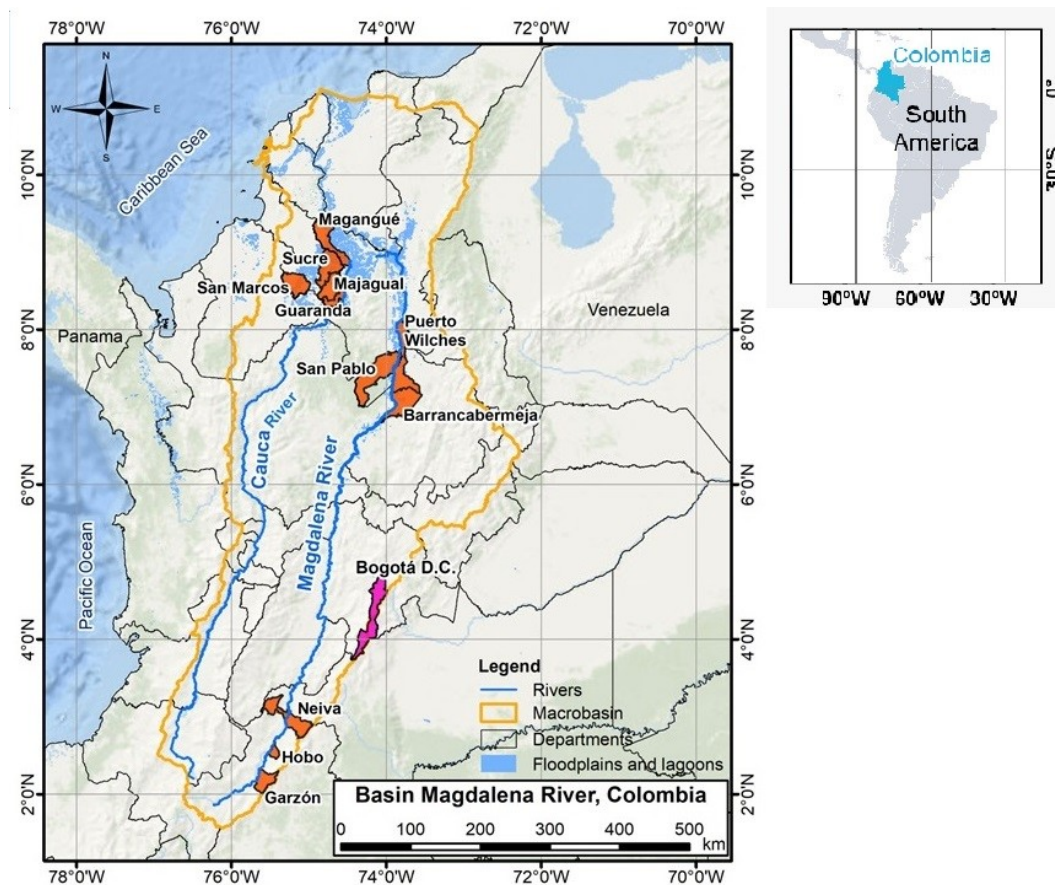
---

<sup>4</sup> Authors’ translation.

The third strategy refers to the qualitative analysis of the conditions and points of view of the fishing communities. This data has been gathered through in-depth interviews with fishermen and fisherwomen carried out between October and December 2021, and continued in October and November 2022, in the upper, middle and lower basins of the Magdalena River.

The points of observation were the municipalities of Neiva, El Hobo and Garzón (Huila) in the upper basin; Barrancabermeja, Puerto Wilches (Santander) and San Pablo (Bolívar) in the middle part of the basin, and Magangué (Bolívar), Sucre, San Marcos and Majagual (Sucre) in the lower basin (see Map 1).

**Map 1. Areas of Study, Magdalena Basin**



Source: DANE, TNC, IDEAM and Mapas del mundo.

The research team carried out 33 interviews with fishermen and fisherwomen in all the above-mentioned municipalities. Many of the contacts of the fisherpersons were made possible through the Confederation National Bureau of Artisanal Fishing - Comenalpac<sup>5</sup> and to Asoquimbo<sup>6</sup>. In the municipality of San Pablo, the research team carried out a focus group with social leaders, many of them fisherpersons.

<sup>5</sup> In Spanish, Confederación Mesa Nacional de Pesca Artesanal de Colombia – Comenalpac. The Confederation is a third-level association (an association of associations) of artisanal fisherpersons all along the basin.

<sup>6</sup> Asoquimbo – Association of people affected by El Quimbo dam in the department of Huila.

The life stories resulted from continuous conversations, in person, and through different media, with two community leaders from the lower part of the basin and one social leader from the middle part of the basin. With them it was possible to visit some fishing spots and to participate in meetings with public officers at local levels, to discuss the protection of the water spaces and the fisherpersons' way of life.

Finally, interviews were conducted with the National Authority of Aquaculture and Fishing, local authorities of different municipalities, environmental authorities at the regional level, the National Planning Department at the national level, one environmental NGO that works all along the basin and the Programs of Peace and Development of La Mojana region (lower part of the basin) and the Magdalena Medio region (in the middle part of the basin).

## **2. Fish and artisanal fisherpersons in the context of food security**

The food on people's plates results from a complex of economic, territorial and social relations and conflicts.

In this sense, to understand the logic of artisanal fisheries and their importance in global, national and local food security, it is necessary to address the debate opposing small-scale food production<sup>7</sup> and the food industry, which have become two parallel realities.

The mass production of food became one of the sectors with the biggest profits since the mid-19th century. One of the characteristics of this industry is its oligopolistic market structure, resulting in important power asymmetries among the peasants – providers on one side and firms involved in transformation and commercialization on the other [Camacho-Vera et al., 2019; Latham, 2002].

These asymmetries have impoverished peasants and transformed feeding habits, both in urban and rural areas. The gaps between the consumption and nutritional needs of the populations with the local food supply become wider. All those changes have negative consequences on the life quality of people around the world, especially those with lower incomes.

However, peasants and fisherpersons are still nowadays the major providers of food both for direct consumption and as input to the food industry. In the "global south", the local supply of food is key to food security. The peasants feed at least 70% of the world's population and 85% of the food produced is consumed within the region or the national borders [Grupo ETC, 2010]. In the Colombian case, according to the Agricultural and Rural Development Ministry, in 2015 83, 5% of the national alimentary supply comes from peasant production.

Regarding fishing, its importance in terms of the world and national food basket is undeniable. 17% of animal protein consumed in the world comes from fishing [IC and WWF, 2019] and 40% of that fish comes from artisanal fisheries [FAO, Universidad Duke and WorldFish, 2022]. The per capita annual consumption on a global scale was 20.5 kg in 2018 [FAO, 2020]. Colombia is still a country with low consumption of fish, with a per capita average of 8.8 kg in 2020 [MADR, 2021].

---

<sup>7</sup> Small-scale producers are women and men cultivating and harvesting crops and fruits, as well as those who are dedicated to animal husbandry activities and fishermen. Among them, we find the farmers, peasants, herdsmen and fishermen relying on the family workforce. We also include peasants and other agricultural workers without land, people living in the forests, hunters-gatherers, indigenous people and all the users at a small scale of natural resources to produce food. [Grupo ETC, 2010]

## Who are the artisanal fisherpersons?

Fisherpersons are key actors in terms of food availability, but they also play an important role in the hydro-social relations that shapes their territories, which have scarcely been addressed by social scientists [Alcalá and Camargo, 2011 ; Camargo and Márquez, 2021]. This paper intends to fill some of the gaps regarding the importance of freshwater fishing to food security, and the process of territorialization resulting from the fishing activity.

Likewise, the category of “artisanal fisherperson” is a contested one. For instance, there is an open debate on whether fisherpersons are peasants – because their activities sometimes combine fishing with agriculture - or if they should be considered as a different group [Becerra and Guzmán, 2015 ; Brochero and Silva, 2019 ; CNMH, 2017]. The definitions used by organizations like FAO<sup>8</sup> define the population in terms of the scale of the fishing activity, meaning that everyone who captures fish or other water animals without using massive methods of capture is considered an artisanal fisherperson.

The considerations about artisanal fishing and the fisherpersons should go beyond their productive function. Their knowledge of the amphibious ecosystems that they inhabit, their relations with non-human beings in those territories, and the practices they have developed to live in those ecosystems make artisanal fishing a way of life, with its specific knowledge, practices and culture [Boelens et al., 2016].

Artisanal fishing is a craft, transmitted orally and practically from generation to generation, and a factor of identity, that involves material culture, practical skills and gender relations [Brochero and Silva, 2019 ; Fundación Alma and ICANH, 2021] [see: picture 1]. At the same time, it is an activity undervalued in the actual economic system, often described as backward in technological terms, with a low capacity for capital accumulation [AUNAP, 2020]. Although, artisanal fishing is a cultural legacy involving millions of people around the world. It is estimated that in 2020 60 million people work full or partial time in the fishing productive chain. In addition, 53 million have performed subsistence fishing activities at least once a year [FAO, Universidad Duke and WorldFish, 2022].

### **Picture 1: Young man with traditional throw net, known as *atarraya***

---

<sup>8</sup> FAO defines an artisanal fishery as a traditional fishery involving fishing households, as opposed to commercial companies. Artisanal fishing typically takes place using small vessels that make short trips close to shore, with the catch used mainly for local consumption (FAO Fisheries Glossary 2003).





Source: Carolina Hernández, Majagual (Sucre), November 2021.

### **Fishing and artisanal fisherpersons in Colombia**

In the Colombian case, the invisibilization of the fisherpersons as a population group results in a lack of consensus and low accuracy when it comes to statistical data. According to National Agricultural Census 2014, 101,904 production units<sup>9</sup> are dedicated to artisanal fishing in marine and continental waters, sustaining 418,791 people [DANE, 2016]. 31% of production units are in the Magdalena – Cauca basin.

Another source is the census carried out in 2013 by the Universidad del Magdalena on the behalf of the National Authority of Aquaculture and Fishing –AUNAP. This survey identified 190,000 fisherpersons in marine and continental waters [UNIMAGDALENA and AUNAP, 2013]. A survey was done among 4,096 fisherpersons, 34% in the Magdalena- Cauca basin.

Also AUNAP, in association with the United Nations for the Development Program – UNDP, developed in 2020 a self-register and characterization of marine and inland fisherpersons of the Pacific and Caribbean basins and in the influence area of the Hidroituango dam project<sup>10</sup>. 33,405 fisherpersons were registered, 80% of whom are men [AUNAP, 2020]. The registration continued in 2020 for the other hydrological basins. According to this official source, the estimation in 2021 at a national level is

---

<sup>9</sup> The census unit was the production agricultural unit, meaning the farm where there is a unique decision taker. In the case of artisanal fishing, the production unit is normally the family. In one family can be more than one fisherman.

<sup>10</sup> Hidroituango is a hydroelectrical power plant in the Cauca River, the biggest in the country. The dam suffered several political and technical problems during its construction. In 2018, before it was completed, an accident was about to provoke its collapse, resulting in still uncalculated damages both up and downstream. Source: <https://acortar.link/WyPYQh>

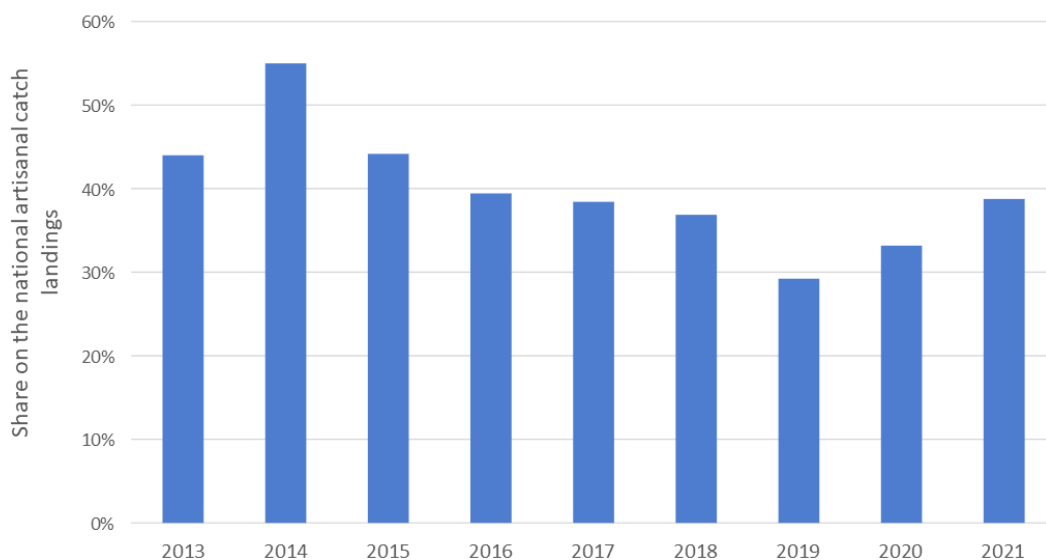
280,000 fisherpersons, 70,000 of them inland and almost 55,000 (78.5% of freshwater fisherpersons) in the Magdalena – Cauca basin [Defensoría del Pueblo, 2021].

Finally, the Alexander von Humboldt Institute, a Colombian research institute in biodiversity, estimated in 2011 that there were 150,000 artisanal fisherpersons in continental waters, 45,900 in the Magdalena-Cauca basin [Lasso and IAVH, 2011] – a figure close to that given by United Nations. The Organization for Economic Cooperation and Development – OECD made a similar estimation, of about 150 thousand artisanal fisherpersons, 75% of them in continental waters [OECD, 2016].

Despite the differences in the magnitude of those sources, the Magdalena – Cauca basin represents around 30% of Colombian fisherpersons. Considering the importance of marine fishing on the Pacific and Caribbean coasts, the Magdalena is the most important source of artisanal fishing in continental waters in the country.

In terms of fish production, the Alexander von Humboldt Institute estimated that in 2011 the basin was home to 50% of inland fishing. According to the statistical information of AUNAP<sup>11</sup>, the Magdalena – Cauca basin has been the source of an average of 40% of fish takes (both marine and continental) in the 2013 – 2021 period (see figure 1). In this respect, the Magdalena Basin is an important source of food at the local and national levels.

**Figure 1. Share of Magdalena – Cauca fish landings on national fish landings, 2013 – 2021**



Source: Calculations of the authors based on SEPEC statistical information

### 3. The environmental crisis of the Magdalena River

Despite the importance of the river for the production of food, in terms of cultural heritage and as a symbol of the integration of the Colombian Nation [Ferro, 2013], all along the basin, the river has become the receptacle of pollution from human activities and has suffered interventions that alter its bio-hydrological dynamics, affecting the natural and social process of the river.

<sup>11</sup> In Spanish, Servicio Estadístico Pesquero Colombiano – SEPEC. <http://sepec.aunap.gov.co/>. The SEPEC makes a monthly survey in specific landing sites, so the data offers information about the tendency of the catches at different points of the country but is not a register of the total amount of caught fish.



The river is facing an environmental crisis that directly affects fisher communities and fish production. We understand the environmental crisis following E. Leff: a crisis in the ways people understand nature, as a separate entity from humans. Nature becomes an object, a *thing*, that can be managed according to technical knowledge, by interventions that unfold into a crisis when they reach a scale that undermines the basis of life itself [Leff, 2004]. As noted by Rodríguez «the condition of the Magdalena Basin is the clearest expression of the unsustainability path that the country has undergone»<sup>12</sup> [Rodríguez, 2015, p. 20].

A direct effect of this crisis is the decline of fisheries and the deterritorialization process for fisherpersons. At the same time, new territorialities are created on the river, based on an idea of modern development in terms of economic growth [Bocarejo, 2018 ; Escobar and Restrepo, 2010]. According to this perspective, shared by the national government and private capital, the river has a double function: it is a transport channel for export productive sectors and a reservoir of natural resources, namely water, land, minerals and forest.

In this sense, the river is valuable if those resources are exploited. This makes the river a territory managed under logic of extractivism, as “the exploitation of vulnerable territories at all costs”<sup>13</sup>[Velut, 2021, p. 13]. The river is a territory for the riparian communities, who have little or no word in the decisions about the type of projects implemented in the river but should assume the environmental and social cost of those activities.

As a result, the river faces negative environmental consequences. Since its materiality is not static, the negative effects are difficult to perceive in the short or medium term or are suffered in different parts of the basin, but it is complicated to link them with the main cause. However, the decline of fisheries and the deterritorialization of fisher communities are manifestations of those dynamics.

In this section, we will present three factors that offer a broad picture of the environmental crisis of the river: deforestation, poor water quality and the construction of infrastructures that alter the biological and hydro-social dynamics of the river.

### **Deforestation, erosion and sedimentation**

The increase in sedimentation is one of the most mentioned problems preventing the development of navigability projects<sup>14</sup> and affecting the quality of water [Márquez, 2016; Rodríguez, 2015]. The increase in sediment transportation is a consequence of a long trend of deforestation in the basin, driven by urbanization, gold mining, agricultural development in the highlands and the conversion of land for pasture [Lasso and IAVH, 2011 ; Restrepo, 2005, 2015].

Restrepo et al. [Restrepo, Kettner and Robert Brakenridge, 2020] have shown the increasing tendencies of sediment transportation over the last three decades and the correlation between patterns of land conversion, deforestation and sediment transport. The main deforestation driver is

---

<sup>12</sup> Authors' translation.

<sup>13</sup> Authors' translation.

<sup>14</sup> Interviews with Cormagdalena, the corporation in charge of the navigability of the river, and Impala, one of the port companies operating on the river.

the conversion of gallery forests into grasslands [Rodríguez, 2015]. By 2000, 80% of native riparian forests were already lost [Restrepo, Kettner and Robert Brakenridge, 2020], given an annual deforestation rate of 2.1% between 1970 and 1990, « the highest deforestation value reported on tropical water basins worldwide» [Restrepo, 2015, p. 296]. This deforestation dynamic is an important factor to explain the increase in about 30% of erosion rates all along the basin [Restrepo, Kettner and Robert Brakenridge, 2020].

Erosion comes with an increase in sediment transport, on a river that is already among the top-ranking in the world in terms of sediments flux, given the geomorphological characteristics of the basin: high precipitation rates, steep slopes in the Andes Cordilleras and strong runoff pulses associated to La Niña events [Restrepo, 2015 ; Restrepo, Kettner and Robert Brakenridge, 2020].

Another consequence of the increase in sedimentation is the loss of water spaces (marshes, waterbodies and floodplains) as well as their hydrological connections. The loss of floodplains and open water bodies affects fisheries since those ecosystems are key to the biological cycles of fish and other species. That explains that more than 40% of fish catches in the basin are made on the lakes [Lasso and IAVH, 2011]. The sediments that flow downstream are sequestered in lakes, river channels and along the adjacent floodplain [Restrepo, Kettner and Robert Brakenridge, 2020]. The loss of connectivity between lakes, streams and the main rivers is estimated at 30% with a lot of lakes already dry and lost [TNC et al., 2016].

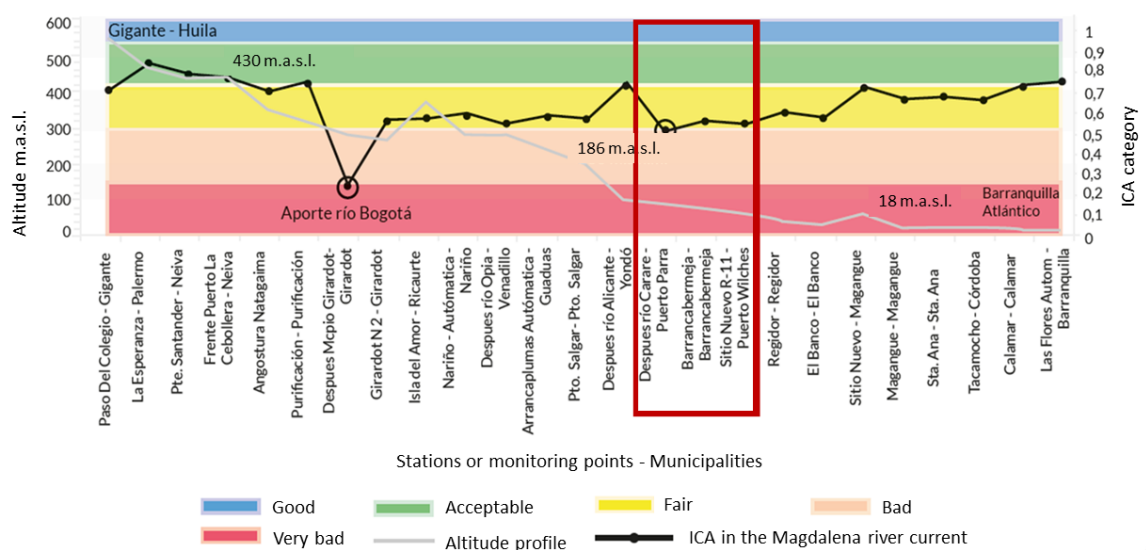
### **Quality of water**

The Magdalena River has been the north-south axis of the settlement of the country, along the Andes mountains. It has become the receptacle of urban, industrial and agricultural pollution all along the basin, lowering the quality of water and affecting both humans and non-humans living in the river. According to the Contraloría General de la Nación, in 2019, 293 municipalities of the basin (of 792) do not have any wastewater treatment system. This situation explains the high content of organic matter and other pollutants in the water [Gutiérrez and de la Parra, 2021].

Figure 2 shows the official measurement of water quality along the basin (right axis)[IDEAM, 2019]. The water quality declines fast once the river passes through medium and big cities such as Neiva and Bogotá (through the Bogotá River). The water quality of the river is “fair” for most of its course (62%) [Gutiérrez and de la Parra, 2021].

One of the sections of lower water quality is in the medium part of the basin (red square in figure 2). The pollution, in this case, is related to the oil industry in the region. Inadequate management, accidents and spills and illegal discharges in rivers and groundwaters affect lakes and streams. There have been numerous studies about the lethal and non-lethal effects of oil-related pollution on fish and other animals in the region, as well as the effects of bioaccumulation making fish improper for human consumption [Gutiérrez and de la Parra, 2021 ; Lasso and IAVH, 2011].

**Figure 2. Water quality index (ICA in Spanish) for the Magdalena River, 2016**



Source: National Water Quality Survey, 2018 [IDEAM, 2019]. Original in Spanish, Author's translation

Barrancabermeja, the largest city in the middle part of the basin, is at the same time the location of the oil refinery and the most important spot of fish catches in the basin: 25.8% of the total catches in 2021<sup>15</sup>. Hereby, oil industry pollution affects the fish quantity and quality for human consumption.

### Changing habitats and territories: hydropower infrastructures

Among the infrastructure for hydrological regulation, we will focus on infrastructure for power generation. These high-scale infrastructure entails major changes in the hydrological and physical characteristics of aquatic ecosystems [Angarita et al., 2021], challenging the hydro-social relations in those territories.

Hydropower is the primary source of power in the country, generating an average of 70% of the electricity [Rodríguez, 2015 ; TNC et al., 2016] and 84% of hydropower is produced in the Magdalena - Cauca basin [Jiménez-Segura et al., 2015]. In the macro-basin Magdalena - Cauca there are 16 reservoirs for hydropower, two of them directly on the main channel of the Magdalena River in the high part of the basin: Betania and El Quimbo. However, the largest number of dams are in the middle part of the basin on tributaries of the Magdalena [TNC et al., 2016].

Dams and reservoirs affect the territoriality of fisherpersons and food security, all along the basin. The first one and the most direct in terms of deterritorialization, is the forced displacement of people for the floods and deviation of watercourses required for the construction of reservoirs<sup>16</sup> [Salcedo and Cely, 2015].

<sup>15</sup> Source: AUNAP statistics – SEPEC. <http://sepec.aunap.gov.co/>

<sup>16</sup> Interviews with fishermen in the municipalities of El Hobo and Garzón (Huila) and with organizations working in the defense of fishermen's rights (Asoquimbo, Diocese of Garzón and ILSA).

A second effect of dams is the disruption of the biological cycles of nutrients and fish. 15% of the fish species in the basin migrate for reproduction. The alteration of the river ecosystems and the building of dams have an important impact on the survival of fish during the first life stage (embryonal and larvae). Most of the affected species sustain artisanal fisheries [Jiménez-Segura et al., 2015 ; Lasso and IAVH, 2011]. For instance, according to AUNAP statistics, in 2021 the *bocachico* (*Prochilodus magdalenae*), a migratory species, represented 57.9% of the artisanal catches in the basin, 18% of the national total.

A third effect associated with the disruption of the streamflow is the uncertainty regarding the volume of water. The radical changes in volumes of water endanger aquatic life, fish populations were confronted with unusually low water levels<sup>17</sup>. The models of Angarita et al. of changes in water volumes due to dams in the Magdalena Basin show that «the alteration with the wider regional effect is related to the intensification of change rates in daily water volumes (meaning, the rates of increasing or decreasing of water volumes in consecutive days)»<sup>18</sup> [Angarita et al., 2021, p. 272], as opposed to seasonal changes under the regime of rains and droughts.

Interventions such as dams, pollution and loss of water spaces have an important impact on the river fisheries. It has been estimated that the catches in the basin fell by about 90% between 1970 and 2000 [Lasso and IAVH, 2011]. The decline in the importance of the river in national fish landings (figure 1) and the observed reduction in 54% of the fish production in the Magdalena – Cauca basin between 1995 and 2015<sup>19</sup> are also evidence of this situation.

The fisherpersons acknowledge the situation. Almost 95% of fisherpersons participating in the AUNAP 2020 survey pointed out that captures used to be more abundant in the past. 77% perceived that the size of captured fish is smaller than before and 71% think that the main problem affecting the fisheries is water pollution in its diverse manifestations [AUNAP, 2020]. The Magdalena River is declining as a source of food.

#### **4. Deterritorialization of artisanal fishermen and food security in Colombia**

The ecological crisis of the river entails a social one. Pollution, the decline of fisheries and water grabbing lead to deterritorialization. In addition, other factors often entangled strengthen this process of deterritorialization: the undervaluation of peasants' and fisherpersons' labor, the conflicts with landlords for the use and access to land and water and the violence and forced displacement suffered by rural communities<sup>20</sup> [CNMH, 2017 ; CNMH and Pontificia Universidad Bolivariana, 2014].

For the communities living in and with the river, the Magdalena is not only a source of water but is rather a living space [Boelens et al., 2021]. The affectations on the material conditions of the river and

---

<sup>17</sup> Interviews with fishermen in the municipality of El Hobo (Huila).

<sup>18</sup> Author's translation

<sup>19</sup> Source: Ministry of Agriculture and Rural Development statistics. Available on [www.agronet.gov.co](http://www.agronet.gov.co)

<sup>20</sup> The population that has been forced into displacement is estimated in Colombia in more than 8 million people for the period 1985 – 2000. 90% of the displaced population inhabited rural areas. Source: <https://www.unidadvictimas.gov.co/es/registro-unico-de-victimas-ruv/37394>. Consulted July 14, 2022.

other basin ecosystems change the relations people have with the river and their territorialities, resulting even in the expulsion of the communities.

Among the changes in the relations people have with the river and other beings living in water spaces, we found in the interviews and the literature a stronger dependency on fishing arts such as the trammel net [CNMH and Pontificia Universidad Bolivariana, 2014 ; Gutiérrez, Barreto and Mancilla, 2011] as opposed to the traditional throw net (*atarraya*). This kind of technology is not allowed since they catch fishes of all sizes, jeopardizing their reproductive cycles. However, with the decline of fisheries, fisherpersons advocate that it is the only way to keep their activity. The situation turns into a vicious cycle: the environmental crisis pushes the fisherpersons towards technologies that deepens the fisheries crises. However, as we will present in the last part of this paper, the territorial claims of the fisherpersons lie partly in the return to traditional fishing arts, hand-in-hand with the recovery of water ecosystems.

### **Food insecurity and food production**

Deterritorialization was one of the consequences of armed conflict in Colombia, which also affects food production and leads to risks of shortage, food insecurity and malnutrition, especially among the children and elderly populations. This situation has already been observed by organizations such as FAO. Its last report on the food security panorama in Colombia points out that «*According to the 2022 Humanitarian Needs Overview, 7.3 million Colombians are food insecure and in need of food assistance in 2022*» [FAO and WFP, 2022, p. 19].

Food security is a fundamental right<sup>21</sup>, defined as the guarantee for the population to access the food they need regularly and continuously. This is a condition the State must guarantee, through policies supporting the national production of food, surveying the prices of basic goods and creating a public structure of strategic alimentary reserves.

In almost all countries, the production of food is sufficient to feed the population. On a global scale, there is no scarcity of food and world production of food would allow feeding properly the world population<sup>22</sup>. As A. Sen pointed out in his analysis of famines, the problem of hunger is not a problem of lack of food, but of inequality in institutional structures preventing people from the access to basic goods [Sen, 1999] – an idea that can be traced to the pioneering work of the Brazilian geographer Josué de Castro [De Castro, 1955].

Colombia is a country with abundant food production. Nevertheless, there are alarming findings in the 2020 survey made by the Cluster of Food Security and Nutrition<sup>23</sup>. 5.4 million people were in the category of level 3 of “severe conditions” and 1.9 million on level 4, which means an imminent risk of

---

<sup>21</sup> «The need for food might be the most basic of human needs. People must eat. The lack of adequate food not only causes hunger [...] but also reduces their abilities and causes apathy and in extreme cases lethargy, diminishing their willing to work and so of improving their means to fight the hunger» [Streeten, 1996, p. 24].

<sup>22</sup> The production of food in the world could feed 10,000 million people. However, with a population of 7,500 million, there are 820 million people suffering from hunger, especially in the global south. In addition, 2,000 million people do not have regular access to food, they are in a situation of food insecurity [FAO et al., 2020].

<sup>23</sup> The methodology used in this measurement follows the guidelines of the Cluster of Global Food Security and the Cluster of Global Nutrition. Given the extent of the results of people in moderate food insecurity (almost 20 million people), only the population with the more critical needs was considered.[Food Security Cluster and Nutrition Cluster, 2021]

hunger. In total, 7.3 million people all over the country are at high risk of food insecurity [Food Security Cluster and Nutrition Cluster, 2021].

The situation of food insecurity is linked to the decline in agricultural and fishing production, a tendency we can observe since the end of the 20th century. This situation results from the factors already presented in this paper, such as environmental degradation, land grabbing and forced displacement of rural inhabitants. However, it is important to consider the role of the economic policies leading to the re-primarization of the economy.

In fact, with the market liberalization in the 1990s, the leading economic sectors have been the extractive ones (oil and mining). About 50% of Colombian exports in the last 20 years are oil and mineral fuels<sup>24</sup>. The result is the transformation of millions of hectares of productive land into mining spaces and the emergence of environmental conflicts with communities of fisherpersons and peasants, given the water requirements and pollution generated by the mining activity<sup>25</sup>.

Despite the discrepancies among sources and the lack of reliable statistics, there is an observed decline in the artisanal fisheries in the Magdalena – Cauca basin as we showed in the previous section. Therefore, assessing the impact of declining fisheries on food security is a challenge that institutions such as the OECD have pointed out [OECD, 2016]. Nevertheless, some sources like the estimation made by Gutiérrez (cited in [Lasso and IAVH, 2011, p. 64]) underline the importance of artisanal fishing in the basin for food security. According to those estimations by the end of the 20<sup>th</sup> century, the fish from the Magdalena Basin provided protein to about 2 million people, in addition to subsistence fishing.

«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» [OECD, 2016, p. 11]. In addition, when eaten whole, as is the case in riparian communities of the Magdalena River, fish is an important source of nutrients difficult to find in other types of food [FAO, Universidad Duke and WorldFish, 2022].

While fish consumption is relatively low in Colombia, with 8.8 kg a year per inhabitant [MADR, 2021], there are important variations at regional and household levels. In the case of riparian territories of the Magdalena River, fish is not only the main source of protein; the consumption of fish is associated with well-being and has become a mark of regional/basin identity<sup>26</sup>. The *bocachico* is an important symbol of life in the Magdalena River. In this sense, the reduction of fisheries affects not only the availability of food but also the hydro-social relations in the basin.

---

<sup>24</sup> Source: ITC TradeMap, based on the National Bureau of Taxes and Customs - DIAN.

<sup>25</sup> Source: Interviews with environmental leaders and activists in Barrancabermeja and Puerto Wilches (Santander), which are central spots of the oil industry in Colombia and with leaders in the lower part of the basin.

<sup>26</sup> Source: Interviews with fishermen and inhabitants of different municipalities along the river.



**Picture 2 (left). Fish market, Puerto Wilches: a *bagre* (*Pseudoplatystoma magdaleniatum*) and a bucket full of *bocachico* (*prochilodus magdalenae*)**

**Picture 3 (right). Fish market, San Marcos: *Bocachico* (*prochilodus magdalenae*)**



Source: Sébastien Velut (left), Puerto Wilches (Santander), November 2022. Carolina Hernández (right), San Marcos (Sucre), October 2022.

Fisherpersons are among the most vulnerable populations in terms of revenue and access to social services in Colombia [Defensoría del Pueblo, 2021]. According to the Multidimensional Poverty Index by DANE, in the period 2010 – 2018, fisherpersons have higher levels of illiteracy, lower levels of education and lower index of health and retirement insurances<sup>27</sup>. This situation entails that fisherpersons have a high dependency on their activity not only to maintain their revenue but to have a source of food: for 84.7% of artisanal fisherpersons, fishing is the main source of food [AUNAP and PNUD, 2021].

74% of artisanal fisherpersons in Colombia have a full-time dedication to fishing activity, being their only source of revenue [Defensoría del Pueblo, 2021]. According to AUNAP and UNDP, 95.6% of Magdalena – Cauca fisherpersons think of themselves as poor and 87.5% of fisherpersons' households have unsatisfied basic needs. Those households have a strong dependency on the quality of fishing spaces for their survival and the decline of fisheries affects their food security.

As several fisherpersons stated in the interviews<sup>28</sup>, the fact that nowadays they catch fewer and smaller fish means that they use a larger portion of catches to feed their families and less to the market, which entails a reduction in their monetary income and less balanced diets.

### **Food imports and aquaculture**

The decline in fish -and in general, food- production is related to two phenomena. The first one is the imports of food and the second one is the growing importance of aquaculture.

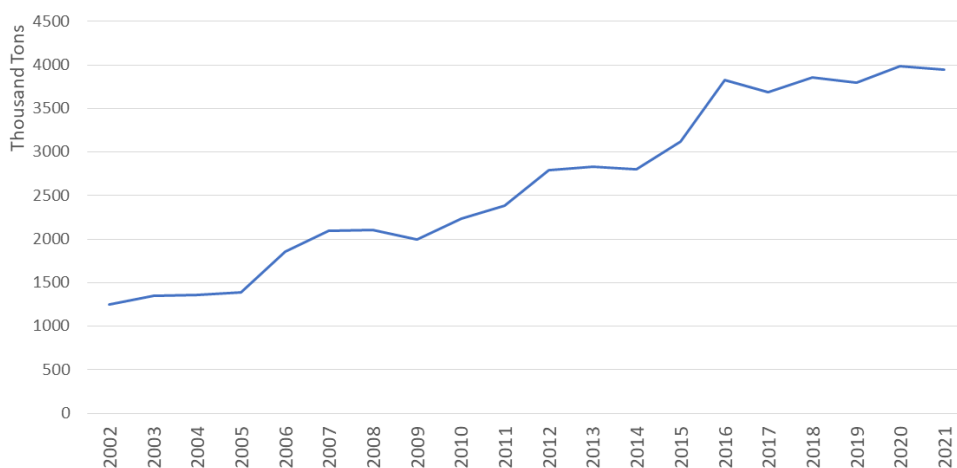
---

<sup>27</sup> Author's calculations, using the anonymized microdata of the Multidimensional Poverty Index by DANE. Fisherpersons were identified through the International Standard Industrial Classification, adapted for Colombia (ISIC Rev. 3 A.C.).

<sup>28</sup> Interviews with fishermen in the municipalities of Magangué, Majagual and Sucre in the low part of the basin.

Regarding imports, the market opening at the beginning of the 1990s and the deepening of market liberalization through Free Trade Agreements have made it easier and cheaper to import food, both fresh and processed. In the last 20 years, food imports have grown by 216%, from 1.2 million tons in 2002 to 3.9 million in 2021 (see figure 3).

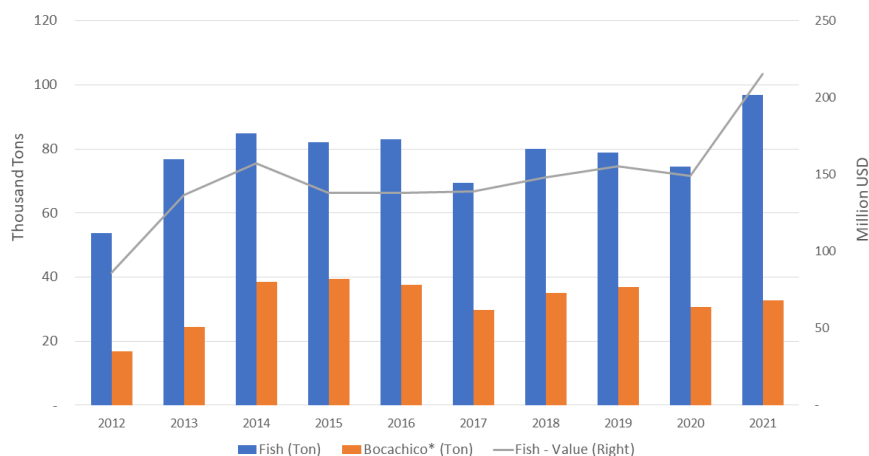
**Figure 3. Process food and agro-based products imports, 2002 - 2021**  
Volume (Thousand Tons)



Source: Trademap

As for the imports of fish, even though the growth has not been as exponential as the rest of the food, between 2012 and 2021 the volume of imported fish<sup>29</sup> has increased by 80% (see figure 4). In 2021 77% of the imports came from five countries: Chile (32%), Viet Nam (22%), China (10%), Uruguay (7%) and the United States (6%).

**Figure 4. Imports of fish (Volume and Value) and of *Bocachico* (Volume)**  
2012 – 2021



Source: UNComtrade, for the commodity chapters 0302, 0303 and 0304  
\* *Bocachico* is part of the commodity codes 030289 and 030389

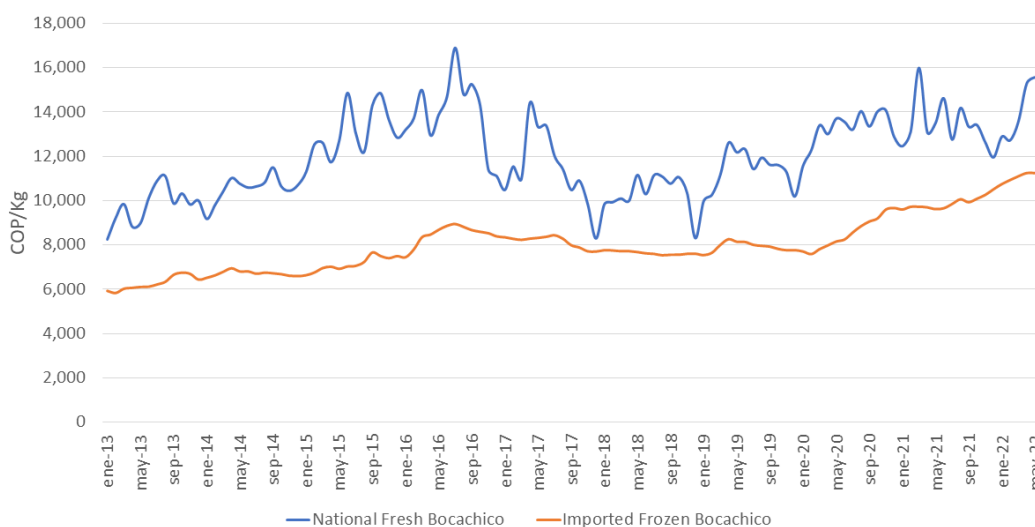
<sup>29</sup> The calculations of imported fish have been made using the information of UN Comtrade. We have included chapters 0302, 0303 and 0304 of the commodity codes, meaning we have not included live fish, crustaceans, shellfish, or processed fish.

While salmon is the most bought species in international markets, it is noticeable the importance that has the category “Frozen fish”, where we find *bocachico*, which accounts for 41% of fish imports in the period. 43% of these imports come from Uruguay.

The competition with imported fish becomes new pressure on local fishermen, who must compete with cheaper imported products. In fact, in wholesale markets in the major cities in Colombia, fresh *bocachico* from the Magdalena River is sold at a higher price (33% on average) than frozen imported *bocachico* (see figure 5).

National prices are also much more volatile since they depend on climate conditions, fish seasonal availability and other factors that fisherpersons cannot control. This situation affects the income and the food security of fisherpersons, who face increasing competition at lower prices, while the fisheries in the Magdalena River keep diminishing.

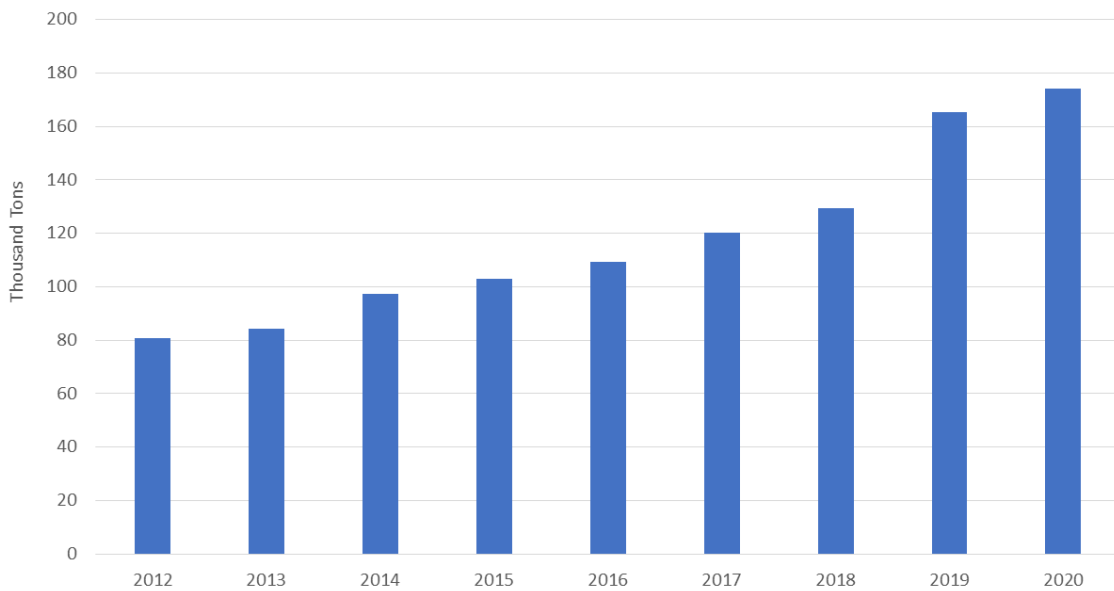
**Figure 5. Monthly prices. National fresh *bocachico* vs. Imported frozen *bocachico*  
January 2013 - June 2022**



Source: System of price information and supply in the agricultural sector -SIPSA-

The second phenomenon is the growing importance of aquaculture, which has been the sector chosen by the national government to increase national fish production. The sectoral public policy aims to strengthen aquaculture and the transformation of fisherpersons into small-scale aquaculture producers [AUNAP and FAO, 2014]. As a result, while the artisanal fisheries decline, aquaculture production increased by 116% between 2012 and 2020 (see figure 6).

**Figure 6. Aquaculture production (Tons), 2012 – 2020**



Source: Ministry of Agriculture and Rural Development

Fish production in aquaculture techniques transforms the dynamics of artisanal fishing, industrializing the process in the entire cycle, from the breeding to the harvesting, including the production of fish food. The production in artificial conditions of growing volumes of fish requires land, water, processed food and energy. It also pollutes waters with fish dejection and antibiotics.

This entails a concentration on the production of fish, since the logic of aquaculture production is entirely different from that of artisanal fishing and the fisherpersons rarely have the technical knowledge and even less the capital (including the land) required to undertake the aquaculture production successfully<sup>30</sup>. The production is directed toward urban centers, leaving rural areas, especially the more peripheral ones, in a situation of scarcity of fish, which used to be a cheap staple food.

## 5. Resisting fishermen

Despite the difficult conditions faced by fisherpersons, many of them refuse to leave their territories and quit their fishing activity. Fishing is part of their identity<sup>31</sup>. The resistance of fishermen against deterritorialization started with the claim of their right to live dignified lives in their territories. Along with that is the recognition that the river and other spaces of water are their territories. In this sense, territorial rights become human rights.

Associations of fisherpersons have initiated legal actions claiming territorial rights all over the basin. For instance, in the high part of the basin, the fight is against extractivist practices over the river. There is a lawsuit of artisanal fisherpersons against the Nation and the company EMGESA for the

<sup>30</sup> Interviews with fishermen in the municipalities of Magangué (Bolívar), Majagual y Sucre (Sucre) in the lower parts of the basin, and Hobo (Huila) in the high part. Interviews with the AUNAP and Colombia Productiva.

<sup>31</sup> Interviews with fishermen in all the areas of study.

construction of El Quimbo dam. The judges have found that «the environmental license approved for the construction of El Quimbo did not consider the rights of the artisanal fisherpersons in the Betania area»<sup>32</sup> [Dussán, 2020, p. 34].

However, some leaders acknowledge that one obstacle they face in claiming their territorial rights is their lack of recognition as political actors, since for the government fisherpersons are not peasants and for most of them, they are neither an ethnic population [Boelens et al., 2021]. Several organizations have been created at regional and national scales. In association with environmental activists, they have reached new spaces to make visible their fights. The most important so far was the creation of the Confederation National Bureau of Artisanal Fishing – Comenalpac and having a candidate for the National Senate in the 2022 election. Through these new political strategies, they have achieved the recognition of artisanal fisherpersons' rights [Defensoría del Pueblo, 2021].

Another strategy is through legal actions toward the protection of territorial rights. One example of this strategy is the fight of fisherpersons in the lower part of the basin for collective identification as victims of armed conflict and the search for collective reparations. Those reparations mainly consist of land and water access, but also ecological restoration of rivers and floodplains [CNMH and Pontificia Universidad Bolivariana, 2014].

As part of this strategy, fisherpersons, mainly in the lower part of the basin, have claims anchored in the concept of spatial justice. They argue that the floodplains and the marshes are the receptacles of all the problems (pollution, deforestation and sedimentation) generated all along the basin. They advocate for the acknowledgment of the ecosystem services offered for the entire basin -and the entire country. The artisanal fisherpersons defined themselves as the caretakers of the river and their ecosystems, based on the concept of ecosystem services and ecosystem compensations. They recognize that their activities have impacts on the ecosystems and so they shall participate in the restoration of the fishing spaces [Fundación Alma and ICANH, 2021].

Nevertheless, they are skeptical about figures of protected areas, since, in the one hand, they recognized possible conflicts between environmental regulations and production practices -like the trammel net. On the other hand, the historic absence of the State is another source of disbelief in the effectiveness of a legal figure of environmental protection.

Another strategy linked with this acknowledgment was a process of patrimonialization of artisanal fishing. This process was developed with allies such as Alma Foundation to achieve the recognition of «the artisanal fishermen's way of life on the Magdalena River as intangible cultural heritage of Colombia as a Nation» [Boelens et al., 2021, p. 475]. This recognition was granted in December 2022. The main objective of this strategy is to search for joint governance of the river through the balance of traditional and scientific knowledge. It is in the context of this strategy that some fisherpersons leaders make efforts to create a collective awareness about the harms of the trammel net, not only in terms of their ecological damages but also in terms of their culture and award them status as guardians of the river. As the "Plan of Safeguard of Knowledge and Techniques related to artisanal fishing of the floodplains of the Magdalena River" states, "artisanal fishing can be defined by any artisanal

---

<sup>32</sup> Author's translation



fisherperson as *the one who takes care of the aquatic and terrestrial milieux*” [Fundación Alma and ICANH, 2021; italics in the original text]<sup>33</sup>.

**Pictures 4 and 5. Mural paintings representing fishing and riverain culture in Puerto Wilches**



“Are we river?”

Source: (left) Sébastien Velut and (right) Carolina Hernández, Puerto Wilches (Santander), November 2022. Commissioned by the grassroots movement “Aguawil – For the defense of the water, the life and the territory”.

## Conclusion

Fishing is an activity facing different kinds of threats. Natural hazards, territorial conflicts and ecological sustainability of water are central factors for the sustainability of artisanal fisheries. In the Colombian case, the fisheries in the Magdalena Basin face all those risks.

The environmental crisis of the river is one of the main threats to artisanal fisheries. This crisis has different manifestations: water pollution, sedimentation, loss of water spaces and alteration of hydrologic flows. One of the consequences of this crisis is the decline of fisheries. In addition to this crisis, fishing territories have become places of conflict. It encompasses not only the violence of fifty-year-long Colombian armed conflict context but also in dispute with large extractive firms. All those factors have triggered a process of deterritorialization of fisherpersons.

The decline of fisheries has implications for food security at the local and national levels. Fish is an important source of high-quality protein, especially for low-income populations living in riparian and coastal territories. Fisherpersons acknowledge that nowadays the catches are scarcer and of smaller fish. This situation reduces the income of fisherperson and households, as well as the availability of fish in local markets.

The imports of fish and aquaculture are new competitors to fishermen, competing with lower prices and governmental incentives. While the imported or harvested fish arrive in urban markets, in rural areas, the availability of fish keeps diminishing. As such, the traditional life of fisher communities is under the threat of disappearing under the advance of markets, industrial production of selected species by aquaculture and the alterations made to the river and its tributaries. This evolution is not

---

<sup>33</sup> Author’s translation, italics in the original text.



only a human, social and cultural loss. It also threatens access to food and especially proteins, for local communities.

However, fisherpersons in the Magdalena River also resist deterritorialization through different strategies, mainly by positioning themselves as political actors that allow them to reclaim territorial rights. In these claims the river and other water spaces are territories and the fight for a clean environment becomes a claim for their right to a dignified life.

### **Acknowledgment:**

This paper results from field work partially supported by the research project “The Magdalena River. Territorial conflicts and development projects. A proposal for sustainability” supported by the binational program ECOS-Minciencias (France – Colombia)

### **Bibliography**

ALCALÁ Graciela, CAMARGO Alejandro, 2011, *Pescadores en América latina y el Caribe: espacio, población, producción y política*, México, Facultad de Ciencias de la Universidad Nacional Autónoma de México.

ANGARITA Héctor, SANTOS-FLEISCHMANN Ayan, ROGÉLIZ Carlos, CAMPO Fernando, NARVÁEZ-CAMPO Gabriel, DELGADO Juliana, SANTOS Tania, HERRERA-R. Guido, JIMÉNEZ-SEGURA Luz, 2021, “Modificación del hábitat para los peces de la cuenca del río Magdalena, Colombia,” in Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Jiménez-Segura Luz, Lasso Carlos A. (dir.), *Peces de la cuenca del río Magdalena, Colombia: diversidad, conservación y uso sostenible*, 1st edition, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, pp. 265–194.

AUNAP, 2020, “Caracterización de usuarios y grupos de interés AUNAP,” Bogotá D.C., Colombia, Autoridad Nacional de Acuicultura y Pesca - AUNAP.

AUNAP, FAO, 2014, “Plan Nacional para el Desarrollo de la Acuicultura Sostenible en Colombia - PlaNDAS,” Autoridad Nacional de Acuicultura y Pesca - AUNAP y FAO.

AUNAP, PNUD, 2021, “Caracterización, formalización y fortalecimiento asociativo de los pescadores artesanales de los ríos Magdalena, Cauca, San Jorge y Sinú,” Informe, Autoridad Nacional de Acuicultura y Pesca - AUNAP; Programa de Objetivos de Desarrollo Sostenible - PNUD; PNUD.

BECERRA Silvia, GUZMÁN Julieth, 2015, “Buscando los rostros campesinos de por acá. Una aproximación desde la noción de vida campesina,” *Controversia*, 205, pp. 39–60.

BOCAREJO Diana, 2018, “Lo público de la Historia pública en Colombia: reflexiones desde el Río de la Patria y sus pobladores ribereños,” *Historia Crítica*, 68, pp. 67–91.

BOELEN Rutgerd, FORIGUA-SANDOVAL Juliana, DUARTE-ABADÍA Bibiana, GUTIÉRREZ-CAMARGO Juan Carlos, 2021, “River lives, River movements. Fisher communities mobilizing local and official rules in defense of the Magdalena River,” *The Journal of Legal Pluralism and Unofficial Law*, 53(3), pp. 458–476.

BOELEN Rutgerd, HOOGESTEGER Jaime, SWYNGEDOUW Erik, VOS Jeroen, WESTER Philippus, 2016, “Hydrosocial territories: a political ecology perspective,” *Water International*, 41(1), pp. 1–14.

BROCHERO Alvaro, SILVA Fabio, 2019, "Campesinos pescadores y pescadores campesinos. Realidades y Tensiones del pescador artesanal en el Sur del Magdalena," *Oraloteca*, 2019, pp. 43–60.

CAMACHO-VERA Joaquín Huitzilihuitl, CERVANTES-ESCOTO Fernando, CESÍN-VARGAS Alfredo, PALACIOS-RANGEL María Isabel, 2019, "Los alimentos artesanales y la modernidad alimentaria," *Estudios Sociales. Revista de Alimentación Contemporánea y Desarrollo Regional*, 29(53).

CAMARGO Alejandro, 2014, "The Crisis of Small--Scale Fishing in Latin America," *NACLA North American Congress on Latin America*.

CAMARGO Alejandro, MÁRQUEZ Ana Isabel, 2021, "Antropología en el agua: pueblos, pescadores y otros seres acuáticos en ríos, ciénagas y mares," in *Antropología y Naturaleza*, Asociación Colombiana de Antropología, Colección cuadernos mínimos, pp. 79–104.

CNMH, 2017, *Campesinos de tierra y agua: campesinado en La Mojana sucreña y bolivarense*, Bogotá D.C., Colombia, Centro Nacional de Memoria Histórica, Campesinos de tierra y agua: memorias sobre sujeto colectivo, trayectoria organizativa, daño y expectativas de reparación colectiva en la región Caribe 1960 - 2015, 60 p.

CNMH, PONTIFICIA UNIVERSIDAD BOLIVARIANA, 2014, *Lucho Arango, el defensor de la pesca artesanal*, Bogotá D.C., Colombia, Centro Nacional de Memoria Histórica, 150 p.

DANE, 2016, "3er Censo Nacional Agropecuario. Hay campo para todos. Tomo 2, Resultados.," Census results, *3er Censo Nacional Agropecuario*, Bogotá D.C., Colombia, Departamento Administrativo Nacional de Estadísticas - DANE.

DE CASTRO Josué, 1955, *Geopolítica del hambre*, Traducción del portugués de Nicolás Cócara, Buenos Aires, Argentina, Editorial Raigal.

DEFENSORÍA DEL PUEBLO, 2021, "Cartilla de derechos para pescadores artesanales," Colombia, Defensoría del Pueblo.

DUSSÁN Enrique, 2020, "Reparación de los daños causados a un grupo. Demandante: Uber Roldan Cortés y otros. Demandado: La Nación – Ministerio de Ambiente, Emgesa S.A. E.S.P. y otros.,"

ESCOBAR Arturo, RESTREPO Eduardo (Trad.), 2010, *Territorios de diferencia: lugar, movimientos, vida, redes*, 1. ed en español, Bogotá, Envió Editores, 386 p.

FAO, 2020, "El estado mundial de la pesca y la acuicultura 2020," *The State of World Fisheries and Aquaculture (SOFIA)*, Roma, Organización de las Naciones Unidas para la Alimentación y la Agricultura - FAO.

FAO, IFAD, UNICEF, WFP, WHO, 2020, *El estado de la seguridad alimentaria y la nutrición en el mundo 2020: transformación de los sistemas alimentarios para que promuevan dieta.*, Roma, FOOD & AGRICULTURE ORG, 348 p.

FAO, UNIVERSIDAD DUKE, WORLD FISH, 2022, "Pesca en pequeña escala y desarrollo sostenible: principales conclusiones del informe 'Iluminar las capturas ocultas'.," Conclusiones del informe, Roma, Durham y Penang, FAO.

FAO, WFP, 2022, *Hunger Hotspots*, FAO, WFP.

FERRO Germán, 2013, “El Río Magdalena. Territorio y Cultura en Movimiento,” *Boletín cultural y bibliográfico, Banco de la República de Colombia*, XLVII(84).

FOOD SECURITY CLUSTER Colombia, NUTRITION CLUSTER Colombia, 2021, “Nota Metodológica. Personas en Necesidades (PiN) del Clúster SAN. Human Needs Overview 2022,” Colombia Food Security Cluster.

FORGET Marie, CARRIZO Silvina Cecilia, BOS Vincent, 2021, “Ressources extractives sud-américaines : mondialisation et territorialisations des marges,” *L’Information géographique*, Vol. 85(4), pp. 37–60.

FUNDACIÓN ALMA, ICANH, 2021, “Plan especial de salvaguardia de los conocimientos y técnicas asociadas a la pesca artesanal en las planicies inundables del río Magdalena.”

GRUPO ETC, 2010, “Quién alimenta el mundo,” *Biodiversidad*, 64(Abril).

GUTIÉRREZ Francisco, BARRETO Carlos, MANCILLA Beatriz, 2011, “Diagnóstico de la pesquería en la cuenca Magdalena - Cauca,” in *Pesquerías continentales de Colombia: cuencas del Magdalena-Cauca, Sinú, Canalete, Atrato, Orinoco, Amazonas y vertiente del Pacífico*, Bogotá, D. C., Colombia, Instituto de Investigación de los Recursos Biológicos Alexander von Humboldt, Serie Recursos Hidrobiológicos y Pesqueros Continentales de Colombia, pp. 35–74.

GUTIÉRREZ Luis C., DE LA PARRA Ana C., 2021, “Contaminación del agua de la cuenca del río Magdalena, Colombia, y su relación con los peces,” in Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Jiménez-Segura Luz, Lasso Carlos A. (dir.), *Peces de la cuenca del río Magdalena, Colombia: diversidad, conservación y uso sostenible*, 1st edition, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, pp. 239–264.

IC, WWF, 2019, *La pesca y la acuicultura en Colombia: del agua a la mesa*, Colombia, International Conservation and World Wild Fund, Agenda del Mar.

IDEAM, 2019, “Estudio Nacional del Agua 2018,” Bogotá, Colombia, Instituto de Hidrología, Meteorología y Estudios Ambientales - IDEAM.

JIMÉNEZ-SEGURA Luz, RESTREPO Daniel, LÓPEZ Silvia, DELGADO Juliana, VALDERRAMA Mauricio, ÁLVAREZ Jonathan, GÓMEZ Daniel, 2015, “Ictiofauna y desarrollo del sector hidroeléctrico en la cuenca del río Magdalena-Cauca, Colombia,” *Biota Colombiana*, 12(2), pp. 3–25.

LASO Carlos A., IAVH (dir.), 2011, *Pesquerías continentales de Colombia: cuencas del Magdalena-Cauca, Sinú, Canalete, Atrato, Orinoco, Amazonas y vertiente del Pacífico*, Bogotá, D.C., Colombia, Instituto de Investigación de los Recursos Biológicos Alexander von Humboldt, Serie Recursos hidrobiológicos y pesqueros continentales de Colombia, 304 p.

LATHAM Michael, 2002, *Nutrición humana en el mundo en desarrollo*, FAO, Alimentación y nutrición.

LEFF Enrique, 2004, *Racionalidad ambiental la reapropiación social de la naturaleza*, Madrid, España, Siglo XXI Editores.

MADR, 2021, “Acuicultura en Colombia. Cadena de la acuicultura.” Ministerio de Agricultura y Desarrollo Rural.

MÁRQUEZ Germán, 2016, “Un río difícil. El Magdalena: historia ambiental, navegabilidad y desarrollo,” *Memorias. Revista digital de historia y arqueología desde el Caribe colombiano*, 28, pp. 29–60.

OECD, 2016, "Fisheries and aquaculture in Colombia," Organization for Economic Cooperation and Development.

RESTREPO Juan D. (dir.), 2005, *Los sedimentos del río Magdalena: reflejo de la crisis ambiental*, 1. ed, Medellín, Fondo Editorial Universidad EAFIT, 267 p.

RESTREPO Juan D., 2015, "Causas naturales y humanas de la erosión en la cuenca del río Magdalena.," in *¿Para donde va el río Magdalena? Riesgos sociales, ambientales y económicos del proyecto de navegabilidad*, Primera edición, Bogotá, Friedrich Ebert Stiftung y Foro Nacional Ambiental.

RESTREPO Juan D., KETTNER Albert J., ROBERT BRAKENRIDGE G., 2020, "Monitoring water discharge and floodplain connectivity for the Northern Andes utilizing satellite data: A tool for river planning and science-based decision-making," *Journal of Hydrology*, 590.

RODRÍGUEZ Manuel (dir.), 2015, *¿Para dónde va el Río Magdalena? riesgos sociales, ambientales y económicos del proyecto de navegabilidad*, Primera edición, Bogotá, Friedrich-Ebert-Stiftung, 314 p.

SALCEDO Camilo, CELY Andrea, 2015, "Expansión hidroeléctrica, Estado y economías campesinas: El caso de la represa del Quimbo, Huila-Colombia," *Mundo Agrario*, 16(31).

SEN Amartya, 1999, *Development as freedom*, 1st. ed, New York, Knopf, 366 p.

STREETEN Paul, 1996, "El hambre," in *El incendio frío: Ensayos sobre las causas y consecuencias del hambre en el mundo*, Bilbao, Universidad del País Vasco.

TNC, FUNDACIÓN ALMA, FUNDACIÓN HUMEDALES, AUNAP, 2016, *Estado de las planicies inundables y el recurso pesquero en la macrocuenca Magdalena-Cauca y propuesta para su manejo integrado*, Bogotá, Colombia.

UNIMAGDALENA, AUNAP, 2013, "Análisis del censo pesquero, de la actividad pesquera industrial y artesanal, continental y marina de Colombia," Convenio 0005 AUNAP-UNIMAGDALENA, Universidad del Magdalena y Autoridad Nacional de Acuicultura y Pesca.

VELUT Sébastien, 2021, "Les territoires de l'Amérique latine et les dynamiques de l'extractivisme," *L'Information géographique*, 85(4), pp. 10–19.