Pêches et Océans Canada | Fisheries and Oceans Canada

SOCIO-ECONOMIC CONTRIBUTION

of the Fisheries and Mariculture Sector in the Magdalen Islands

Fisheries and Oceans Canada, Strategic Services, Quebec Region

Report submitted to Parks Canada and Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (2023)

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Mrs. Catherine Allard-Bergeron for sharing and donating the copyright of the photos she took in the Magdalen Islands.

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Acronyms and Symbols

Acronyms

BGMPA	Canada-Quebec Bilateral Group on Marine Protected Areas
CFIA	Canadian Food Inspection Agency
CGE model	Computable General Equilibrium Model
DFO	Department of Fisheries and Oceans
ECCC	Environment and Climate Change Canada
EC-IO	Integrated Econometric Input-Output Models
FEAM	Fishery Economic Assessment Models
FTE	Full-time equivalents
GDP	Gross Domestic Product
GHG	Greenhouse gas
ISQ	Institut de la statistique du Québec
ITQ	Individual Transferable Quotas
MAPAQ	Quebec Department of Agriculture, Fisheries and Food
MDDEFP	Quebec Department of Sustainable Development, the Environment, Wildlife and Parks
MELCC	Quebec Department of the Environment and the Fight Against Climate Change
MRNF	Ministère des Ressources naturelles et des Forêts
MISQ	Modèle intersectoriel du Québec (Québec input-output model)
MPA	Marine Protected Area
MPDB	Marine Product Dockside Buyers
MTESS	Quebec Department of Labour, Employment and Social Solidarity
NAICS	North American Industry Classification System
PCA	Parks Canada Agency
SAM	Social Accounting Matrix
SME	Small or medium-sized enterprise
SS-QR	Strategic Services, Quebec Region
UQAR	University of Quebec at Rimouski

Symbols

$K	Thousands of dollars
$M	Millions of dollars

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Summary

Situated in the heart of the Gulf of St. Lawrence, the Magdalen Islands have a unique natural and cultural heritage in Canada where its residents have an immediate connection with their maritime environment. These characteristics clearly influence the economic activity that has developed in the archipelago over the years.

To assess the potential socio-economic impacts of creating a marine protected area in the Magdalen Islands, the Parks Canada Agency and MELCCFP asked the Strategic Services Directorate of Fisheries and Oceans Canada (DFO) to analyze the economic contribution of the area's fishing and mariculture sector by

- developing an overall socio-economic profile of the Magdalen Islands (demographics, educational attainment and socio-economic characteristics);
- highlighting the socio-economic importance of fishing and mariculture activities; and
- estimating the economic benefits provided by the main institutions and industries that make up the archipelago's fishing and mariculture sector.

Socio-economic profile

First of all, the economy of the Magdalen Islands centres on two seasonal drivers: the harvesting and processing of fishery resources, and tourism. Roughly 20% of Islanders are employed in seasonal jobs, compared with 3% of workers in the province as a whole. The archipelago's non-seasonal economic activity consists of the tertiary sector; public, parapublic and community services; and the only working salt mine in Quebec. Worker recruitment is particularly difficult because of the aging population and limited access to housing for newcomers. The area has characteristics typical of island communities: specialization in the production of exports, a preponderance of SMEs, a higher cost of living, and lower buying power. Magdalen Island residents are therefore highly dependent on foreign markets, both for supplies and for selling their products, which results in higher costs compared with other maritime communities in Quebec. There is also the cost of travel outside the archipelago, which is possible only by sea or air.

Profile of the fishing and mariculture sector

In this study, the fishing and mariculture sector consists of the commercial fishing, mariculture, and fish and seafood processing industries. In 2019, the value of fish landings in the Magdalen Islands was $118 million, and the value of the fish and seafood processing industry's output was $132 million, accounting for 31% and 22% of the total value for maritime Quebec, respectively. Lobster and snow crab, the two most lucrative species for the Magdalen Islands, accounted for, respectively, 70% and 25% of the total landings in the area. Mariculture activities, focused primarily on mussel, scallop and oyster farming, generated an estimated $2.6 million in production in 2019, positioning the Magdalen Islands as the province's leading mariculture producer.

Estimating the economic benefits

In 2019, the combined output of the fishing and mariculture sector was valued at over $238.3 million. In addition, the expenditures of institutions in the Islands with a mandate directly related to fishery resources harvesting and production activities amounted to $3.9 million. Through their operations and production, those industries and institutions generate direct, indirect and induced benefits for the economy of the archipelago and the province. In this report, those economic benefits were estimated using the Institut de la statistique du Québec (ISQ) *Modèle intersectoriel du Québec* (Québec input-output model) and Statistics Canada's provincial multipliers. The estimate is based on indicators such as employment, value added, federal and provincial government revenues and parafiscal taxes, and the volume of greenhouse gas (GHG) emissions generated by those activities.

The results of the simulations suggest that all of that spending by industries and federal and provincial institutions in the Magdalen Islands in 2019 created 1,334 annual full-time jobs and generated $169.2 million in value added (wealth creation in the economy). For governments, that translated into $9.2 million in revenues and $10.9 million in parafiscal taxes. On the environmental front, all those activities combined produced 30,650 tonnes of GHG emissions, just under 0.04% of total GHG emissions in Quebec in 2019. The results also indicates that the effects of that spending were felt primarily in the local economy and enhanced the vitality of several other economic sectors in the area.

Overall, despite the major changes that have occurred over the years in the marine ecosystem surrounding the Magdalen Islands, stakeholders in the fisheries and mariculture sector have shown great resilience by continually adapting to their environment and finding ways to develop profitable commercial activities that benefit several economic sectors in the region, including the tourism industry. The information presented in this report will undoubtedly contribute to the reflection on the factors that can hinder or favour the growth and economic prosperity of the Magdalen Islands and, by the same token, it will allow to better anticipate the potential impacts associated with the creation of a marine protected area in the region.

1. Background

1.1. Marine protected areas in Quebec

The main objective of the marine protected area (MPA) network in Quebec is to maintain and enhance marine biodiversity and important or representative ecological components of the St. Lawrence River and Gulf over the long term. The richness and biodiversity of marine areas provide undeniable ecological and economic benefits for the prosperity of present and future generations.

To establish a marine protected area in the province, the governments of Quebec and Canada must work together, while ensuring that the coastal and Indigenous communities concerned are involved in the development of the project to foster social acceptability. Thus, in 2007, the governments of Canada and Quebec began discussions to develop collaborations for the establishment of MPAs in Quebec. These discussions took place in the Canada-Quebec Bilateral Group on Marine Protected Areas (BGMPA). The Quebec representatives are the Ministère de l'Environnement, de la Lutte contres les changements climatiques, de la Faune et des Parcs (MELCCFP), le ministère de l'agriculture from the departments of Environment and the Fight Against Climate Change (MELCC); Agriculture, Fisheries and Food (MAPAQ); Forests, Wildlife and Parks (MFFP); and Energy and Natural Resources (MERN). For Canada, the representatives are from Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC) and the Parks Canada Agency (PCA). The BGMPA is co-chaired by representatives of MELCC and DFO. The Canada-Quebec Collaborative Agreement to establish a network of marine protected areas in Quebec was signed on March 19, 2018. This agreement objective is to facilitate the designation of MPAs in Quebec and enable the governments to work together to achieve their respective marine conservation targets.

1.2. Magdalen Islands MPA project

In 2004, the federal government announced a study on the possibility of establishing an MPA in the Magdalen Islands (Îles-de-la-Madeleine). The objective of this study was to provide an overall profile and identify this region's issues relative to the marine environment.

On December 5, 2011, the governments of Quebec and Canada agreed to conduct a joint study on an MPA in the Magdalen Islands. This agreement set out the terms and conditions of collaboration between PCA and the Quebec Department of Sustainable Development, the Environment, Wildlife and Parks (MDDEFP) in their common interest of ensuring the conservation and enhancement of marine biodiversity around the Magdalen Islands. Accordingly, a pre-feasibility study conducted jointly by the two governments between 2012 and 2014 had five main objectives:

I. Characterize the study area from an ecological, economic, social and cultural perspective.

II. Provide an assessment of the natural resources, the development potential and the level of representativeness of the marine environment in the southern Gulf of St. Lawrence.

III. Analyze the conservation problems in the area, the impacts in terms of economic benefits, and the conservation and development objectives to be put forward.

IV. Identify and describe sectors of interest for the conservation of marine biodiversity and cultural resources.

V. Examine opportunities for development, education and appreciation of the marine environment, as well as the constraints related to the creation of an MPA.

The contribution of three organizations was sought to achieve these objectives. The University of Quebec at Rimouski was mandated to characterize the Magdalen Islands territory by developing a profile of the ecological components and uses of the marine environment to develop conservation and development scenarios. Cultura was mandated to identify and assess the development of the maritime cultural heritage in the context of a potential MPA. Fisheries and Oceans Canada, more specifically the Strategic Services[1], Quebec Region (SS-QR) team, was mandated to produce a socio-economic profile of the Magdalen Islands, particularly its fisheries and mariculture sector; as well as to evaluate the sector's economic benefits in the region.

The reports produced by these organizations have highlighted the potential for establishing an MPA in the Magdalen Islands. Following this conclusion, the governments initiated discussions to determine the terms and conditions for the realization of a feasibility study, including community participation.

The governments of Canada and Quebec announced the launch of a joint feasibility study on June 27, 2019. A coordination committee of local representatives, with the majority representing the fishing and mariculture sectors, was set up to support the work.

1.3. Report objectives

To support the decision-making process regarding the establishment of an MPA in the Magdalen Islands, the SS-QR team at Fisheries and Oceans Canada was asked by PCA, in collaboration with MELCC, to update the report entitled [Translation] "Economic Contribution from the Fisheries and Mariculture Sector in the Magdalen Islands" that was published in 2014 as part of the work carried out on the pre-feasibility assessment of this project. Fisheries and Oceans Canada has the necessary expertise for this type of study and access to the data and communication mechanisms set up with the fishers to consult them.

1.4. Report structure

The report is divided into three parts. Part 1 provides an overall socio-economic profile of the Magdalen Islands that covers population demographics and levels of educational attainment as well as the socio-economic characteristics of each sector of economic activity. While Part 2 is a sector analysis of fishing and mariculture activities in the Magdalen Islands, it also highlights the socio-economic importance of this sector by presenting a detailed profile of its main industries or organizations. In Part 3, the Quebec intersectoral model developed by the Institut de la Statistique du Québec and Statistics Canada input-output multipliers are used to estimate the socio economic impacts of these industries or organizations and analyze the results obtained.

1. Previously Economics, Statistics and Informatics Branch; then, Policy and Economics Branch.

Part I

Socio-Economic Profile of the Magdalen Islands

Part I

2. Socio-Economic Profile of the Magdalen Islands

2.1. Description of the study area

2.1.1. Location and size

The Magdalen Islands cover an area of 205.6 km^2. They are located in the heart of the Gulf of St. Lawrence, 105 kilometres from Prince Edward Island, 95 kilometres from Cape Breton Island and 215 kilometres from the Gaspé Peninsula. Access to the archipelago is by sea or air only.

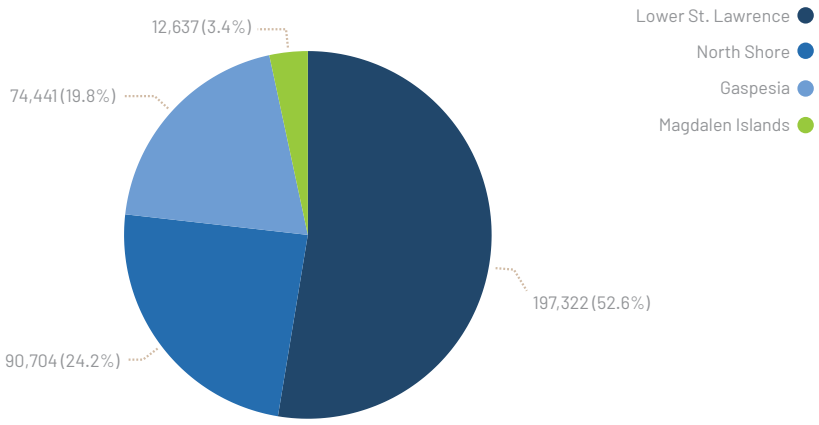
As shown on the map of the Magdalen Islands in Appendix A-1, the archipelago includes eight year-round inhabited islands, seven of which are connected by narrow dunes. From north to south, the inhabited islands are Grosse-Île, Île de l'Est, Île de la Grande-Entrée, Pointe-aux-Loups, Île du Havre aux Maisons, Île du Cap aux Meules, Île d'Entrée and Île du Havre Aubert. Île d'Entrée is the only island that is not connected to the archipelago by road.

2.1.2. Demographics

In 2019, the population of the Magdalen Islands was 12,637, or 3.4% of the population of maritime Quebec (Chart 2-1).

The Institut de la statistique du Québec's demographic outlook for the 2016–2041 period shows a decrease of 6.4% in the Magdalen Islands' population during this period, while the province of Quebec as a whole is expected to see an estimated population increase of 13.6% during the same period. Nevertheless, the demographic outlook for the Magdalen Islands is more optimistic than for the rest of maritime Quebec, whose population is projected to decrease by 10.1%. The population decrease is due to two factors: natural population increase (births vs. deaths) and interregional migration (Payeur et al., 2019).

Chart 2-1. **Maritime Quebec Population Distribution by Region in 2019**



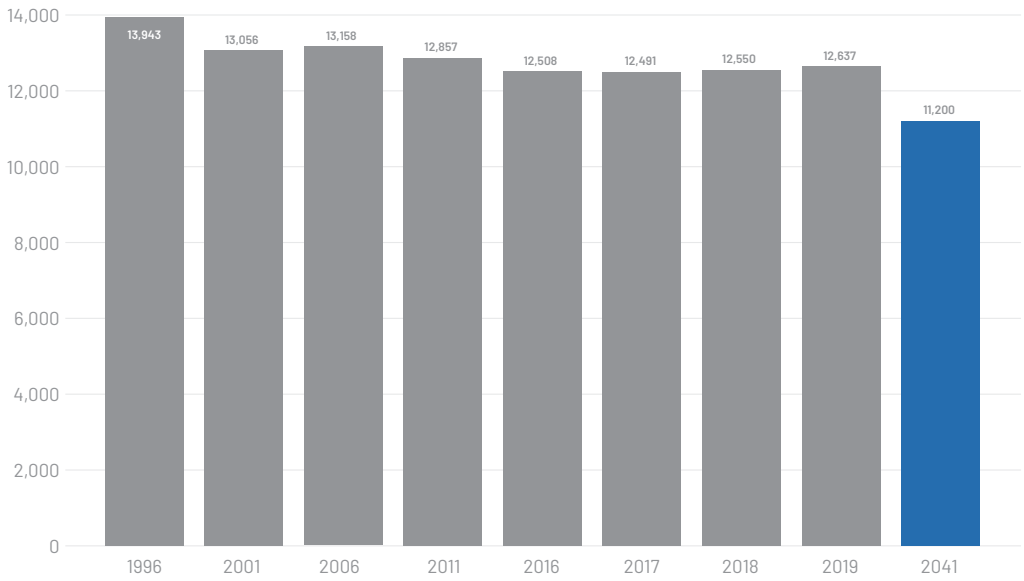
Source: Institut de la Statistique du Québec (2020). Main indicators on Québec and its regions. https://statistique.quebec.ca/en/vitrine/region

2. Demographic projections are a simulation of how a population will change in the future based on assumed fertility, mortality and migration (Payeur et al., 2019).

For a number of years now, more deaths than births have been reported for the Magdalen Islands population. This factor, combined with an aging population, is expected to exacerbate the population decline in the coming years. The demographic outlook for 2041 puts the population at 11,200 inhabitants (Chart 2-2).

It is essential to examine interregional migration from two perspectives: people coming to the Islands and people leaving. According to the municipality of Les Îles-de-la-Madeleine, the retention power of the archipelago has a very high population retention rate, but the number of newcomers is below the general average for the province (Municipalité des Îles-de-la-Madeleine, 2016). However, according to recent demographic outlook studies conducted by the ISQ, the Islands posted a positive net migration of 120 inhabitants between 2018 and 2019.

Chart 2-2. **Magdalen Islands Population Trends, 1996–2019 and 2041 Projection**



Source: Institut de la statistique du Québec (2020). Main indicators on Québec and its regions . https://statistique.quebec.ca/en/vitrine/region
Institut de la Statistique du Québec (2020b). Population projections - RCMs (regional county municipalities) https://statistique.quebec.ca/en/document/population-projections-rcms-regional-county-municipalities

2.1.3. Educational attainment

Levels of educational attainment of the Magdalen Islands population (15 years and older) is relatively low, compared with the provincial average. Of the 10,370 people in this age category, 30% have no certificate, diploma or degree. The provincial rate was 19.9% in 2016 (see Table 2-1). This trend continues at the university level with 14.4% of the Magdalen Islands population having a university education, while the provincial average is 24.1% (Chart 2-3).

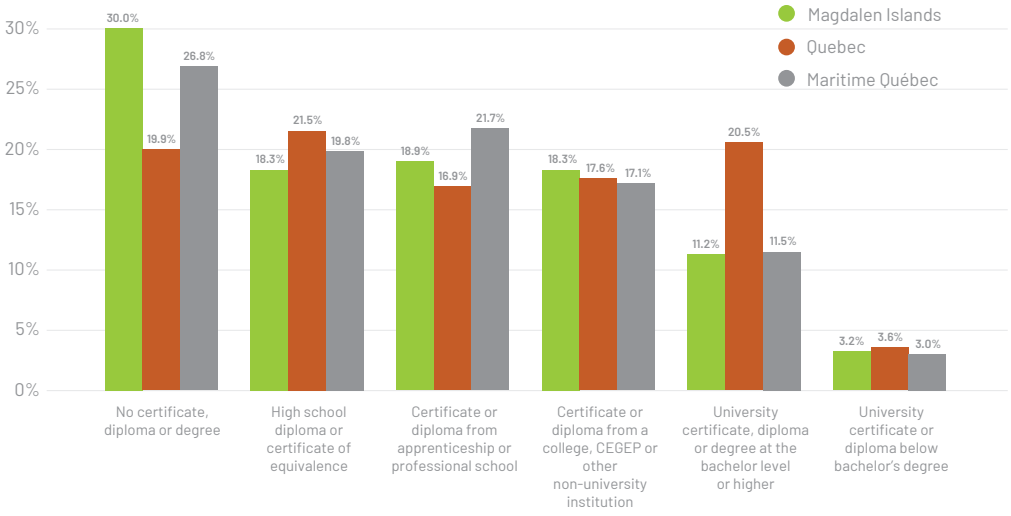
In maritime Quebec,[3] out of a standardized population of 400,000 inhabitants, the percentage of people without a diploma is 7.1% on average, compared with 7.5% in the Magdalen Islands (Chart 2-4). However, the percentage of people with a university education in the Islands, i.e., 3.6%, is similar to that of maritime Quebec (an average of 3.4%).

3. Maritime Quebec consists of the North Shore, Gaspé Peninsula, the Lower St. Lawrence and the Magdalen Islands.

The demographic outlook for the 2016–2041 period shows a decrease of 6.4% in the Magdalen Islands'.

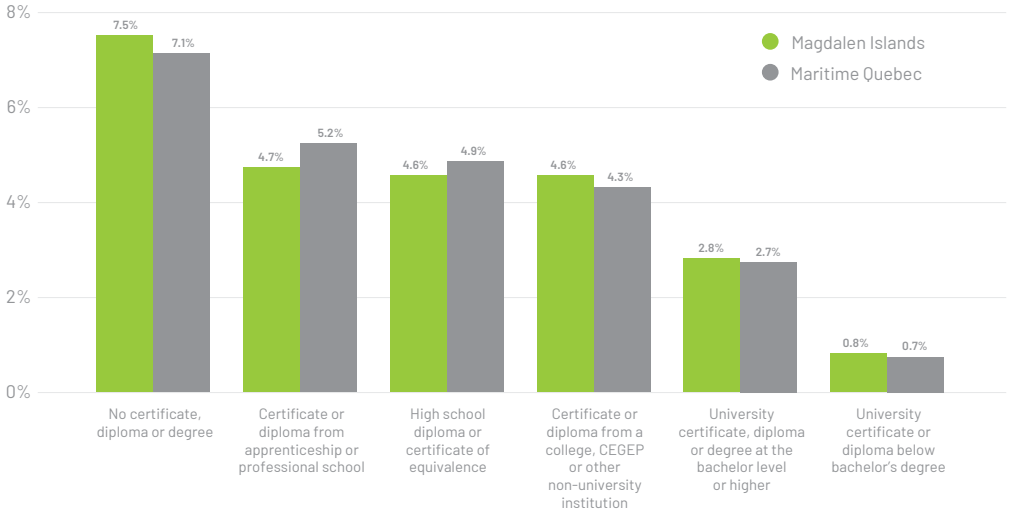
This lack of qualifications and skills hampers the recruitment of employees by businesses in the Islands. In addition, because employers in the fishing and processing industries are faced with a limited pool of prospective employees, they tend to hire fewer than they need. Lastly, career opportunities continue to be limited for workers lacking enough experience in the relevant sectors (Comité sectoriel de main d'œuvre des pêches maritimes, 2018).

Chart 2-3. **Distribution of Educational Attainment for the Magdalen Islands, the Rest of Maritime Quebec and Quebec, 2016**



Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

Chart 2-4. **Distribution of Educational Attainment for the Magdalen Islands and the Standardized Average for Maritime Quebec, 2016**



Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

Table 2-1. **Distribution of Educational Attainment for the Magdalen Islands Population, 2016**

	Magdalen Islands		Rest of Maritime Quebec		Quebec	
	Population (15 +)	%	Population (15 +)	%	Population (15 +)	%
No certificate, diploma or degree	3,115	30%	84,190	27%	1,323,070	20%
Apprenticeship or trades certificate or diploma	1,965	19%	68,095	22%	1,120,730	17%
College, CEGEP or other non-university certificate or diploma	1,895	18%	53,785	17%	1,165,515	18%
University certificate or diploma below bachelor level	335	3%	9,420	3%	236,255	4%
University certificate, diploma or degree at or above bachelor level	1,165	11%	35,995	11%	1,361,730	21%
Secondary (high) school diploma or equivalent	1,895	18%	62,270	20%	1,426,975	22%
Total population (15+)	10,370	100%	313,755	100%	6,634,275	100%

Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

2.2. Socio-economic characteristics

2.2.1. Activity sectors

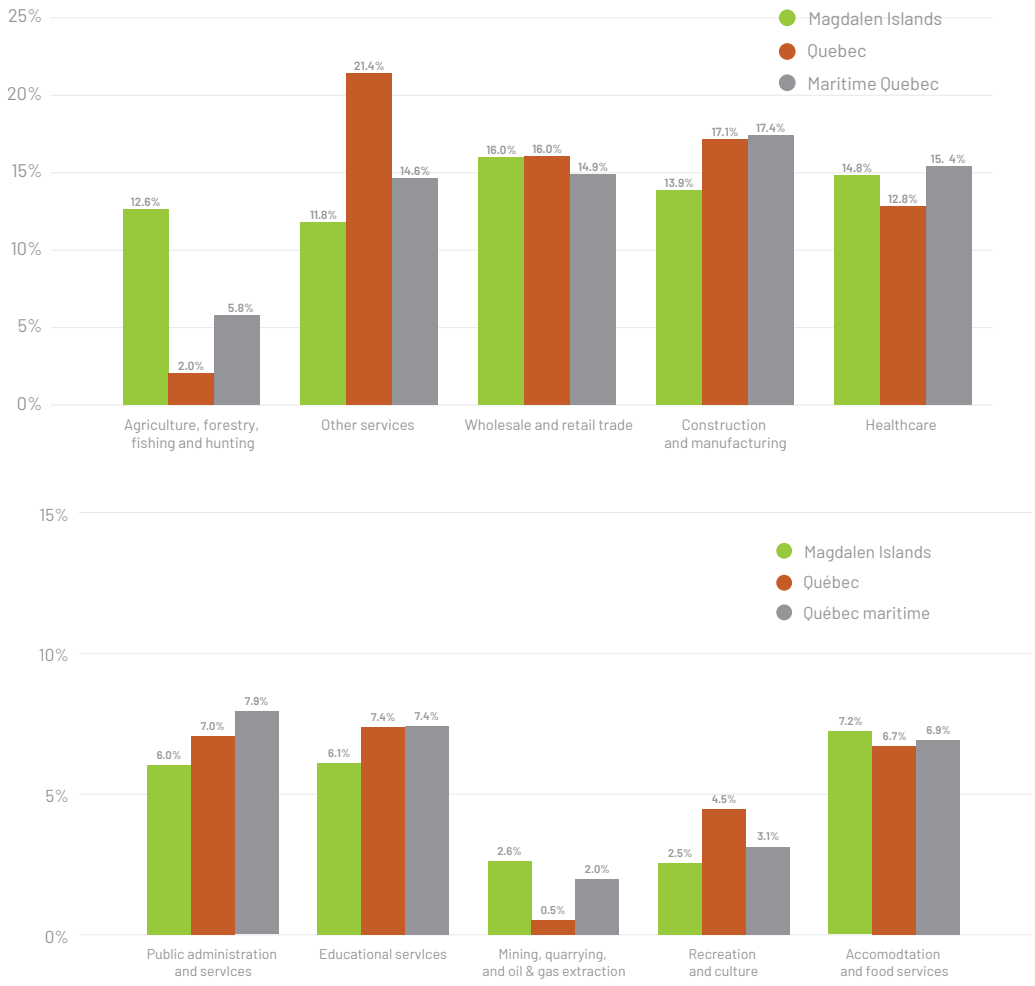
The labour force can be classified according to the activity sector associated with their occupations. In most activity sectors, the Magdalen Islands follow the same distribution trend as the rest of maritime Quebec and the province. Nevertheless, the "agriculture, forestry, fishing and hunting" sector accounts for nearly 12.6% of the labour force, which is much higher than the figure for maritime Quebec as a whole (5.8%) and the province overall (2.0%). This primary sector consists almost solely of the commercial fishing industry, recognized as a key industry in the Islands. Note also that the percentage of the labour force in the Islands' tourism industry, which includes several activity sectors,[4] continues to be the same as that of the tourism industry provincewide, despite the small size of the Magdalen Islands (Chart 2-5).

Out of a standardized population of 400,000 inhabitants for maritime Quebec, 3.1% of the Magdalen Islands population is employed in the "agriculture, forestry, fishing and hunting" sector, or almost twice the average percentage for maritime Quebec, i.e., 1.7%. Out of all the activity sectors, this is the only one where there is a difference in the percentage of workers employed in the Magdalen Islands, compared with the average percentage for maritime Quebec.

4. According to Statistics Canada's classification, tourism is an economic activity where the jobs are distributed across various industries. In the tourism sector, there are jobs in accommodation and food services, recreation and culture, and trade industries.

Roughly 20% of Islanders
are employed in seasonal jobs,
compared with 3% of workers
in the province as a whole.

Chart 2-5. **Labour Force Distribution by Activity Sector[5] in the Magdalen Islands, Maritime Quebec and the Province of Quebec, 2016**



Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

In parallel with these two main sectors, the Magdalen Islands account for a permanent share of economic activity with the two main employers in the Islands: CTMA, a carrier that operates in a number of areas, such as the cruise ship travel industry and ferry transportation services, and Seleine Mines with nearly 200 employees (Les Îles, 2020).

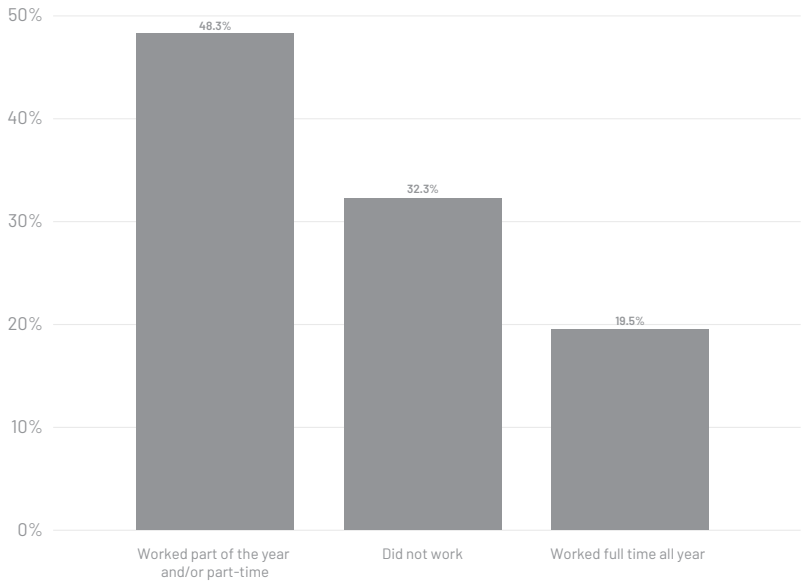
Only 11.8% of the Islands labour force is employed in the Other Services sector, compared with 21.4% in the province overall and 14.6% in maritime Quebec. The manufacturing and construction industries also employ fewer people in the archipelago (13.9%) than in Quebec as a whole (17.1%). Owing to the archipelago's small size and smaller population, there is less diversity and fewer businesses in these activity sectors in the Magdalen Islands, which explains the percentage variance with the province overall and maritime Quebec. In addition, the transportation and storage sector accounts for a slightly higher share of the labour force in the Magdalen Islands. This is directly related to the Islands' particular geographic location. Lastly, a large part of Islands' economy is based on small and medium-sized enterprises (SMEs). Small businesses account for 56% of the archipelago's 800 businesses (other than fishing firms) and generate 24% of the jobs.

5. The "Other Services" category includes the following activity sectors: Finance and Insurance, Management of a Company, Private Administrative Services, Real Estate Services, and Scientific and Technical Professional Services.

2.2.2. Seasonal jobs

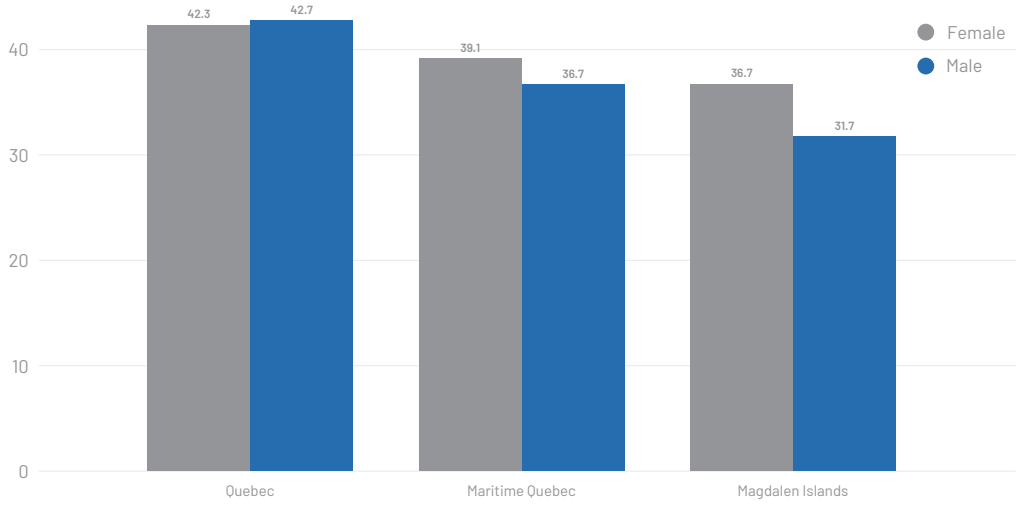
The Magdalen Islands' main economic activities, i.e., the fishing industry and tourism, are considered seasonal because they operate for only a few months each year. In fact, between May and September, they employ more than 50% of the labour force in the Islands. This is reflected in the employment figures for 2016, which indicate that a majority of the labour force worked part-time (48.3% or 5.005 workers), compared with 19.5% who worked full time year-round (2,020 workers) (Chart 2-6). In Quebec, 35% of workers were part-time and 31.5% were full-time. The same observation can be made when comparing the number of weeks worked in relation to the reference year (2016). The Quebec labour force has an average of 42.5 weeks of work, compared with 34.2 weeks for the Magdalen Islands labour force, while the maritime Quebec population as a whole works an average of 37.9 weeks. There is also a gender difference in the Islands. Women work an average of 36.7 weeks, whereas men work 31.7 weeks and are more often associated with the fishing sectors (see Figure 7). According to Quebec Department of Labour, Employment and Social Solidarity [MTESS] estimates, about 20% of all jobs in the Gaspésie–Îles-de-la-Madeleine administrative region are seasonal jobs, compared with about 3% for all provincial workers (MTESS, 2017).

Chart 2-6. Employment Status Distribution for the Magdalen Islands Labour Force, 2017



Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

Chart 2-7. **Distribution of the Number of Weeks Worked by Gender – Magdalen Islands, the Rest of Maritime Quebec and Quebec Overall, 2017**



Source: Statistics Canada (2017). Data products, 2016 Census.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng

2.2.3. Labour and income

The archipelago's labour force in 2016 was made up of 6,425 people,[6] and the participation rate[7] was 62%, which is higher than the overall maritime Quebec rate (58.9%). The provincial average was 64.1%. The employment rate[8] follows the same trend, with the Islands posting a rate of 54.3%, compared with 59.5% for the province and 51.7% for maritime Quebec. Lastly, the unemployment rate[9] in the Islands (12.4%) is similar to the rate posted by the rest of maritime Quebec (12.3%). These numbers are well above the provincial average of 7.2%.

In terms of per capita household disposable income, the Magdalen Islands were below the provincial average in 2016 with a total of $26,925 per capita, or about 3.3% less than the figure for Quebec as a whole ($27,838 per capita). However, that is slightly higher than the figure for maritime Quebec as a whole, i.e., disposable income of $26,252 per capita. Total income before taxes in the Islands is $38,812 per capita, with nearly 32% coming from government transfers (e.g., Employment Insurance), while in maritime Quebec, the average total income before taxes is $38,257 per capita with 28% coming from government transfers. In comparison, in Quebec overall, the rate is $42,709 per capita, 21% of which is from government transfers.

Furthermore, the percentage of low-income families (i.e., 3.7%) in the Islands is much lower than in the rest of maritime Quebec (8.9%) and the province as a whole (9.5%) (Institut de la statistique du Québec, 2019).

6. This category does not include those laid off, in between casual jobs, or the unemployed during the reference week used by Statistics Canada. This explains the differences observed between "Seasonal Nature of Work" and "Labour and Income."
7. The labour force participation rate is the ratio of the working population to the working-age population.
8. The employment rate is the ratio of the employed population to the working-age population.
9. The unemployment rate corresponds to the ratio of the unemployed population to the labour force.

2.2.4. Tourism industry

With the influx of seasonal visitors, tourism is an integral part of the Magdalen Islands economy. Visitors generate business for residents involved in recreational tourism, restaurant and accommodation services and transportation services.

The significance of tourism is reflected in the data on tourist volumes,[10] compared with other regions of the province. In 2017, nearly 74,000 visitors came to the Magdalen Islands, accounting for 0.2% of visitors to all regions in Quebec. Since the year-round population of the Islands is estimated to be between 12,000 and 13,000, this figure for the number of visitors every year is more than five times the archipelago's population. In addition, visitors spent about $56M in 2017, accounting for 0.6% of tourist spending in the entire province (Ministère du tourisme du Québec, 2017).

The importance of tourism in the Magdalen Islands can also be seen in the various transportation services that provide access to the archipelago. According to data gathered by the CTMA and Tourisme Îles-de-la-Madeleine for 2018, most people arrive in the Islands by water. Ferries account for 64% of arrivals, cruise ships for 12% and aircraft for the remaining 24%. Ferry and cruise ship traffic has been steadily increasing over the past five years (+25%), while the visiting months are no longer just July and August (Tourisme Îles de-la-Madeleine, 2018).

Tourism stakeholders are aware of the attractiveness of the Magdalen Islands, and many development strategies have been implemented since the early 1990s to optimize the tourism offering to its full potential. In 2006, the Municipality of Les Îles-de-la-Madeleine adopted a tourism development policy tailored to the context of the Islands. Development addresses a number of economic, social, cultural and environmental problems. As mentioned above, seasonal cycles have an impact on the Islands' various activity sectors, which is reflected in the tourism industry. The activity sectors receive two thirds of the annual number of tourists (50,000 visitors on average) during the summer season, mainly in July and August. This trend, while still pervasive, could decrease in importance because of an emphasis on recreational and tourism activities outside of the summer season (Tourisme Îles-de-la-Madeleine, 2018).

According to the municipality's policy framework, tourism development must also complement other economic activities, particularly those linked to the harvesting of marine and land resources. Consequently, fishing and the processing of fish and seafood products are presented as the basis of the archipelago's economy and are rooted in the residents' way of life. The interaction between tourism and this industry is expected to develop further over time, especially with some companies already offering sea-fishing excursions.

2.2.5. Island economic context

Because of their geography, limited ties to the mainland, exposure to major risks and environmental fragility, the Magdalen Islands can be characterized as a small island economy. While most businesses in all of the world's economies are small and medium-sized enterprises, they often account for nearly all businesses in small island economies. The smaller the economy, the more specialized it must become to achieve economies of scale. It must specialize in a small number of export products whose large-scale production is destined for foreign markets. The export revenues are then used to import products for the domestic market. Consequently, in order to compete on a level playing field, businesses in small island economies must pay lower wages than their counterparts closer to larger markets (Ernatus, 2009). In the Magdalen Islands, the products for export are those of the archipelago's two major economic sectors, namely fish and seafood and by-products for the tourist market (agri-food or artisanal products). The isolation stemming from insularity generates a strong dependence on revenue-generating activities in the marine and air transportation sectors. As a result, the remoteness of the Islands pushes up transportation costs for imports and exports, since an island location implies having marine or air

10. Tourists are defined as people who take a trip outside their hometown for one night or more (in less than one year) and use commercial or private accommodations.

connections with the outside world. For example, the cost of marine transportation is $0.28/km versus $0.14/km to $0.21/km in other regions. This translates into higher travel costs for Islanders in general (Tourisme Îles-de-la-Madeleine, 2018).

In brief, the main features of the Magdalen Islands economy is a large primary sector and, more specifically, fish and marine resources harvesting and processing. Together with tourism, the archipelago's second economic engine, these two factors are inherent to the seasonal nature of many of the jobs employing Magdalen Islands residents. In addition, the constraints of island living result in lower wages for employees and additional costs for businesses, and hence, the cost of living in the archipelago is higher, while purchasing power is lower.

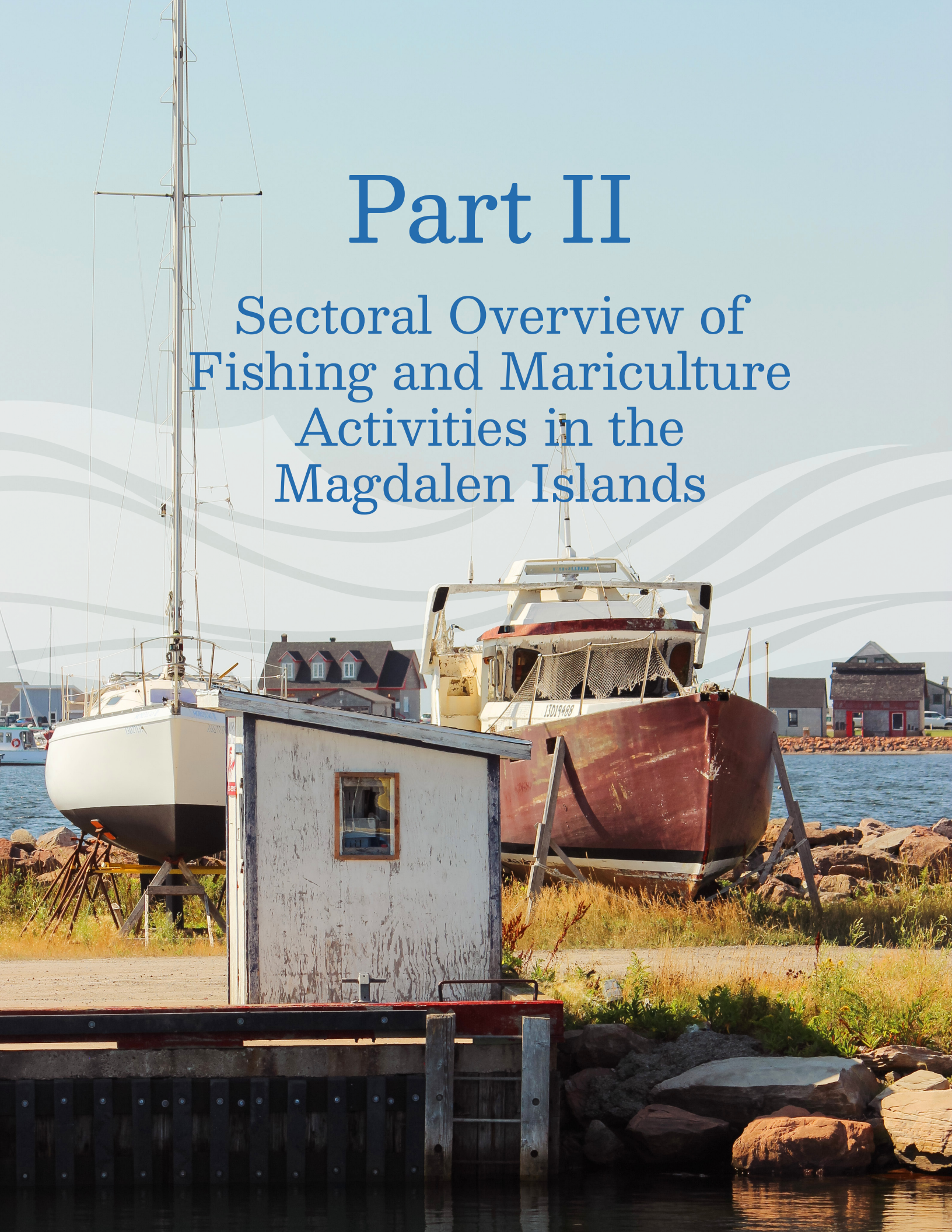
2.3. Summary: Part I

The economy of the Magdalen Islands region is primarily based on two seasonal economic engines: the fishing and mariculture sector and the tourism sector. Roughly 20% of Islanders are employed in seasonal jobs, compared with 3% of workers in the province as a whole. In addition, this region maintains characteristics specific to its island context, namely specialization in the production of export products, a preponderance of SMEs, a higher cost of living and lower purchasing power.

Given the importance of the fishing industry to the Magdalen Islands' economy, this essential aspect must be further analyzed in view of the possible creation of a marine protected area in the region. To this end, later work will focus specifically on the industry's growth and size, particularly in terms of economic benefits, which will be estimated using the Québec input output model developed by the Institut de la Statistique du Québec.

Part II

Sectoral Overview of Fishing and Mariculture Activities in the Magdalen Islands



Part II

3. Sectoral Overview of Fishing and Mariculture Activitiews in the Magdalen Islands

3.1. Sector analysis of fisheries and mariculture

The fishery resource harvesting and processing sector consists of the fishery and mariculture industries—a chain of industries and economic activities linking fish and seafood to consumers. For the purposes of this study, the definition of this sector has been expanded to include, in addition to the industries in the sector, a set of several related industries and economic activities (an intersectoral network) that fall into both the private and public sectors, as well as recreational fishing. The fishery resource harvesting and processing sector, thus redefined, is called the fisheries and mariculture sector. Therefore, the list of industries and economic activities included in this sector extends beyond the harvesting and production of fishery resources. It includes all related economic activities that would not occur without fishing and mariculture activities.

This section provides an overall sector analysis of fisheries and mariculture, and is organized into four subsections. The first subsection provides a historical overview of the Magdalen Islands fishery. The second looks at the regulatory environment. The third subsection analyzes the marketing channel, and the fourth subsection concludes with sectoral networking.

3.1.1. Historical overview

Long before the arrival of Europeans, the Magdalen Islands were known by the Mi'kmaq First Nations as an area for fishing and seal hunting. Fishing operations in the Islands have always been part of the landscape. Despite the problems that the Magdalen Islands fisheries and mariculture sector have had over the years, particularly with the moratorium on cod fishing resulting from the collapse of cod stocks in the early 1990s, commercial fishing is still the main economic activity in the Islands today. The harvesting and processing sectors are interdependent, with sales to processing plants being the primary source of income for fishers. The main species landed in the Magdalen Islands are lobster and snow crab. Since processing plant production is dependent on landings, the plants have focused mainly on the processing of these crustaceans since the moratorium on groundfish was introduced. Rock crab, toad crab and scallops are also some of the harvested fished species. A more detailed picture is provided in section 3.2.

3.1.2. Regulatory environment

In Canada, the institutionalization of the catch is reflected in federal legislation, programs and policies put in place by Fisheries and Oceans Canada. The Department's mandate is to help ensure healthy and sustainable aquatic ecosystems through habitat protection and sound science. It also supports economic growth in the marine and fisheries sectors and innovation in areas such as aquaculture and biotechnology (Fisheries and Oceans Canada, 2021). Government intervention in the fisheries sector increased in the early 1980s, notably with the coming into force of the *Fisheries Act*, which regulates the fishing industry, fishing activities in marine waters where it applies and the protection of fish (Department of Justice Canada, 2021). Management measures for a given fishing season generally vary by species (or group of species) and fishing area. They include information on management plans, total allowable catches, and opening and closing dates of fishing seasons by species.

Under federalism, a principle inherited from the British Parliament, the exercise of judicial, legislative and executive powers is divided between two levels of government: federal and provincial. With respect to fishery resource harvesting, the federal and provincial governments are both autonomous and interdependent. While the processing of marine products is a provincial prerogative, and the Quebec government relies on several acts and regulations to exercise its jurisdiction in this area, notably the *Act respecting the marketing of agricultural, food and fish products* (Régie des marchés agricoles et alimentaires, 2021), border control remains under federal jurisdiction. The federal government sets the rules for marketing between Canadian provinces and other countries.

To carry out a processing activity in Quebec, companies must have a permit issued by the Quebec Department of Agriculture, Fisheries and Food (MAPAQ). In addition, according to the *Regulation respecting minimum standards for processing marine products, products* intended for sale outside the province must undergo a minimum amount of processing. This regulation prevents the value added resulting from the processing from being exported outside the province. With respect to mariculture,[11] no one may carry out commercial aquaculture activities unless they have a permit issued by the MAPAQ (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2017). For its part, the federal government is responsible for preserving species and their environment through stock assessment surveys of all fish products and the allocation of quotas. Both levels of government have multiple ties with the fisheries and mariculture industries, ranging from the issuance of operating licences to the monitoring of activities and the management of fisheries resources.

Lastly, most fish and seafood prices in Quebec and Canada are influenced by the external market and, in particular, the American market. For most species, the fishing season is short and lasts only a few weeks in the year. This tends to increase the competitiveness of harvesting activities and could have consequences for the price of fish and seafood (Rioux et al., 2010). At the request of the fishers' associations, some species in specific fishing areas are subject to a joint Plan[12] under the *Act respecting the marketing of agricultural, food and fish products.* In the Magdalen Islands, a joint plan for lobster marketing has been in effect since 1991. The agreement makes it possible to set a landing price for fishers based on the resale price of buyers, as well as any other conditions agreed upon by both parties. This regulatory mechanism not only takes the economic environment of the species into consideration, but it is also a method of collective bargaining.

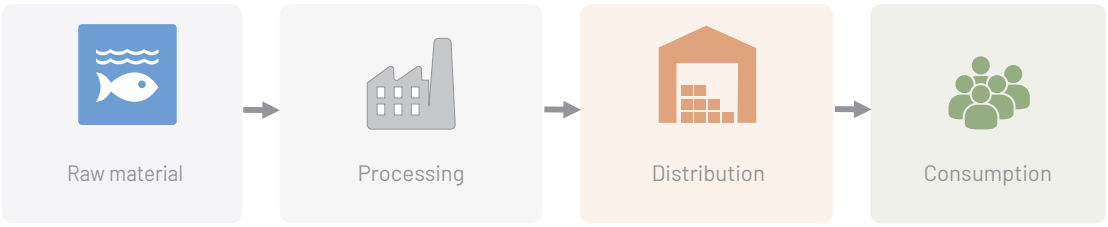
11. Aquaculture practised in the marine environment or seawater tanks.

12. [Translation] "A joint plan is essentially a tool available to agricultural producers and fishers. It gives them an opportunity to collectively negotiate all the conditions for marketing their product or fishery and to regulate the terms and conditions." (Régie des marchés agricoles et alimentaires, 2021)

3.1.3. Marketing channel

Fish and seafood marketing involves various players who share the main stages of the marketing channels, from the transfer of fish and seafood caught at sea to the place of consumption. For simplification purposes, the exchanges between the various players have been categorized into four main channels: raw material, processing, distribution and final consumption of products (see Figure 3 1). The marketing channels are divided between short and long channels. Short channels are considered a method of marketing food products where only one intermediary is involved. For example, a sale made at a public market or at a stand on the dock is considered a direct sale through a short channel (MAPAQ, n. d.). This method of doing business is very common in the Magdalen Islands, especially for lobster. By comparison, long channels correspond to the sale of products to retailers, supermarkets or distributors, where more than one intermediary is part of the marketing channel to sell the product (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2010). Imported inputs or species are automatically categorized as products in a long-channel trade. On leaving the processing plant, they must pass through at least the exporter, importer and retailer. Marketing a product through a long channel allows a larger territory to be included and allows the product to reach a broader range of customers. In terms of value, most of Quebec's landed snow crab and lobster are marketed through a long channel, particularly to meet demand for these products in the United States.

Figure 3-1. Theoretical Illustration of the Marketing Channel for Marine Products



Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region [figure adapted from Bureau (2018)].

Raw material

The flow of raw material inputs is basically ensured by suppliers such as marine fishers who land in Quebec, mariculturists and companies outside Quebec (interprovincial or international imports). These suppliers sell almost all of these inputs to processing plants that process them into various products. Depending on the species, fishers can also sell their catches to authorized buyers, such as purchasers (or brokers), wholesalers and retailers, or directly to consumers. The percentage of sales to facilities and authorized buyers is highly dependent on the species landed. For example, more than 90% of landed northern shrimp and snow crab are intended for plants. By comparison, lobster are usually sold alive and marketed directly on the dock or to brokers and wholesalers to shorten the number of intermediaries before they reach the consumer. Mariculture by-products are also a source of raw materials for processing facilities. These fresh products rarely go through more than one intermediary. Some of the information on trade in the raw material channel, including purchases by authorized buyers from fishers landing in Quebec, is gathered by Fisheries and Oceans Canada through the purchase receipts provided by fishers.

As defined in this study, the fisheries and mariculture sector includes recreational fishing. However, recreational fishing is not an industry in the strictest sense of the term because it does not combine factors of production (facilities, procurement, labour and knowledge) to produce material goods or services intended for the market. Recreational fishers are the equivalent of consumers in the sector. They create demand for a number of industries, some of which are indirectly related to the commercial fisheries and mariculture sector. Recreational fishers operate independently or through boat charter or sea tour companies.[13] Recreational fishers or businesses offering recreational fishing activities must buy fishing equipment and materials and have them maintained or repaired from time to time.

Processing

Once the raw material is caught, the channel of products offered by the processing sector in Quebec is divided into two main production profiles: facilities in the marine sector (e.g., the Magdalen Islands) and facilities in urban centres (e.g., Quebec City and Montreal). These differ according to the type of input bought, the nature of the products offered and the destination markets. Processing plants in the marine sectors are mainly supplied by Quebec marine and mariculture fishers and buy only a small part of their inputs from outside the province. The range of fish and seafood processing done by these facilities usually varies from simple packaging to ready-made meals. Once their products are processed, a significant part of the production is intended for the external market. The rest of the production goes to facilities in urban areas and the distribution sector. Other plants have counters in their facilities where they can sell directly to consumers. Plants located in urban centres import most of their inputs from the local or international market. Their production is usually intended for local market players, especially in the distribution sector.

Distribution

The products leave the processing plants, then pass through the distribution sector before reaching the consumer. These intermediaries are involved in buying, storing and selling the processors' products to other distributors or wholesalers, retailers, other processors or the food services industry. They establish relationships between buyers and sellers or carry out commercial transactions on behalf of a third party (Institut national de la statistique et des études économiques, 2019). International importers and exporters of fish and seafood also belong to this sector. These intermediaries may be specialized, but they may also market a large volume of fish and seafood, as is the case for food distributors, such as Sobeys (distributor of the IGA banner), who act as wholesaler-retailers for their respective retail stores. This wholesaler-retailer structure makes it possible to meet high demand.

13. Note that these businesses are in the recreation and tourism sector and not in the fisheries and mariculture sector.

End consumption

Lastly, fish and seafood lovers can consume and buy products from various establishments.

The fish and seafood retail trade is quite varied and includes supermarkets, local grocery stores and fishmongers. In addition, some non-traditional retailers whose mandate is not exclusively food and beverages offer these types of products (e.g., Costco). In food services, supply comes from HRIs[14], i.e., hotels, restaurants and public and private food institutions.

Processors can use either a short or long marketing channel for marketing their products with HRI food services and retail sales. In 2018, 19% of the final sales of the Quebec marine fishing and seafood processing sector were in retailing and the local HRI network. As a result, most products processed in Quebec end up in the Canadian or international market.

3.1.4. Intersectoral networking

All the above-mentioned industries produce outputs that require inputs. The main supplier of inputs to the Magdalen Islands processing plants is the Quebec commercial fishing and mariculture industry; however, consumable material supplies must also be obtained, such as packaging plastics, cardboard boxes, ice and so on. They also need various types of equipment and machinery suppliers, as well as companies involved in the maintenance and repair of production equipment on a less recurring basis than the supply of consumable materials. Processing plants, distributors and retailers call on business service firms, such as insurance brokerages and law firms, to support their operations.

Similarly, the commercial fishing and mariculture industries need equipment suppliers (fishing gear and equipment retailers), fuel, equipment repair and maintenance companies, as well as vessels and business service firms (accounting firms, insurance brokerage firms, etc.). In addition, industries in the ship and watercraft building sectors are required when the time comes to upgrade the boats they work with. In short, intersectoral networking in the fisheries and mariculture sector goes beyond primary suppliers to include commercial fisheries, mariculture, and fish and seafood processing industries. These suppliers must also buy from wholesalers and equipment manufacturers who, in turn, require inputs that are essential to their operations. The figure in Appendix A-2 illustrates the fisheries and mariculture sector and intersectoral networking. The next part of this report focuses on the socio-economic importance of the main industries in the fisheries and mariculture sector in this intersectoral networking.

14. Hotel industry, food services (restaurants, caterers, drinking places) and public and private food institutions (health and education, correctional services, armed forces; workplace food services, and air and rail transport companies).

3.2. Socio-economic Importance of fishing and mariculture activities

Section 3.1 identifies the various industries or industry groups that are an integral part of the fishing industry. Federal and provincial departments and agencies whose mandates are directly related to the management, conservation, protection and research of fishing resources are also considered a key "industry" in the Magdalen Islands fisheries and mariculture sector. A key industry is one whose economic purpose is directly linked to the harvesting of fishery resources with a high socio-economic dependence on the fisheries and mariculture sector. Hence, the key industries examined in this study are commercial fisheries, mariculture, fish and seafood processing, recreational fishing, and federal and provincial services.

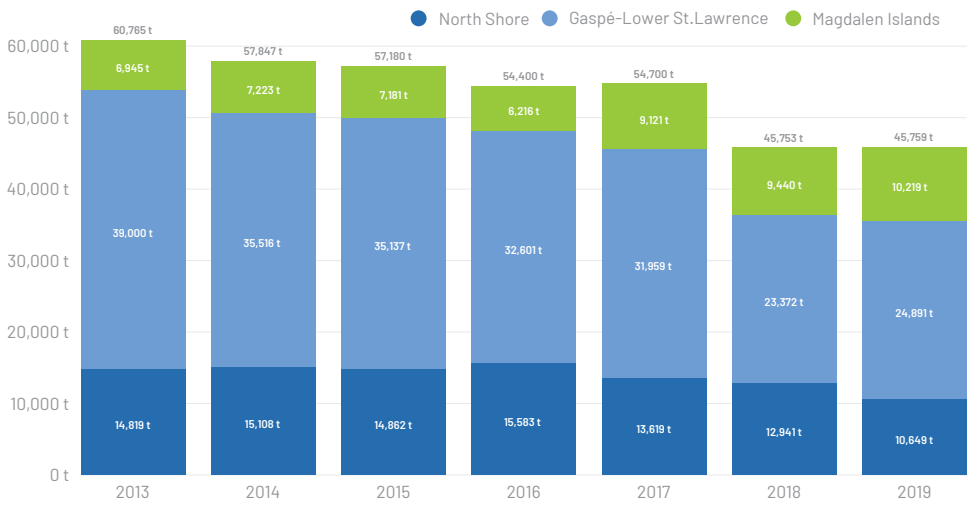
A socio-economic profile of these industries in the Magdalen Islands is presented in this section. It focuses on the changes that occurred during the 2013–2019 period and the socio economic aspects of these industries in the Islands, with emphasis on the pre COVID 19 economic situation.[15] In addition, the relative socio-economic importance of each of these industries is reflected to the extent possible by comparison with maritime Quebec. In the case of the fisheries and mariculture sector, a comparison with maritime Quebec is like a comparison with the province of Quebec because the bulk of this sector's activities take place in the province's marine sectors.

3.2.1. Commercial fishing

Landings

During the 2013-2019 period, Quebec fish and seafood landings decreased by nearly 25%, from 60,795 tonnes to 45,759 tonnes. However, the value of these landings increased by about 126%, from $168.5M to $380.6M (Chart 3-1 and Chart 3-2).

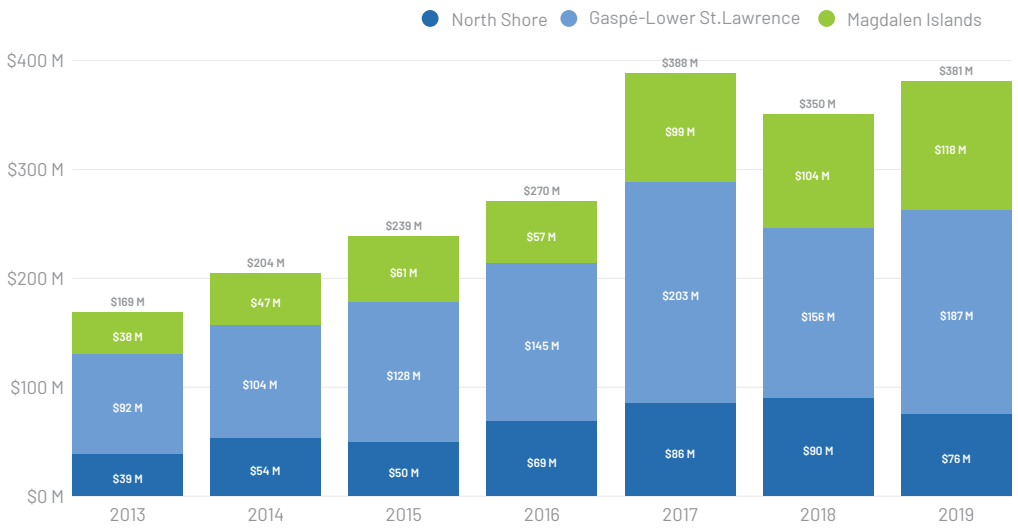
Chart 3-1. Changes in Fish and Seafood Landings[16] in Quebec by Maritime Sector in Tonnes, 2013–2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

15. Data for 2020 are not available or are still considered preliminary (subject to change). This is briefly discussed in section 2.6 of the study.
16. These data represent all commercial landings in Quebec, regardless of where the fishers live.

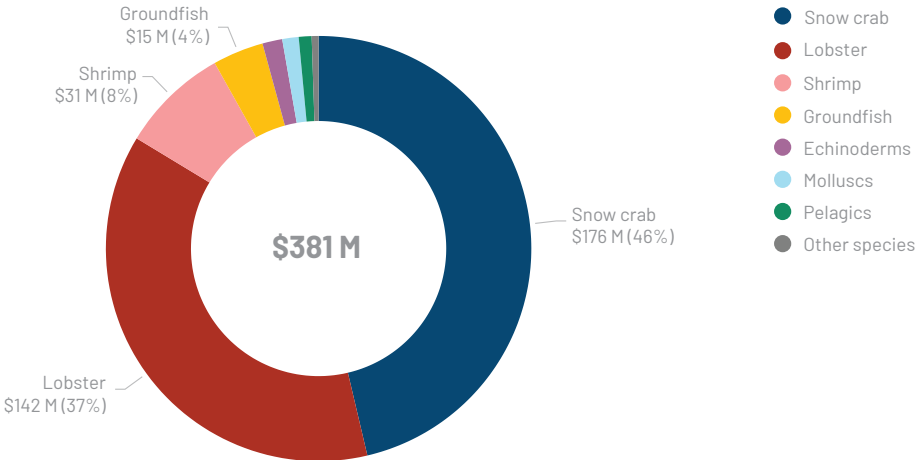
Chart 3-2. **Changes in Values of Landed Fish and Seafood in Quebec by Maritime Sector in $M, 2013–2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Crustaceans are the most lucrative species in Quebec, with snow crab, lobster and shrimp worth $176.3M (46%), $142.2M (37%) and $31.2M (8%), respectively, in 2019. The other species landed are mainly groundfish, molluscs, echinoderms and pelagic fish (Chart 3-3).

Chart 3-3. **Species Distribution by Landing Value for All of Maritime Quebec, 2019**

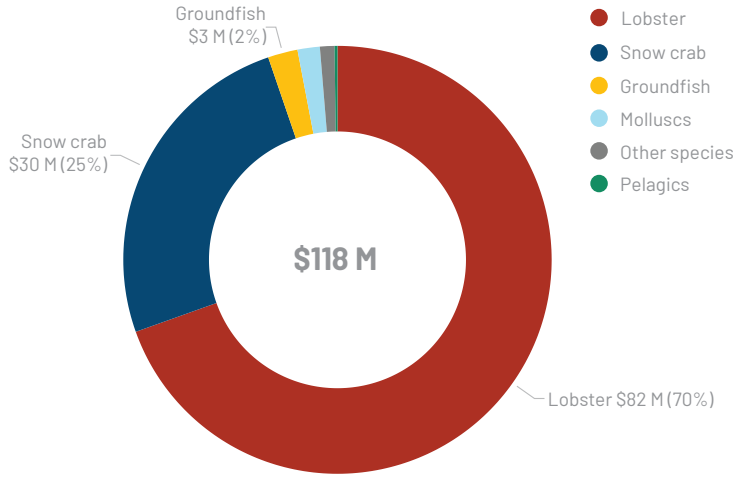


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

In 2019, landings in the Magdalen Islands amounted to 10,219 tonnes and were valued at $118.2M, all species combined. They accounted for 22% of the share of landings in quantity and 31% in terms of value, compared with maritime Quebec as a whole. Although the value of these landings was higher than those on the North Shore (31% vs. 20%), it was still lower than those in the Gaspé and Lower St. Lawrence regions (31% vs. 49%). During the entire period analyzed, the quantity and value of Magdalen Islands landings increased by a mean of 27% and 58%, respectively (2013-2019).

For a number of years, commercial fishing in the Islands has focused primarily on crustaceans, with lobster in the lead. In 2019, the value of lobster landings was $82.2M or nearly 70% of the total landed value. That accounted for 58% of the total value of lobster landings for the Quebec maritime region overall. Landings of snow crab, the second most important species in the Islands, were worth $29.8M in 2019, or 25% of the total landed value. For the Quebec maritime region as a whole, they made up 17% of the landed values for this species. The rest of the total landed value in the Islands came from groundfish[17] (2%), molluscs[18] (2%) and pelagic fish (less than 1%). Other species[19] not categorized account for 1% of the landed values (Chart 3-4).

Chart 3-4. Species Distribution by Landed Value for the Magdalen Islands, 2019



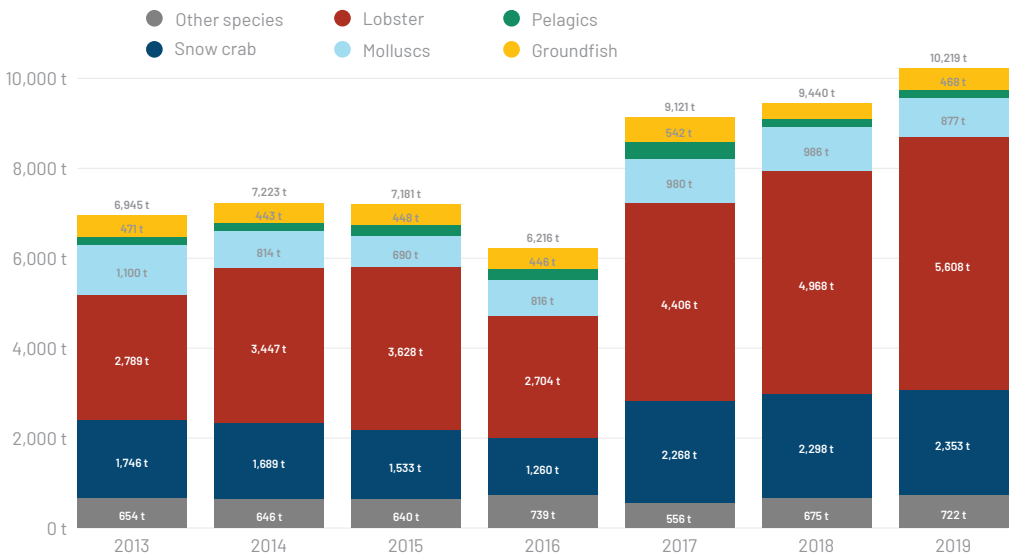
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

As previously mentioned, landings in the Islands showed an upward trend in both quantity and value during the 2013-2019 period, despite a slight decline in 2016 due to a decrease in groundfish[20] and pelagic[21] landings. There was a significant increase in lobster and snow crab landings during this period. Lobster landings fluctuated between 2,704 tonnes and 5,608 tonnes, resulting in values ranging from $25M to $82M, due in particular to the exceptional growth that occurred in 2017 (65%, compared with 2016), which continued gradually to reach a peak in 2019.

Snow crab landings followed a very similar trend, fluctuating from 1,260 tonnes to 2,353 tonnes, with values ranging from $8M to $30M (peak in 2019) (Chart 3-5 and Chart 3-6).

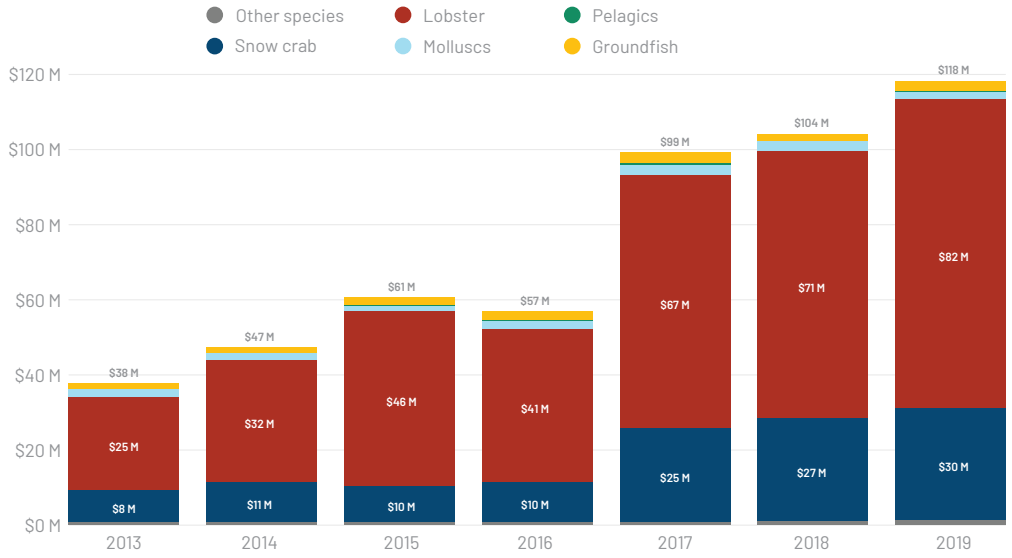
17. Groundfish consist mainly of Atlantic halibut, winter flounder, yellowtail flounder, windowpane flounder, redfish and cod.
18. Molluscs mostly consist of scallops, whelks and Atlantic surf clams.
19. The other species consist of rock crabs and toad crabs.
20. Cod, redfish and Canadian plaice.
21. Herring and mackerel.

Chart 3-5. Changes in Quantities Landed in the Magdalen Islands by Species Caught, 2013–2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Chart 3-6. Changes in Values Landed in the Magdalen Islands by Species Caught, 2013–2019



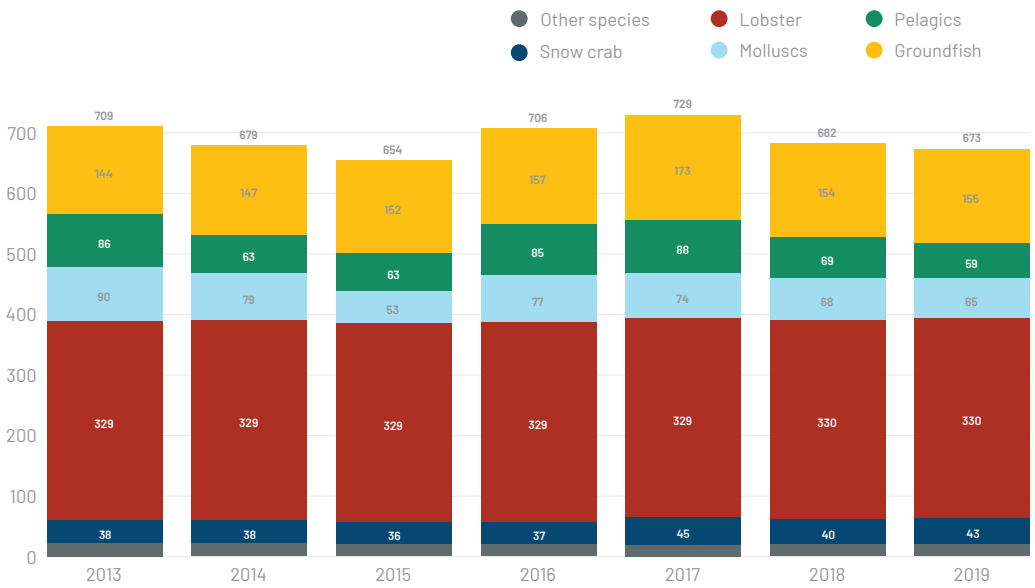
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

The increase in landings for these two species can be explained by a change in lobster stock distribution from the south to the north as well as by the increase in snow crab quotas between 2016 and 2017 for Areas 12 and 12F, where Magdalen Island fishers regularly catch this resource. In addition, the increase in landing prices, directly influenced by the markets, has been a major incentive for fishers and has contributed to this growth. More specifically, between 2013 and 2019, the average landing price for Magdalen Islands lobster increased from $4.05/lb to $6.75/lb (+66%) and from $2.21/lb to $5.75/lb for snow crab (+159%). As a result of a combination of increased demand and dominance of Canadian supply in the market as well as a favourable exchange rate for export to the United States, the trade conditions were very favourable for the increase in prices for these two species during this period.

Licences

In 2019, 673 fishing licences were used by fishers in the Magdalen Islands. Of these active licences,[22] 330 were for lobster harvesting (49%), including 325 for Area 22 (coastal waters of the Magdalen Islands) and 5 licences for Area 17 affiliated with Anticosti Island. Note that the number of lobster licences issued annually for Area 22[23] has been limited to 325 fishers per year since the implementation of the first *integrated Fisheries Management Plan – Lobster* in 1999. For snow crab, 43 licences, or about 6% of the total number of active licences, were used for the various catch areas (12, 12C and 12F).[24] Licences for groundfish and pelagic fish are also numerous, amounting to 155 (23%) and 59 (9%), respectively. Lastly, active licences for molluscs and other species totalled 65 (10%) and 21 (3%), respectively (Chart 3-7). Note that bait licences were also issued by Fisheries and Oceans Canada (354 in 2019).

Chart 3-7. Changes in Numbers of Active Licences by Fishers in the Magdalen Islands, 2013–2019



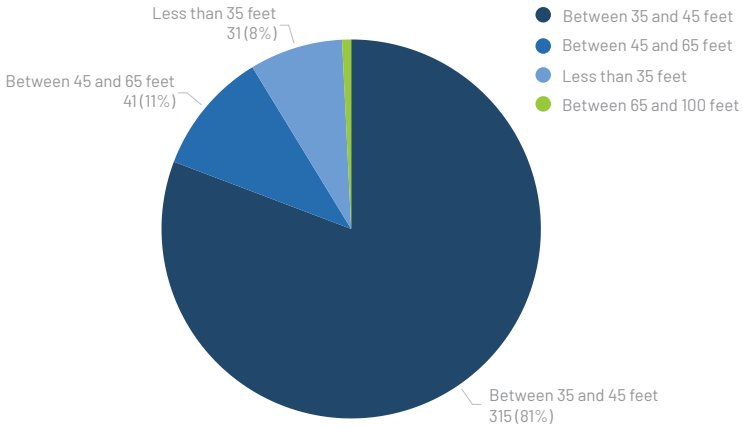
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

22. Fishers with at least one landing during the year.
23. See the map of lobster fishing areas for the Quebec Region at https://www.qc.dfo-mpo.gc.ca/infoceans/sites/infoceans/files/Homard.pdf.
24. See the map of snow crab fishing areas for the Quebec Region at https://www.qc.dfo-mpo.gc.ca/infoceans/sites/infoceans/files/Crabe_des_Neiges.pdf.

Vessels

In 2019, Magdalen Islands fishers used 390 boats, or 28% of the commercial fleet in maritime Quebec. This number has remained relatively unchanged in recent years. Of all the boats used by Magdalen Islands fishers, 315 (81%) were between 35 and 45 feet in length, a much higher total than for all of maritime Quebec (50%). Two other boat categories were used by fishers: boats between 45 and 65 feet in length (11%) and boats less than 35 feet in length (8%). About 2% of the boats were over 65 feet in length in 2019 (Chart 3-8).

Chart 3-8. Distribution of Boats Used by Fishers in the Magdalen Islands, by Size, 2019

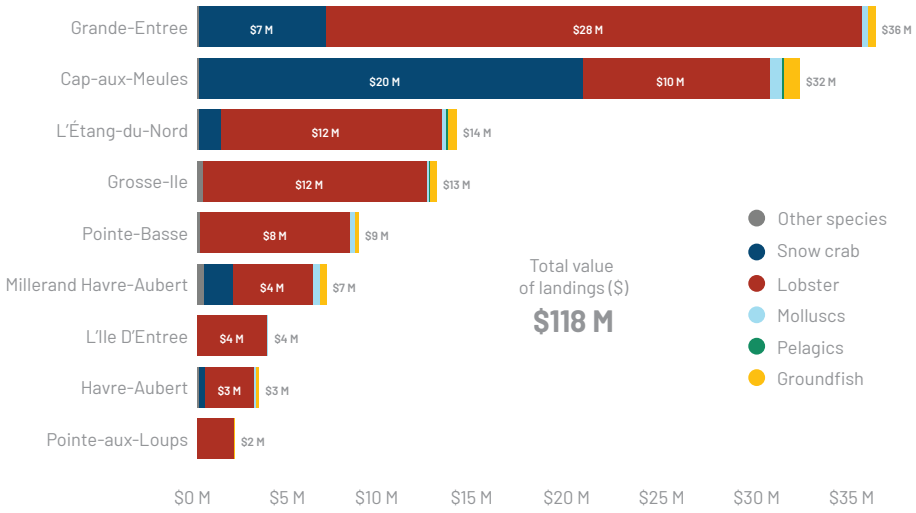


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Landings by fishing harbour

In 2019, commercial fishing landings in the Magdalen Islands took place in 10 different harbours. Of these harbours, four were among the top 10 fishing harbours in maritime Quebec. In fact, the Grande-Entrée (2nd), Cap-aux-Meules (5th), L'Étang-du-Nord (7th) and Grosse Île (8th) harbours account for 50% of the value of landings in the Magdalen Islands (Chart 3-9).

Chart 3-9. **Distribution of Harbours by Landing Value in the Magdalen Islands, Broken Down by Species Landed, 2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

The Grande-Entrée harbour handled the most lobster landings, for a value of $28.2M, and accounted for 20% of landings of this species in Quebec (2019). In the Magdalen Islands, the Cap-aux-Meules harbour is the main port for snow crab, for a value of $20.2M, and, across maritime Quebec, it is the third most important harbour for landings of this species (11.4%). The Grande-Entrée harbour is also the main landing site for groundfish, valued at $0.8M (30%) and molluscs, valued at $0.65M (33%). The landings distribution is relatively similar from year to year.

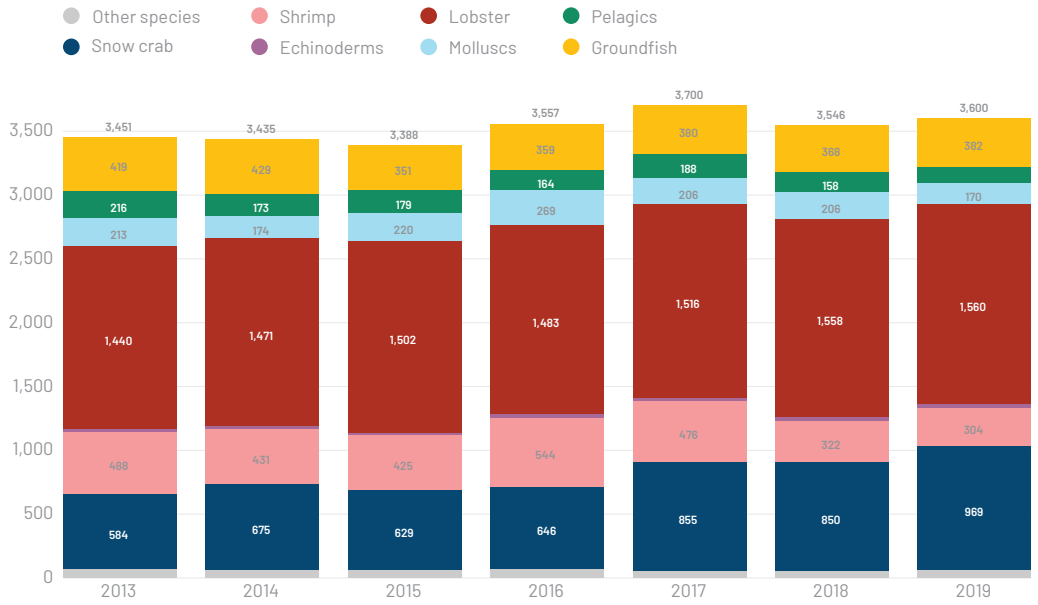
Commercial fisheries employment

From 2013 to 2019, the estimated number of full-time equivalent (FTE) employees[25] in maritime Quebec commercial fisheries increased from 3,451 to 3,600, up 4%. More specifically, in the Magdalen Islands, this number increased from 1,002 to 1,092, up almost 9% (Chart 3 10: a and b). During this same period, the biggest increase in the Islands in number of FTE employees in commercial fisheries was in snow crab fishing. The number rose from 86 in 2013 to 139 in 2019, an increase of nearly 62%. This was followed by increases in the number of FTE employees catching groundfish (40%), molluscs (3%) and lobster (3%).

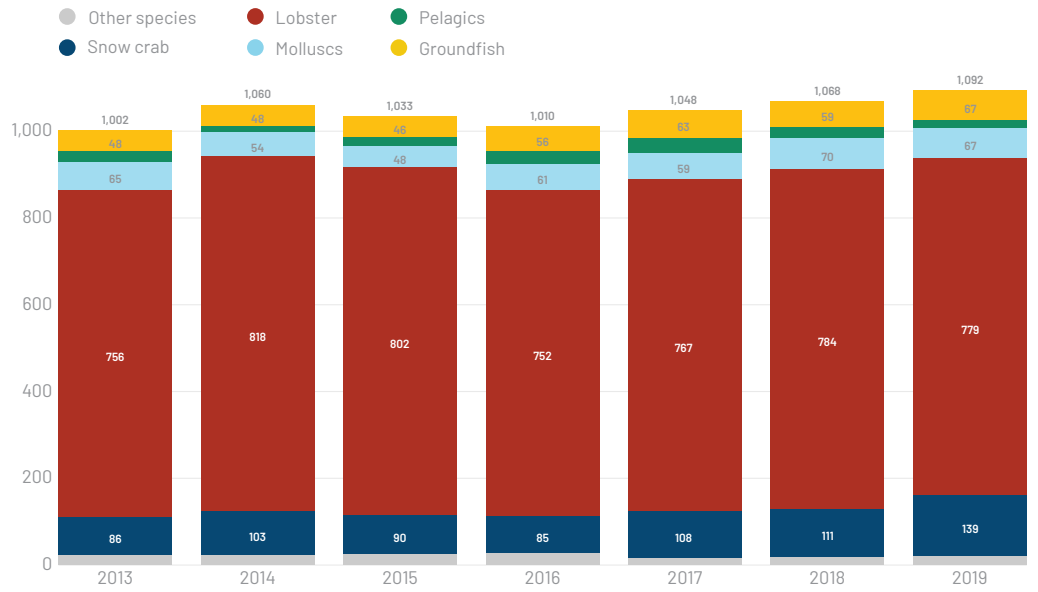
25. Essentially, the number of FTE employees is calculated from the average number of crew members required per operator (based on the targeted species and vessel length), the number of days worked, and hypotheses about the number of days worked and eligibility criterion for employment insurance.

Chart 3-10. **Breakdown of Estimated Numbers of Full-Time Equivalent Employees by Species Landed for (a) Maritime Quebec and (b) the Magdalen Islands, 2013–2019**

(a)



(b)



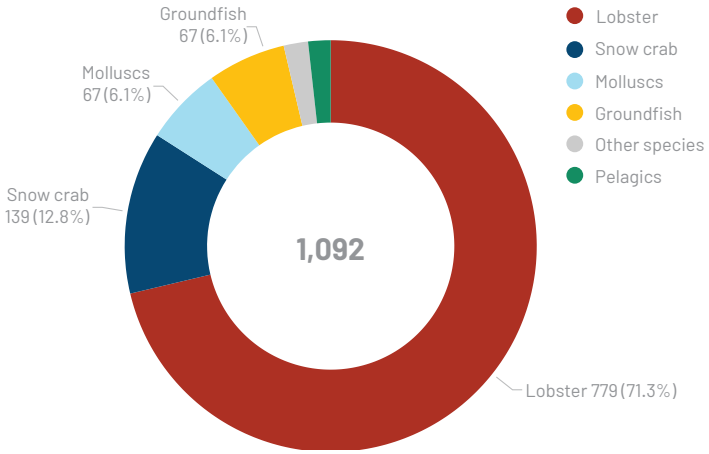
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

In 2019, the estimated 1,092 FTE employees in commercial fishing in the Magdalen Islands accounted for more than 30% of the total for maritime Quebec. Of these, 779 were employed in harvesting lobster, 139 in harvesting snow crab (13%), 67 in harvesting groundfish (6%), 67 in harvesting molluscs (6%), 19 in harvesting pelagic fish (2%), and 21 in harvesting other species, including 12 in harvesting rock crab (1%) and 9 in harvesting toad crab (1%).

Lobster harvesting accounted for more than 71% of the total estimated number of FTE employees in the Magdalen Islands commercial fisheries, all species combined, and almost 50% of the total number of FTE employees harvesting lobster in maritime Quebec (Chart 3 11).

Note that more than 79% of the estimated number of FTE employees harvesting groundfish were involved in catching Atlantic halibut, whereas 20% and 1%, respectively, were involved in catching flounder and cod. Of the FTE employees involved in mollusc fishing, 44% harvested whelks, 35% harvested scallops, 18% harvested Atlantic surf clams and 2% harvested Stimpson's surf clams.

Chart 3-11. Breakdown of Full-Time Equivalent Jobs by Species Landed, Magdalen Islands, 2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

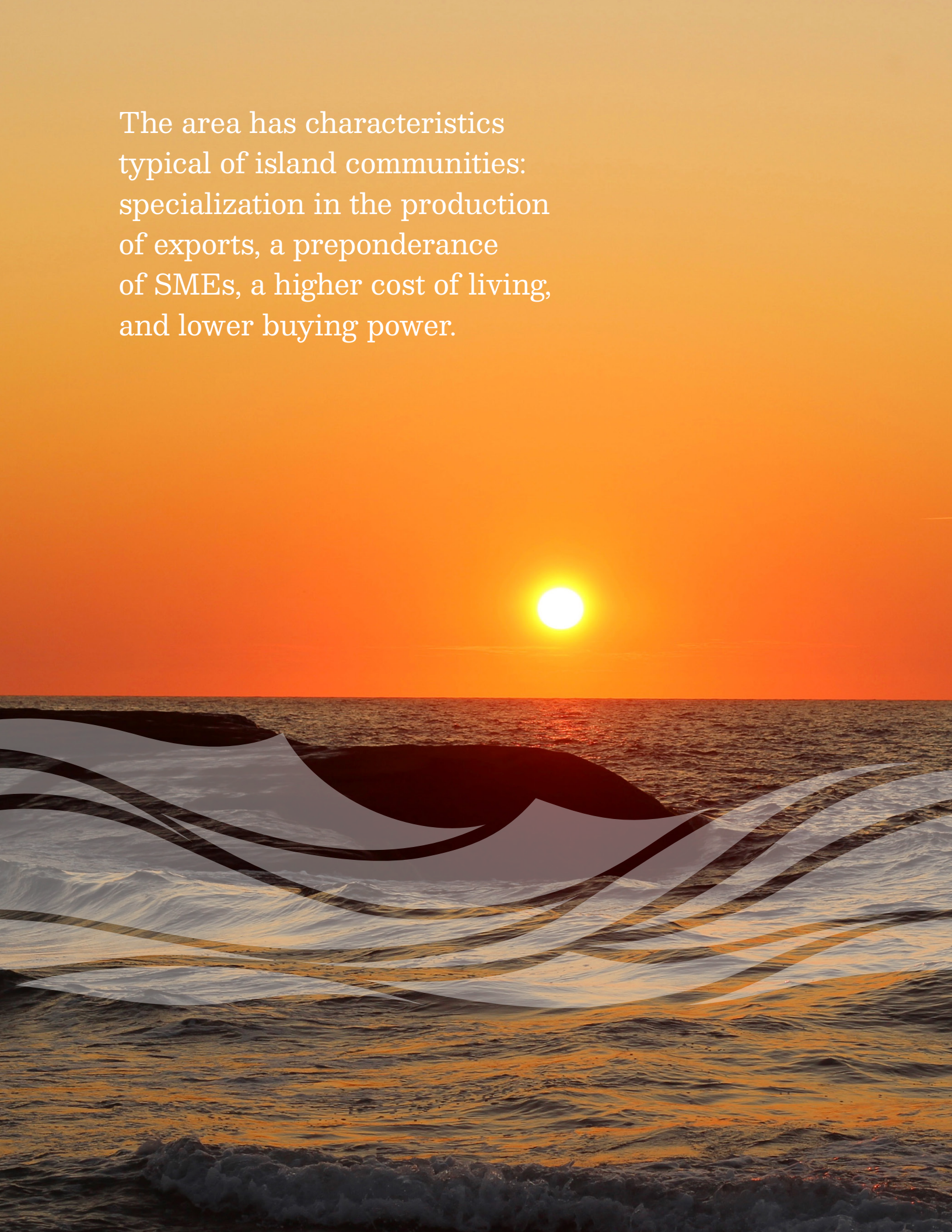
Characteristics of the main fleets

Although the commercial fishery in the Islands focuses on lobster and snow crab (accounting for 95% of the total landed value in 2019), these fisheries are very different from each other. The lobster fishery consists of a much larger fleet (325 lobster fishing vessels) and is subject to a competitive management regime that controls fishing operations with measures such as the fishing period, the type of traps used and the characteristics of the lobster caught.

The snow crab fishery is based on an individual transferable quota (ITQ) system. Fishers are subject to a total allowable catch (TAC), which is subsequently divided into ITQs. In the Magdalen Islands, fishers participate in this type of fishing in Areas 12, 12F and 12E. Area 12 is the largest in area and its TAC is divided between the Gulf and Quebec regions. Area 12F is smaller, but because of its proximity to the Magdalen Islands, local fishers are more present there. Access is shared between the Quebec, Gulf and Maritime (Nova Scotia) regions. However, in recent seasons, Magdalen Islands fishers have only caught snow crab in Areas 12 and 12F and their respective shares have been about 4% and 39% of the TAC in each area. In total, the initial ITQs of Magdalen Islands fishers amounted to 2,046 tonnes in 2019, an increase of 18%, compared with 2018.

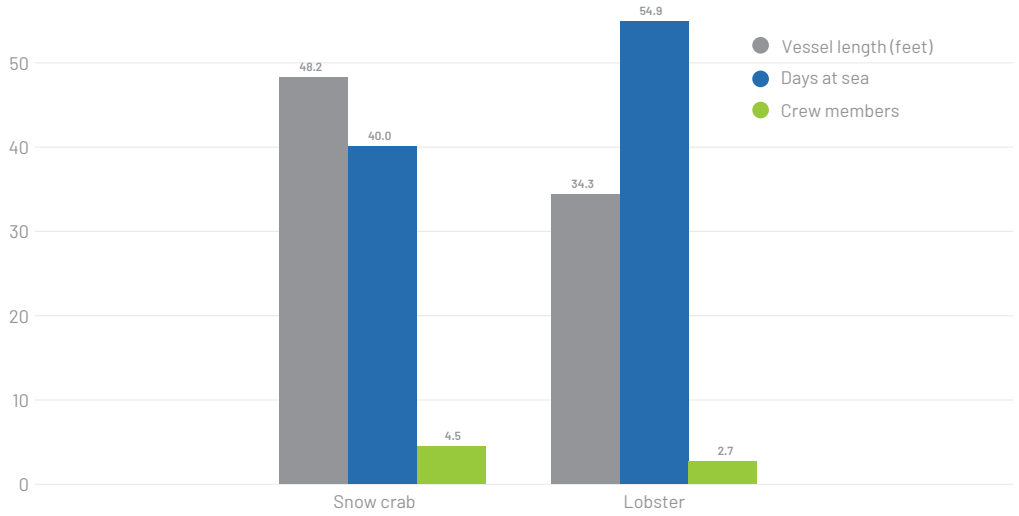
Note that fishing enterprises focus their fishing activities on the species that is most profitable, but nearly all of these enterprises also harvest other species to supplement their fishing income.

The area has characteristics typical of island communities: specialization in the production of exports, a preponderance of SMEs, a higher cost of living, and lower buying power.



The characteristics of these fleets are not limited to the various management regimes; they are also determined by the fishers' harvesting operations during a season. For example, Chart 3 12. shows the differences in the average number of crew members, average vessel length and number of days at sea. During the 2019 season, the lobster fleet spent more days at sea (55 days on average) than the crabbers, who spent 40 days at sea. However, the vessels used by the latter are larger, with an average length of 48 feet, compared with 34 feet for lobster fishing vessels. There are also more crew members on crab-fishing vessels: an average of five crew members consisting of fishers and fisher helpers, compared with three crew members for lobster fishing vessels (Chart 3 12.).

Chart 3-12. Average Characteristics of the Main Magdalen Islands Fishing Fleets, 2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Landing dynamics

In general, the bulk of the fishing enterprises in the Magdalen Islands land their catches in the archipelago, but some land them elsewhere in Quebec. Since 2013, the average percentage of landings in the archipelago by Magdalen Islands fishers has been 97%. Of the main species, 99% of lobster catches and 100% of snow crab catches are landed in the archipelago's ports. In 2019, only two species of groundfish, i.e., Greenland halibut and cod, caught by Magdalen Islands fishers were landed elsewhere, mainly in the Gaspé or Lower St. Lawrence regions. All bluefin tuna caught in 2019 by Magdalen Islands-based fishing businesses were landed outside the archipelago.

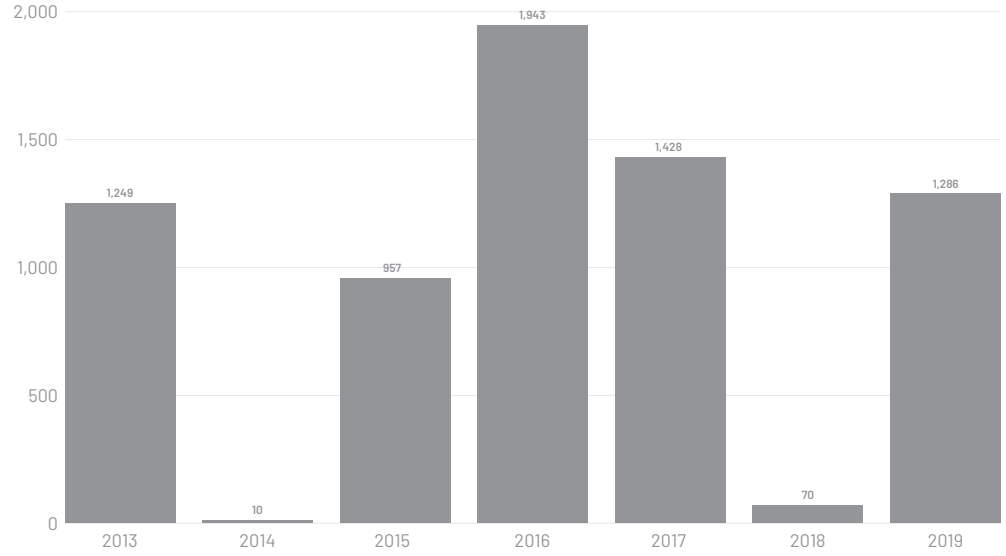
Every year, a few enterprises based outside the archipelago, mainly in the Gaspé Region but also some outside Quebec, come to the Magdalen Islands to land a portion of their catches. The main species landed by these businesses was snow crab, valued at $8.3M in 2019. This was the highest value of catches landed by non-residents of the Islands over the 2013-2019 period, given that these landings have increased since 2018 (+27%). In addition, 96% of non-residents of the Islands landing their snow crab catches on the Islands came from outside Quebec.

Commercial seal hunt

The Magdalen Islands commercial seal hunt has been a Magdalen Islands tradition for many generations. The main species caught are harp seals and grey seals. In the past, these animals were caught mainly for their skins, but in recent years, the catches have targeted the market for by-products, such as meat and fat, which have many uses. In recent years, hunting activities have been hampered by variable environmental conditions that have a significant impact on the resulting catches. The absence of ice around the archipelago as well as the locations of the herds play a major role in the supply of the resource and thus influence the number of seals caught. Catch reports from the last few seasons indicate that very few seals were harvested.

For example, in 2019, 1,286 seals were harvested by hunters, compared with 70 in 2018 and 1,943 in 2016 (Chart 3 13). For confidentiality reasons, the values of seal sales in the Magdalen Islands are not available.

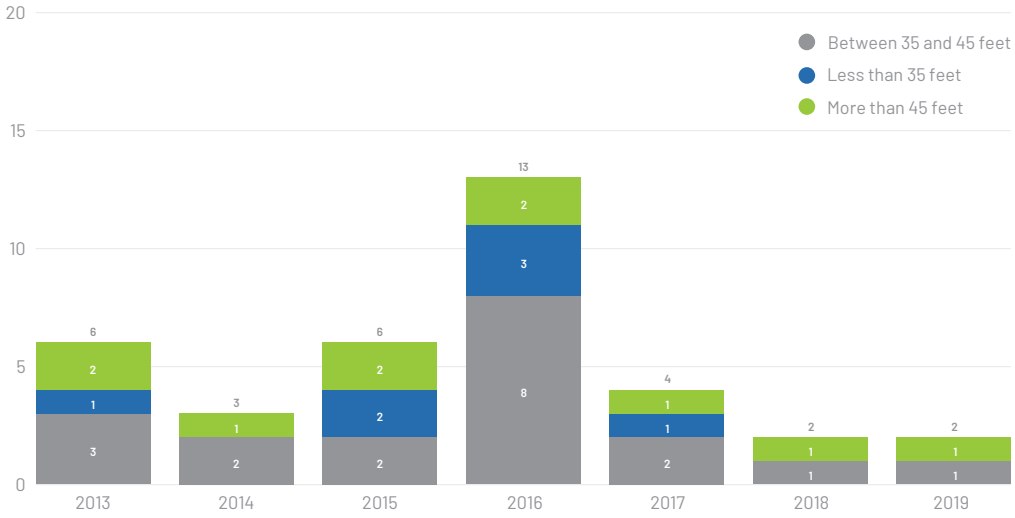
Chart 3-13. Changes in Harp Seal and Grey Seal Catches by Magdalen Islands Hunters, 2013–2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

The number of vessels used per season for seal hunting is relatively small. Ice and weather conditions play a key role in whether or not a vessel is used. In general, few vessels are designed to navigate through ice, which limits the number of participating vessels. In addition, young hunters are less interested in this activity. On average, over the 2013–2019 period, five vessels and their crews participated in the hunt, whereas there were only two vessels in 2019. During that period, more than half of the vessels used were between 35 and 45 feet in length (52%), while vessels over 45 feet accounted for 28% of vessel usage. Vessels under 35 feet accounted for 19% of hunters (Chart 3 14). Ice conditions play a major role in the distribution of the categories of vessels used.

Chart 3-14. **Changes in the Number of Vessels Used by Magdalen Islands Hunters by Vessel Category, 2013–2019**

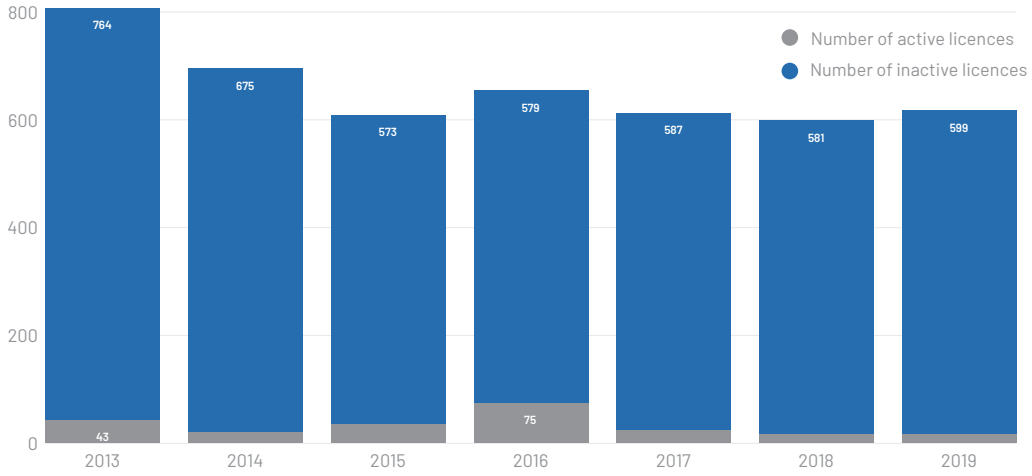


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

The number of commercial seal licences is relatively high, compared with the number of seals harvested. Licence holders renew their licences every year to remain eligible in case of favourable hunting conditions and prices. At the industry's request, a freeze on the issuance of new harp seal licences was implemented in 2004 and remained in effect until 2019, so that the training of hunters in humane harvesting practices could be better supervised. In 2014, Fisheries and Oceans Canada implemented humane harvesting training (three step method).[26] In order to deal with crew shortages, DFO issued temporary (renewable on an annual basis) "assistant hunter" licences for harp seals until 2018. In 2019, 599 seal licences were issued, but only 17 hunters were active during the period. On average, 622 licences were issued per year during the 2013–2019 period, with an average of 33 hunters harvesting during the period. Note that the number of active hunters is an estimate based on the category of vessels used during the year and should therefore be treated with caution (Chart 3 15).

26. The three steps: 1. Striking – the seal harvesters must shoot or strike animals on the top of the cranium, with either a firearm or a hakapik or club. 2. Checking – the seal harvesters must palpate both the left and right halves of the cranium, following striking (either with a firearm, hakapik or club), to ensure that the skull has been crushed. This ensures that the seal is irreversibly unconscious or dead. 3. Bleeding – The seal harvester must bleed the animal by severing the two axillary arteries located beneath the front flippers and must allow a minimum of one minute to pass before skinning the animal. Bleeding ensures that the seal is dead.

Chart 3-15. **Changes in the Number of Licences and the Number of Active Hunters in the Magdalen Islands, 2013–2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

3.2.2. Mariculture

Since 2013, the Magdalen Islands mariculture industry has consisted of four enterprises and is based on the cultivation of three main species: mussels, scallops and oysters. Oysters are the main species cultivated by most businesses (see Table 3-1).

Over time, there have been significant changes in the species cultivated. The production of mussels has been abandoned in favour of oysters because environmental conditions (global warming) have become increasingly conducive to cultivating oysters and production methods have become more efficient, especially when rigid structures are used to protect oysters from predation by ducks. Because the cultivating of mussels has never been profitable, despite the introduction of some biotechnical advances, mussel production operations were terminated in 2012.

Table 3-1. **Mariculture Enterprises in the Magdalen Islands and Their Main Cultivated Species, 2019**

Enterprise name	Main species cultivated
Les moules de culture des Îles inc.	Mussels
La moule du large inc.	Oysters
Grande-Entrée Aquaculture inc.	Oysters
Les huîtres Old Harry inc.	Oysters

Source: Quebec Department of Agriculture, Fisheries and Food (MAPAQ)

The number of people employed in this industry varied greatly during the 2013–2019 period, with the lowest number recorded in 2019 (25), compared with 40 in 2013 (-38%). The main reason for this decrease is the gradual decline in scallop production activities, which in the early 2010s, accounted for 50% of all mariculture jobs in the Islands.

Production volumes were relatively stable during the 2013–2019 period at an average 299 tonnes. In 2019, 304 tonnes were accounted for across all enterprises. However, the production values rose steadily from $774,000 to $2,592,000 during the 2013–2019 period, an increase of 234% (see Table 3-2). The main reasons were the switch from mussel to oyster production by some companies and higher market price for oysters.

Table 3-2. Breakdown of Production Volumes and Values by Number of Enterprises, Number of Employees and Various Species Cultivated, 2013–2019

Year	Number of Enterprises	Species Cultivated	Number of Jobs	Volume (tonnes)	Value ($1,000s)
2013	4	Mussels, scallops, oysters	40	305	774
2014	4	Mussels, scallops, oysters	37	320	913
2015	4	Mussels, scallops, oysters	29	305	1,175
2016	4	Mussels, scallops, oysters	26	257	1,230
2017	4	Mussels, scallops, oysters	33	315	2,058
2018	4	Mussels, scallops, oysters	30	289	2,157
2019	4	Mussels, scallops, oysters	25	304	2,592

Source: Quebec Department of Agriculture, Fisheries and Food (MAPAQ), 2020

Mariculture companies in the Magdalen Islands stand out for their production volumes and values, which accounted for 83% and 75%, respectively, of all production volumes and values in maritime Quebec. Oyster production, established and developed in recent years, is helping the mariculture sector, in particular, to grow within the industry. This growth is also supported by Quebec's aquaculture development framework, which stems from the *Plan de développement sectoriel en aquaculture commerciale 2010–2013* [2010–2013 commercial aquaculture sector development plan]. The plan's objective is to position commercial aquaculture as an important component of Quebec's sustainable development, while addressing industry expectations and concerns. The establishment of a mariculture area, as well as the development of mariculture sectors off Cap-aux-Meules, have contributed to the sector's growth in recent years.

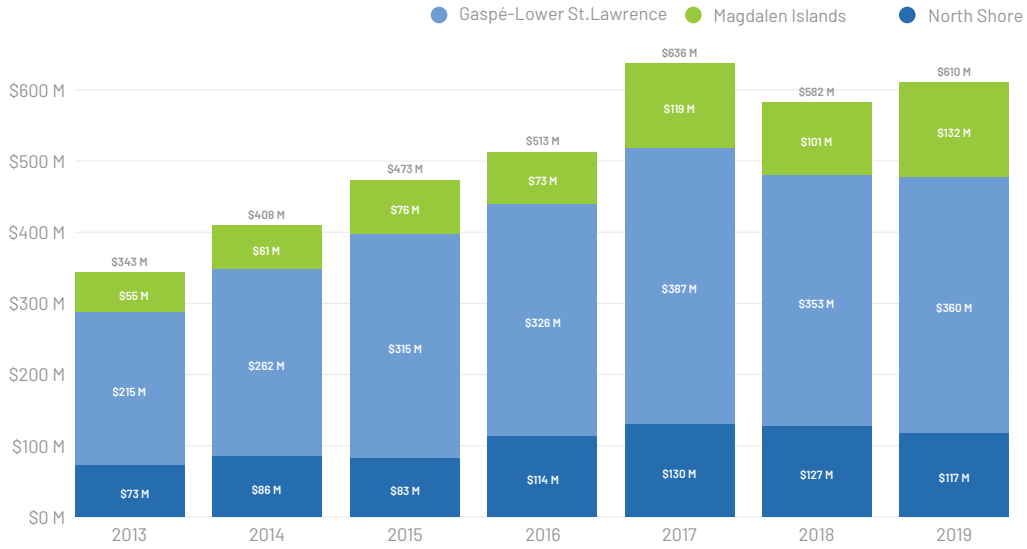
3.2.3. Seafood processing

Voluntarily reported sales by Marine Product Dockside Buyers[27]

According to data gathered on a voluntary basis by DFO from marine product dockside buyers (MPDBs) in maritime Quebec, there were 13 players in this industry in the Magdalen Islands in 2019, or about 18% of the total number recorded for all three marine sectors. Their supply of raw material comes almost entirely from fishers who have landed their catches on the Islands. Specifically, in 2019, their dockside purchases accounted for 97% of purchase values, compared with 3% for purchases from other local plants (inter-plant trade).

Reported sales by MPDBs in the Magdalen Islands totalled $132M in 2019, above the 2013–2019 period average estimated at $107.5M. Among the maritime Quebec MPDBs, those in the Magdalen Islands ranked second in 2019 with 22% of total reported sales values. The Gaspé–Lower St. Lawrence region was in first place with $360M (59%), with the North Shore region rounding out the picture with $117M, or 20% (Chart 3-16).

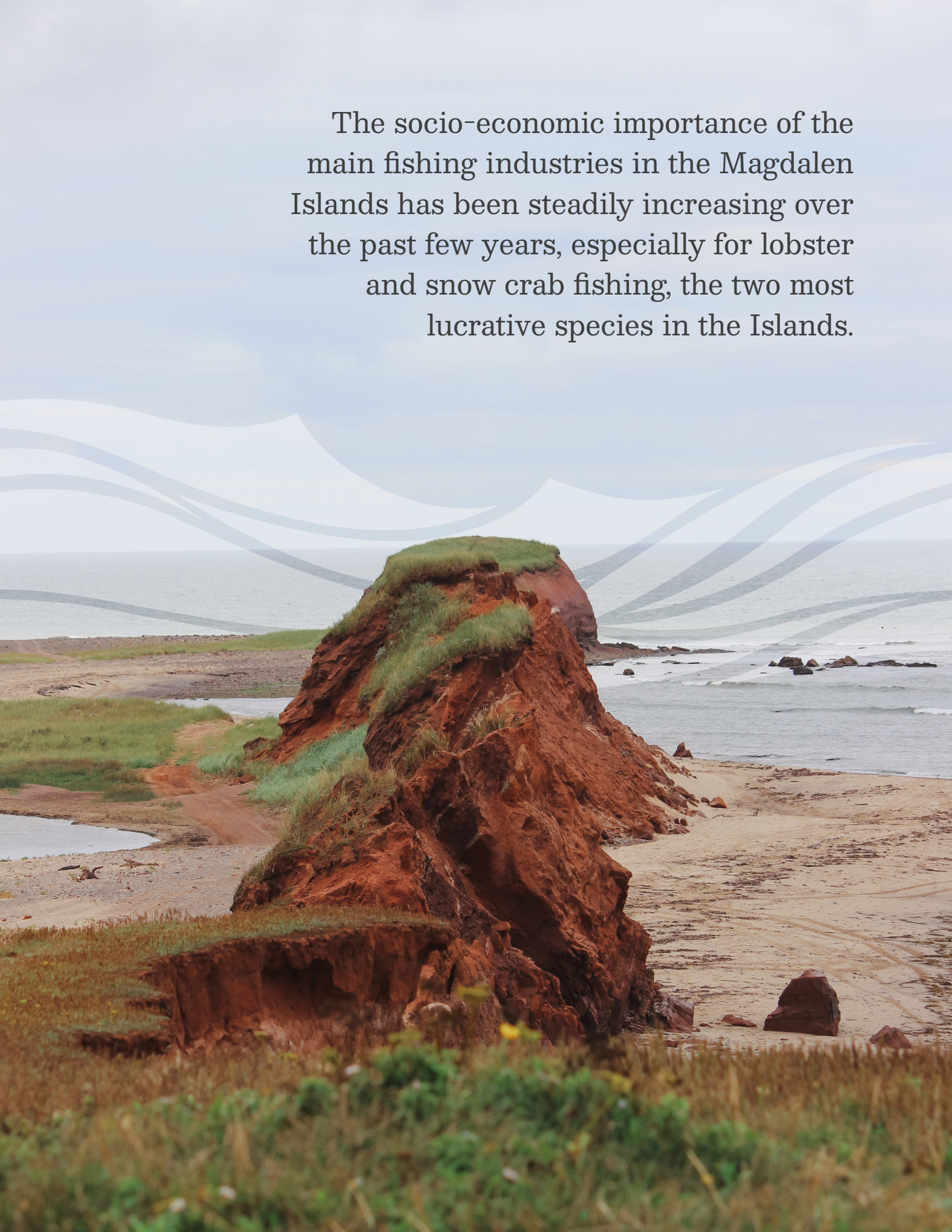
Chart 3-16. Changes in Values of Voluntarily Reported Sales by Marine Sector, 2013–2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

27. These data do not include the entire marine product processing sector in Quebec. These are only the MPDBs in the marine sector (Magdalen Islands, North Shore and Gaspé–Lower St. Lawrence) that have bought landed catches in Quebec and for which DFO provides a follow-up. Note that because these data are provided on a voluntary basis and may not always accurately reflect reality, this information is provided as a reference only (interpret with caution). Moreover, it is not the production of the processing plants because unsold quantities are not taken into account in the data.

The socio-economic importance of the main fishing industries in the Magdalen Islands has been steadily increasing over the past few years, especially for lobster and snow crab fishing, the two most lucrative species in the Islands.

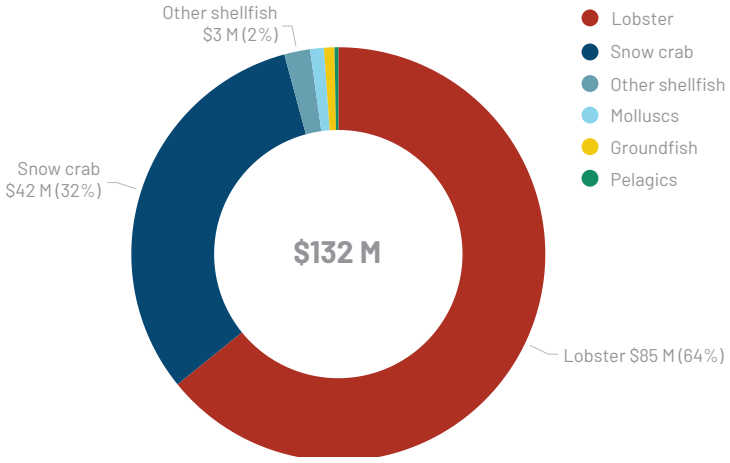


During the 2013–2019 period, the value of sales reported by archipelago MPDBs increased. Between 2018 and 2019, values increased by about 31% from $101M to $132M.

Because the processing industry's activities are directly related to market demand, they focus mainly on the crustaceans most highly sought after by consumers. In 2019, lobster was the top-ranking species in terms of value at $85M and accounted for 64% off all species processed in the Magdalen Islands. In relation to maritime Quebec as a whole, the percentage of this species processed out of all species processed was more than 38% ($235M).

Snow crab was the second most processed species at $42M and accounted for 32% of reported sales in the Magdalen Islands and for slightly less than 16% of sales in maritime Quebec. The third most processed species were other crustaceans for a value of $3M and accounting for 2% of processing. Molluscs accounted for a marginal percentage of processing at 1% ($1M). The other species were groundfish and pelagic fish, which supplemented the production of Magdalen Islands plants by $1M (slightly less than 1% of processing) and $0.39M (0.3% of processing) respectively (Chart 3-17).

Chart 3-17. Distribution of the Values of Voluntarily Reported Sales, Magdalen Islands, 2019

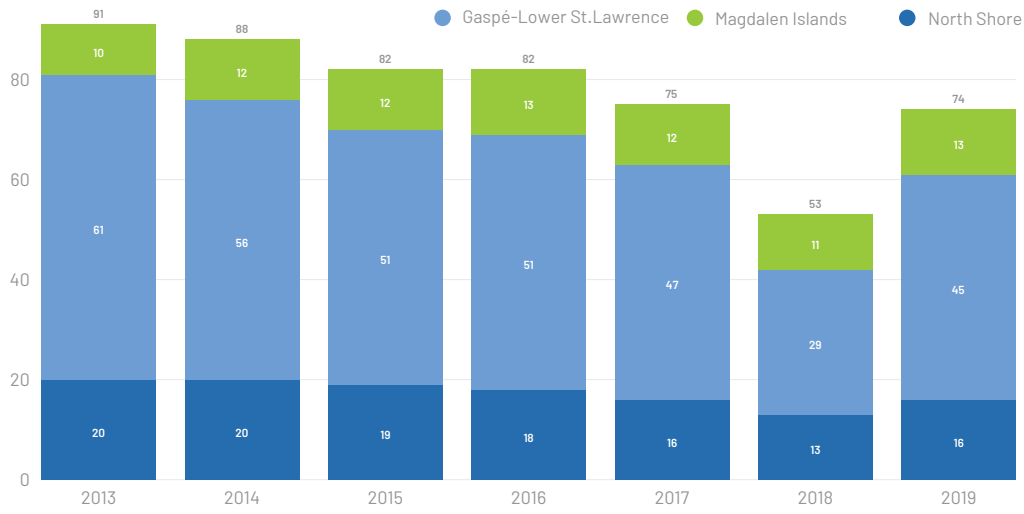


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Marine product dockside buyers

From 2013 to 2019, the number of MPDBs in the archipelago increased from 10 to 13, a 30% increase (Chart 3-18). Despite this increase, the number of MPDBs remained relatively unchanged during this period, but was still the lowest in maritime Quebec (18%) and equal to three times less than the plants in Gaspé–Lower St. Lawrence.

Chart 3-18. **Number of Marine Product Dockside Buyers, Magdalen Islands, 2013–2019**

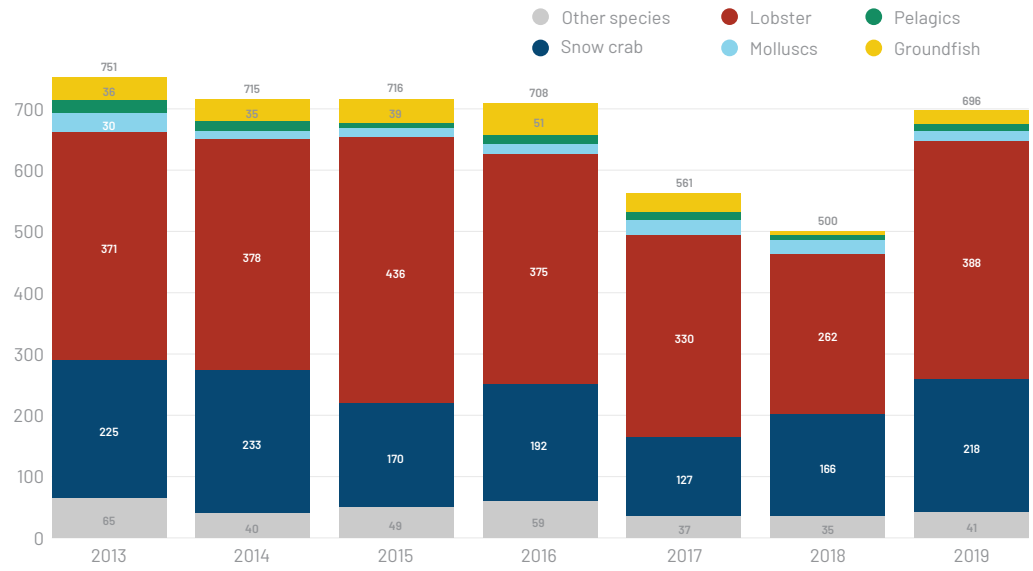


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Processing sector jobs

From 2013 to 2019, the estimated number of jobs[28] in MPDB businesses in the Magdalen Islands decreased from 751 to 696, down more than 7% (Chart 3-19). The equivalent figure for maritime Quebec overall was about 17%, increasing from 4,628 in 2013 to 3,819 in 2019.

Chart 3-19. **Breakdown of Jobs by Species Processed, Magdalen Islands, 2013–2019**



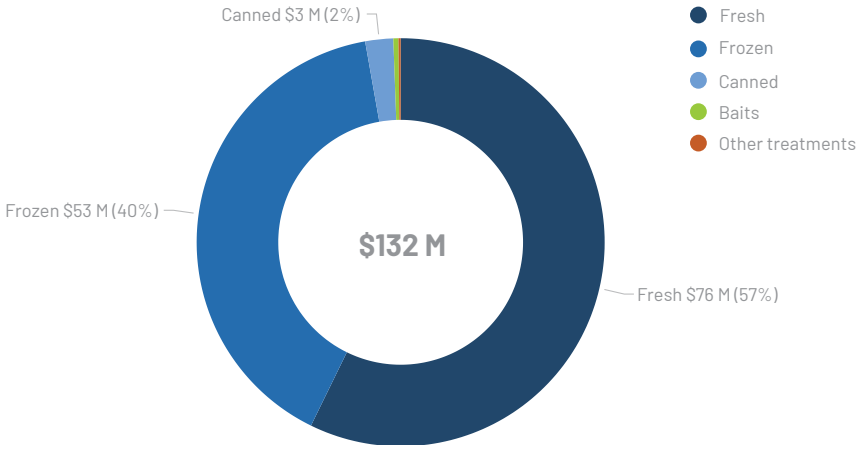
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

28. Note that this information is not broken down by species since the data are not available. The processing activity is different for each species and may vary between plants.

Products

The marine products sold by the MPDBs in the Magdalen Islands are mainly fresh and frozen products (raw or cooked). Their corresponding values in 2019 were $76M (57%) and $53M (40%), respectively. Canned products accounted for $3M or 2% of total sales by these MPDBs. The proportion of sales by product type is similar from year to year (Chart 3-20).

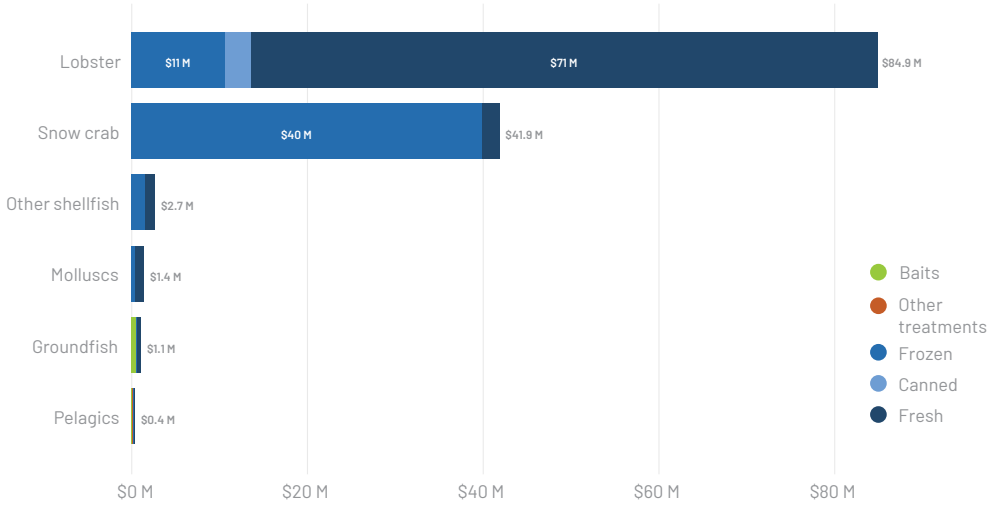
Chart 3-20. Distribution of Product Types of Processed Products, Magdalen Islands, 2019



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

In 2019, lobster processed in the Magdalen Islands, which accounted for $85M in MPDB-reported sales, was mainly fresh lobster, valued at $71M (84% of all lobster product sales), and frozen lobster, valued at $11M (13% of all lobster product sales). The total value of the remaining processed lobster products was $3M (3% of sales). The latter were spreads, patés and tomalleys (lobster paste) sold in cans. Snow crab is sold almost exclusively in frozen and cooked form and accounted for nearly $40M of Magdalen Islands MPDB sales in 2019, or 95% of the total sales value for the species. The remainder was sold fresh, for a value of $2M (5% of total sales). Other crustaceans and molluscs were sold mainly in two forms, fresh and frozen, with sales totalling $2M (52% of sales) and $2M (48% of sales), respectively. Groundfish were sold as bait, for value of $0.5M (45% of sales), but also fresh and frozen, for sales values of $0.4M and $0.2M, respectively. Most pelagic fish were processed into bait, for a value of $0.2M, but were also sold fresh, frozen and in other formats (smoked or cured products), for a value of $0.4M (Chart 3-21).

Chart 3-21. **Distribution of Product Types by Species Processed, Magdalen Islands, 2019**



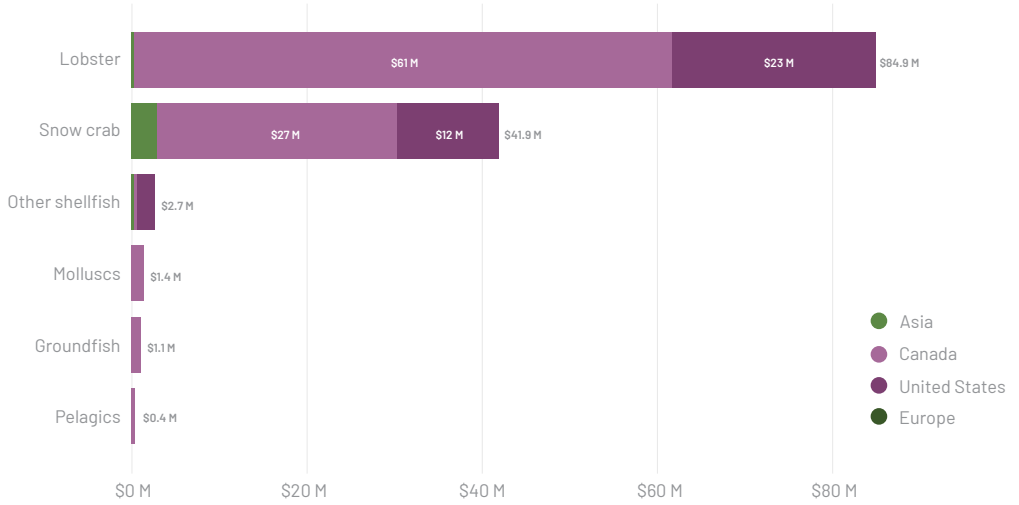
Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Marketing

The products from Magdalen Islands MPDBs are marketed primarily in local and interprovincial markets in Canada and in the United States and Asia (mainly Japan). Other markets are also targeted, such as European countries such as France and Spain. According to MPDB-reported sales data for 2019, the bulk of lobster sales (i.e., $61M or 72% of sales) were in the domestic market, while the United States was the second largest market with $23M (27% of sales). The Asian market accounted for $0.3M (1% of sales). During the 2013–2019 period, the value of average domestic lobster sales was $38M, a 63% increase in 2019. Sales in the United States market amounted to $21M, an increase of 9% in 2019. Note that between 2016 and 2017, lobster sales in the domestic market increased by 64%, partly because of greater quantities of lobster landed as a result of increases in lobster biomass in the previous years. Starting in 2013, quantities increased every year, except in 2016. Snow crab sales followed a similar trend, with a sale value of $27M (65% of sales) in the Canadian market and of $12M (28% of sales) in the United States market. Asia was the third largest market, with sales of $3M (7% of sales). All sales of other species, such as molluscs ($1.4M), groundfish ($1.1M) and pelagic fish ($0.4M), were made in the Canadian market in 2019. The majority of sales of other crustaceans, such as rock crab and toad crab, were in the United States market, for a value of $2M or 74% of total sales. The Canadian and Asian markets followed with values of $0.4M (14% of sales) and $0.3M (10% of sales), respectively. In Chart 3-22, which shows the distribution of sales markets, the domestic market remains dominant. However, note that plants may use Canadian intermediaries that then export their products outside the country.[29]

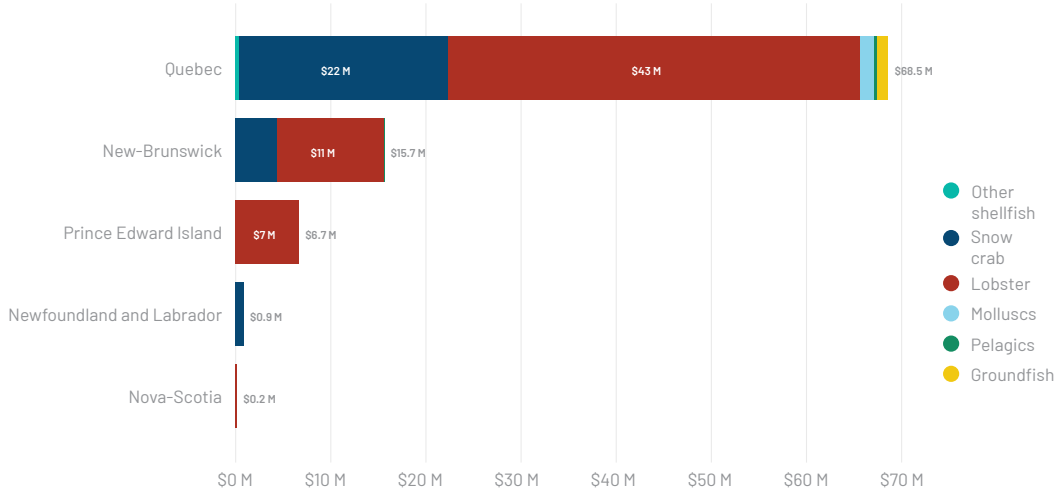
29. This information is not available to the Department.

Chart 3-22. **Distribution of Sales Markets by Species Processed, Magdalen Islands, 2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Chart 3-23. **Distribution of Sales Markets by Species Processed, Magdalen Islands, 2019**

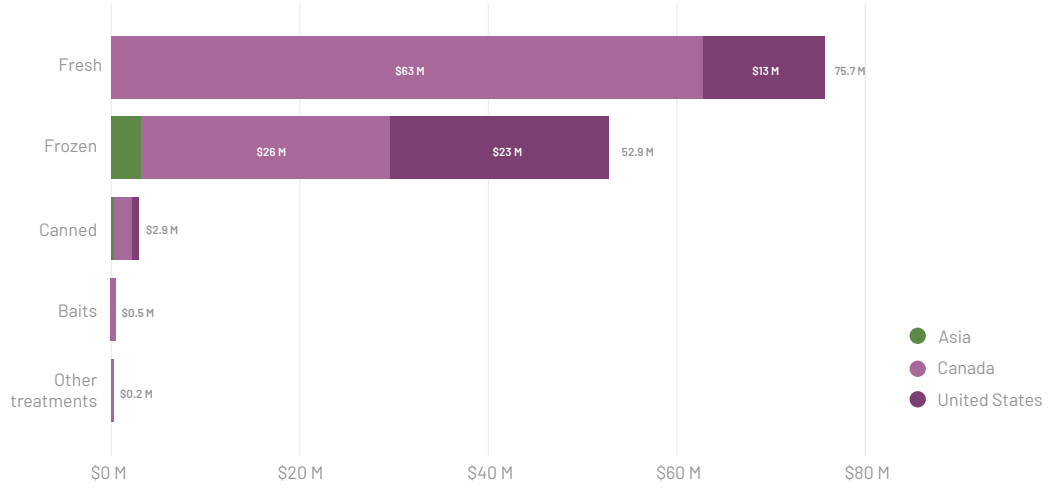


Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Fresh products accounted for the bulk of sales in 2019, for a total value of $76M (57% of all products sold), because of lobster, the main species caught in the Magdalen Islands, which was sold mainly fresh or live. Frozen products ranked second at $53M (40% of sales) and canned products followed with a value of $3M (2% of sales). Note that the proportion of fresh products increased by 13% in 2019, compared with the 2013-2019 average, while frozen products decreased by 10%. The same was true for the proportion of canned products, which decreased by 46%.

In 2019, most fresh products were sold in the domestic market for a value of $63M (86% of sales) (Chart 3-23). The United States accounted for the remaining $13M (14% of sales). In Canada, sales of fresh products from the Magdalen Islands increased by 6% in 2019, compared with the 2013-2019 average. Frozen products were also sold mostly in Canada for a value of $26M (50% of sales), with the United States just behind at $23M (44% of sales). The Asian market accounted for the remaining frozen product sales, valued at $3.2M (6% of sales). Sales of canned goods followed the same trend, with the majority sold in Canada for $2M (69% of sales), $0.6M in the United States (21% of sales) and $0.3M in Asia (10% of sales) (Chart 3-24).

Chart 3-24. **Distribution of Sales Markets by Type of Product Processed, Magdalen Islands, 2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

3.2.4. Recreational fishing

Overview

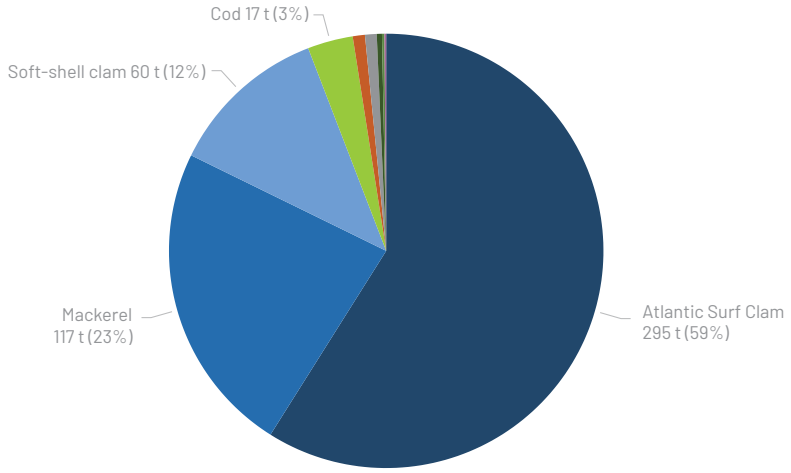
Recreational fishing in the Magdalen Islands includes mollusc harvesting on the beaches at low tide and groundfish and mackerel fishing at sea or from a wharf. A variety of factors come into play to estimate the annual catch of these species, including weather conditions, the number and duration of closed shellfish areas, and the number of active recreational fishers. These data are derived from the best possible estimates of the quantities fished that are not included in the regular landing data-gathering process. Because they are still estimates, they should be treated with caution. During the 2013–2019 period, the estimated quantities averaged 89 tonnes for an average value of $133,250.

Targeted species

The main species targeted by recreational fishers in the archipelago during the 2013–2019 period were surf clams, mackerel and soft-shell clams, whose estimated percentage shares of the total quantity harvested were 59%, 23% and 12%, respectively (Chart 3-25). Other species caught in small numbers were cod, mussels, winter flounder, razor clams, Canadian plaice and yellowtail flounder. Based on commercial landing prices, surf clams ranked first in terms of estimated percentage of total value. Next were soft-shell clams at 29% and mackerel at 19% of total value. Cod, winter flounder and mussels accounted for 5%, 2% and 2% of total value, respectively. The estimated values of the other species were marginal.

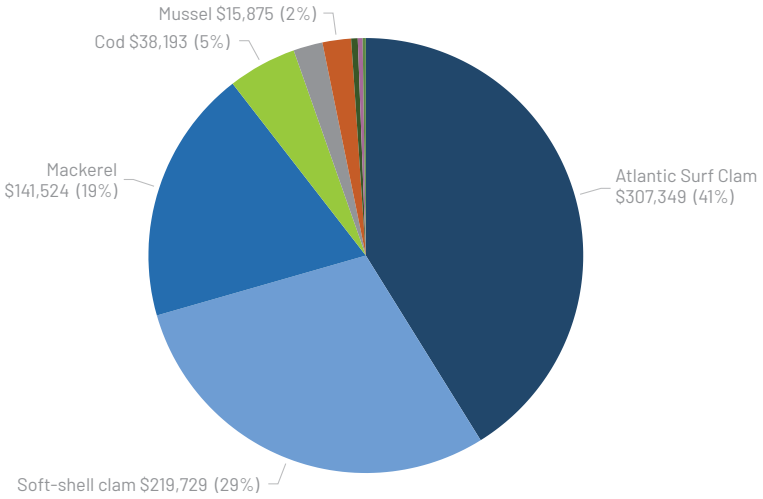
Chart 3-25. **Distribution of Quantities (a) and Estimated Values (b) of Recreational Fisheries in the Magdalen Islands, 2013–2019**

(a)



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

(b)



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

Population numbers

The estimated number of recreational fishers in the Magdalen Islands is based on the average quantities of each species caught, which are derived from marine sector estimates (recreational saltwater fishing study conducted in 2012). The estimated total number of fishers during the study period was highest in 2019, when there were estimated to be 7,593 fishers harvesting three main species, which were soft-shell clams, surf clams and cod in descending order (see Table 3-3).

Table 3-3. Estimated Number of Recreational Fishers in the Magdalen Islands, 2013–2019

Category	Species	2013	2014	2015	2016	2017	2018	2019
Molluscs	Atlantic razor clam	67	67	38	91	45	30	45
	Surf clam	765	953	272	953	953	924	1,089
	Mussel	34	45	45	45	23	23	11
	Soft-shell clam	2,721	2,948	907	953	953	1,905	1,542
Groundfish	Yellowtail flounder	0	0	0	102	102	76	45
	Cod	529	378	529	1,134	1,058	1,028	984
	Canadian plaice	113	114	114	34	34	34	35
	Winter flounder	340	114	114	545	545	271	249
Pelagics	Mackerel	652	680	1,134	1,588	2,948	1,275	3,402
Grand total		**4,911**	**5,714**	**2,589**	**5,904**	**6,912**	**5,786**	**7,593**

Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

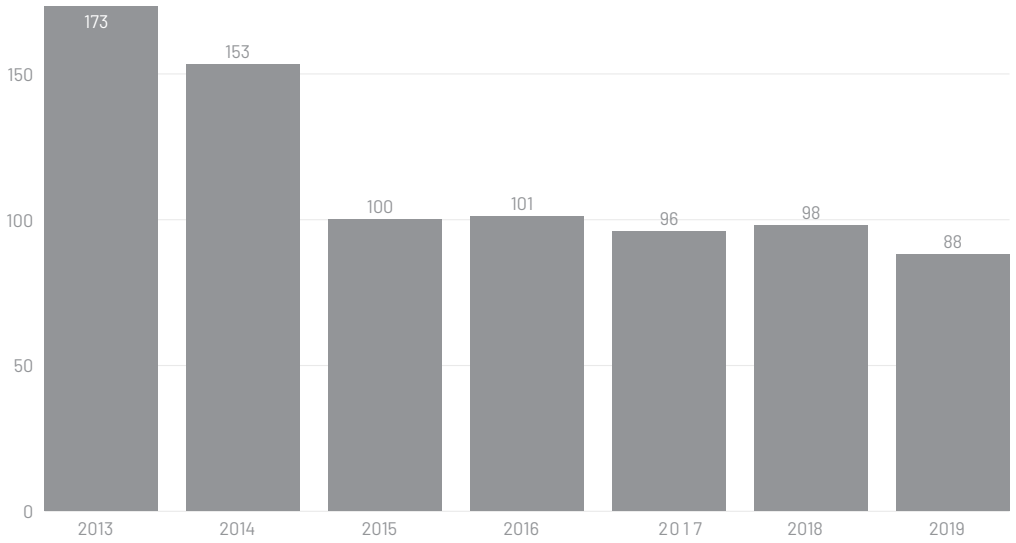
Businesses

Some Magdalen Islands businesses have developed tourism and recreation activities based on fishing and the fishing tradition in the Magdalen Islands. Some of them offer mackerel fishing trips, sea excursions with lobster trap raising and clam fishing (soft-shell clams). Other businesses offer interpretive services for scallop farming in the lagoon and related activities. Recreational fishers also work directly with the skipper owners of commercial craft on recreational mackerel and groundfish fishing trips.

Seal hunting for personal use

Seal hunting is part of the culture and traditions of the Magdalen Islands. Since 1995, as a result of a change in direction in the *Commercial Fisheries Licensing Policy for Eastern Canada*, residents of communities adjacent to the Newfoundland and Labrador and Quebec sealing areas have been able to hunt seals for their own consumption (without the right to sell, trade, etc.). Some Magdalen Islanders hunt harp seals or grey seals for their own use, which can be considered sport fishing (hunting). In 2010, a freeze on personal use seal hunting licences (harp seals and grey seals) was lifted, allowing hunters to kill six seals per year. Since the seal hunt is usually carried out on foot, few hunters take advantage of personal use seal hunting licences. For example, during the 2013–2019 period, nearly 173 permits were issued in 2013, but the number subsequently dwindled and only 88 permits were issued in 2019 (Chart 3-26).

Chart 3-26. **Changes in the Number of Personal Use Seal Hunting Licences Issued, 2013–2019**



Source: Department of Fisheries and Oceans, compilation of Strategic Services, Quebec Region, 2021

3.2.5. Federal and provincial services

Two federal and two provincial organizations with mandates directly related to the fishing and mariculture sector (that involve managing, conserving, protecting and conducting research relative to marine resources) have offices and staff based in the Magdalen Islands. The federal organizations are Fisheries and Oceans Canada and the Canadian Food Inspection Agency (CFIA), while the provincial ones are the Quebec Department of Agriculture, Fisheries and Food (MAPAQ) and Mérinov, a non-profit organization whose mandate is to manage the administration and operations of the Cégep de la Gaspésie et des Îles and its college centre for technology transfer.

Fisheries and Oceans Canada

DFO's primary role is to protect and manage Canada's fisheries, including aquaculture, while working collaboratively with fishers, coastal communities and Indigenous peoples to ensure sustainable prosperity. DFO's strategic objective in carrying out this role is to achieve sustainable management of fisheries and aquaculture, economic prosperity for the marine and fishing sectors, protection of Canada's oceans and other aquatic ecosystems from negative impacts, and safe navigation for commercial vessels and recreational boaters. DFO's activities are governed by three main pieces of legislation that support fisheries and mariculture: the *Fisheries Act*, the *Oceans Act* and the *Species at Risk Act*.

During the 2019–2020 fiscal year, DFO had 12,700 full-time equivalent (FTE) employees across Canada and spent $2,559M on salaries and $547M on operations. The Magdalen Islands area office had 19 FTEs and spent $1,135,054 on salaries and $415,033 on operations. This spending by the Fisheries Management (Magdalen Islands sector) and Resource Management, Conservation and Protection branches, and the Small Craft Harbours program went towards general maintenance and dredging of harbour infrastructure in the Magdalen Islands.

Canadian Food Inspection Agency

The CFIA's objective is to mitigate food safety risks by developing and verifying compliance with product and process standards for fish and seafood products. These standards ensure that fish and seafood products processed in federally registered establishments or imported into Canada are identified, safe and of acceptable quality. The CFIA is also responsible for licensing and inspecting processing facilities. Processing facilities must implement a quality management program (QMP) in order to comply with the standards. The CFIA is also responsible for certifying products for export.

The CFIA also has a lead role to play in administering the Canadian Shellfish Sanitation Program (CSSP); is responsible for monitoring the handling, storage, transportation, processing and labelling of shellfish, including imports (Safe Food for Canadians Regulations), and the marine biotoxin monitoring program (*Fisheries Act* and regulations for implementation); and liaises with foreign governments in regard to shellfish safety problems. Because the CFIA implements the biotoxin monitoring program in the shellfish sector in order to support its own activities and those of DFO, its links with the fishing and mariculture sector include the marine products processing industry and recreational shellfish fishing.

In Canada, in 2019, the CFIA had approximately 6,056 FTEs and spent $606M on salaries and $146.3M on operations (Canadian Food Inspection Agency, 2021). In the Magdalen Islands, the CFIA spent $153,000 on salaries and $13,100 on operations in 2019–2020. It employed two full-time equivalents.

MAPAQ

The mandate of the MAPAQ, and more specifically its Assistant Deputy Minister's Office for Commercial Fisheries and Aquaculture, is to position the fisheries and aquaculture industry in marine regions and inland waters, make the industry more adaptable on an ongoing basis and ensure that there is a sufficient supply of and demand for commercial marine products. The Assistant Deputy Minister's office includes the Analyses and Policies Directorate, the Aquaculture and Sustainable Development Directorate and four regional branches, including the regional Îles-de-la-Madeleine Directorate.

In 2019–2020, the MAPAQ had 1,610 employees and spent $601.5M on salaries and operations (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2020). For the fisheries and aquaculture component of its mandate, the Magdalen Islands office employed 10 full-time staff and its expenses of $928,182 included $735,778 in salaries and $192,404 in operations.

Mérinov

Established in June 2010, Mérinov is an integrated industrial research centre specializing in fishery, aquaculture, processing and marine bioresources technologies. It was founded by the MAPAQ, the Cégep de la Gaspésie et des Îles and the University of Quebec at Rimouski (UQAR). The Cégep de la Gaspésie et des Îles is an accredited college centre for technology transfer and it has given Mérinov a mandate to oversee the centre's administration, manage its operations and ensure the implementation of the centre's research, technology transfers, technical assistance, monitoring and dissemination activities. This non-profit organization has four centres in Quebec, which are located in Gaspé (head office), Grande-Rivière, the Magdalen Islands and the North Shore region. Mérinov's mission is to foster innovation, competitiveness and sustainable development in Quebec's fishing, aquaculture and marine biomass conversion industries through research and development, knowledge transfers and technical activities, while promoting the development of expertise in those areas.

In 2019, Mérinov had 114 employees. The Magdalen Islands office had 11.92 FTEs, or more than 10% of the organization's total number of employees. The company spent $799,171 on salaries and $500,000 on operations.

3.3. Pre-COVID-19 analysis

On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak to be a pandemic. This situation has created a lot of uncertainty in world markets and had an economic impact on several industries, including the fishing and marine products processing industry. In that regard, Esther Duflo (co-laureate of the 2019 Nobel Prize in Economic Sciences) believes that reliable predictions cannot be made about the economic impacts of COVID-19 with the information currently available. As a result, the analysis of the economic benefits of the fishing and mariculture sector in the Magdalen Islands focuses only on the 2013-2019 period in order to identify trends in a pre-Covid-19 context. In other words, for the purposes of this study, the pandemic is currently considered to be a one-time shock that is expected to subside in the coming years (working hypothesis). The results therefore do not take into account the impacts in 2020[30] as well as future events that are still difficult to predict for the time being.

3.4. Summary: Part II

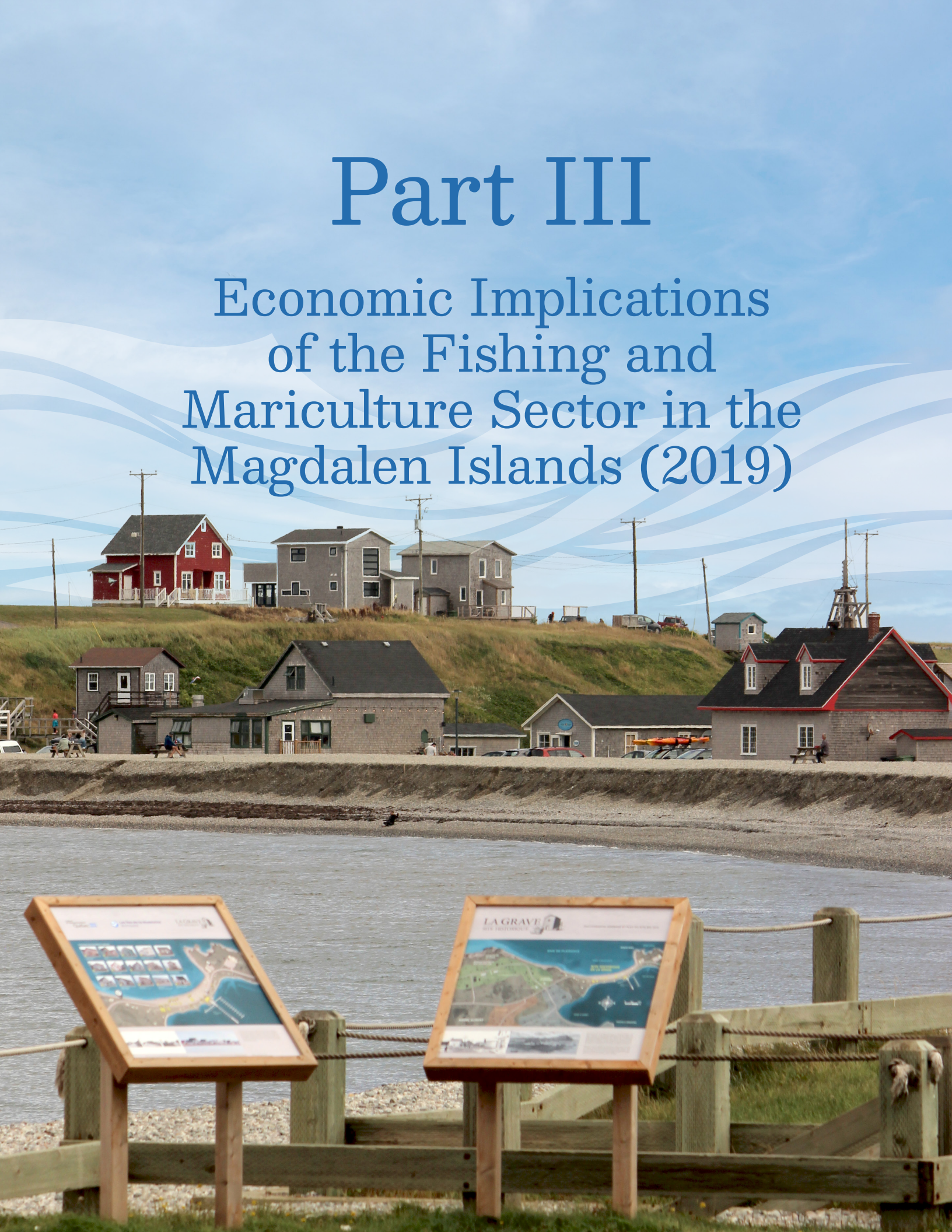
The socio-economic importance of the main fishing industries in the Magdalen Islands has been steadily increasing over the past few years, especially for lobster and snow crab fishing, the two most lucrative species in the Islands. Mariculture also has a notable share in production, the value of which has been increasing since 2013. In light of the information updated throughout this document, the Magdalen Islands region contributes significantly to the development of Quebec's fishing and mariculture sector.

Later work will focus specifically on economic benefits, which will be estimated using the Québec input-output model developed by the Institut de la Statistique du Québec. This last component provides an overview and a detailed quantitative analysis showing the importance of the economic activities resulting from the fishing and mariculture sector in the Magdalen Islands, but also for the economy of the province of Quebec.

30. The data collected by the Department on the harvesting sector for 2020 are still considered preliminary. The data on processing are currently being processed.

Part III

Economic Implications of the Fishing and Mariculture Sector in the Magdalen Islands (2019)



Part III

4. Economic Implications of the Fishing and Mariculture Sector in the Magdalen Islands (2019)

The data presented in section 3.2 of the second part of this study emphasize the importance of the contribution of the Magdalen Islands fishing and mariculture sector to the economy of the archipelago and that of the province. In 2019, the Magdalen Islands agglomeration contributed 31% of the value of commercial fishery landings in maritime Quebec, 75% of the value of mariculture production and 22% of the value of seafood processing plant production. The combined output of these three industries accounted for $238.3M in sales in 2019. In addition to this amount, federal and provincial departments spent $3.9M in the Islands with a mandate directly related to fisheries resources development and production activities.

The purpose of this third part is to estimate the economic benefit generated by this $242.2M economic contribution from the Magdalen Islands fishing and mariculture sector. It begins with a review of a selection of studies estimating the economic benefit of the fishing and mariculture sector (commercial fisheries, mariculture, and fish and seafood processing) in different regions of the world.

The next, more theoretical section is devoted to the methods used to estimate economic benefits, namely the Québec input-output model and the provincial input-output multipliers. In the third section, the data used to simulate economic benefits is presented. This includes data from the three main industries (commercial fishing, mariculture, and marine fish and seafood processing) in the Magdalen Islands fishing and mariculture sector, and from federal and provincial departments whose mandates are directly related to fisheries resources management, conservation and research. In the next sections, the results from the simulation performed using the above methods are discussed. The analysis summary is provided in the last section.

4.1. Review of the economic benefit literature

For many countries, including Canada, activities related to the fishing sector, as a primary industry, constitute the beginning of a production value chain that can have significant ramifications for the economy. Despite a smaller contribution at the global level (less than 2.5% of the world's gross domestic product), the contribution of the fishing sector can account for as much as 7% of the economy in some countries, particularly in developing countries (Béné et al., 2007). In Canada, the contribution of the entire marine sector[31] in 2018 amounted to 1.6% (of which 0.3% came from commercial fishing, aquaculture, and fish and seafood processing) of the estimated gross domestic product (GDP) of the economy (Statistics Canada, 2021). In Quebec, this sector contributes around 0.9% of Quebec's GDP.

31. The marine sector includes the private sector (commercial fishing, aquaculture, fish and seafood processing, oil and gas development and extraction, marine transportation and support activities, shipbuilding and port construction) and the public sector (National Defence, Fisheries and Oceans Canada, other federal departments, provincial/territorial departments, universities and ENGOs).

The concept of an economic multiplier is often used in fishing sector research to show the relationships between this primary sector and other sectors of the economy. Such multipliers are applied to the value of production of the sector concerned in order to assess its contribution to the GDP of the country or region under study. When they are calculated, both the direct and indirect impacts of fishing and mariculture activities are taken into consideration in order not to underestimate the sector's contribution by being limited only to the direct values collected from countries' national accounts (Sumaila et al., 2007; Kelleher et al., 2009).

For the commercial fishery, the "landed value" is the direct economic value of this sector, and is considered the starting point for the total economic impact in the input-output analysis (Sumaila et al., 2007; Kelleher et al., 2009). Except for the subsistence fishery, where fish are usually caught for personal consumption, the value chain of commercial fisheries does not end immediately after landing. Instead, the fish is sold in markets where it is destined for consumers or intermediaries for processing. At each link in this value chain, a share of each sector's value of production can be attributed to the harvesting sector. These direct and indirect economic impacts can extend across many sectors, from agriculture and forestry to manufacturing and financial services (Dyck & Sumaila, 2010).

In that regard, several approaches have been developed to determine both direct and indirect effects for any sector of the economy. A literature review of these direct and indirect effects arising from the commercial fishing, aquaculture, and fish and seafood processing sectors, consistent with similar objectives of this analysis, shows that the methods used are the input output model, the social accounting matrix (SAM) and the fisheries economic assessment models (FEAM)[32] (see Table 4-1).

Among these models, input-output models are the most commonly used in the fishing sector because of their ease of calculation and the accessibility of their results[33] (Leung & Pooley, 2001; Hoagland et al., 2005). They produce a detailed description of the propagation of demand and present a cost-benefit ratio, in terms of data and time constraints (cost), territorial scale, economic situation of the region concerned and reproducibility of the model, which is very attractive (Fouqueray, 2016). Other types of models using input-output multipliers have also been developed, either to estimate regional effects, regardless of the sector involved (as with the Québec input-output model), or to determine effects specifically related to the fishing sector (as with the FEAM in the United States).

The SAM is appropriate when analyses focus on the social benefits of a sudden decrease or increase in demand for goods and services. The SAM also estimates the negative impacts of the shock on households, but requires the costly gathering of data on household behaviours (Loveridge, 2004).

32. Represents an input-output model specifically for the fish and seafood sector. This model estimates the economic impact of seafood products as they move along the supply chain from resource extraction to to the processing plant, to the distributor and lastly to the grocery store and restaurant. Model estimates are produced at the state level, as well as at the national level.

33. The multipliers are simply multiplied by the output value to obtain the sector's (direct and indirect) impact.

Other models, such as the computable general equilibrium model (CGEM) and integrated econometric input-output (EC+IO) models, are also used to estimate economic impacts in the fishing sector (Seung & Waters, 2006a). However, for the purpose of this study, these models cannot be used to estimate the expected effects. On the one hand, in addition to the complexity of its modelling and its cost, the CGEM does not precisely differentiate the effect of a spending shock in the economy by industry sector (Decaluwé et al., 2001). On the other hand, EC+IO models, which are a combination of input-output and econometric models, require estimation from an econometric model that uses data on several individuals or over several years, resulting in a considerable amount of time to develop such a model.[34]

Therefore, the choice of model depends more on the available data and the objectives of the modelling (Vollet, 2013). For this project, the objective in analyzing the contribution of the fishing and mariculture sector in the Magdalen Islands is to estimate the direct, indirect and induced economic benefits. To that end, the Québec input-output model, developed by the Institut de la statistique du Québec, and the input-output multipliers, developed by Statistics Canada, are the most appropriate method for estimating these economic benefits in the commercial fishing, mariculture, and fish and seafood processing sectors. Unlike input output multipliers, the Québec input-output model makes it possible to estimate several economic benefit components in terms of value added and indirect taxes[35] net of subsidies at a very detailed level (excluding induced effects).

These two models are based on the 2017 input-output tables of the Quebec economy produced by Statistics Canada. These tables, in matrix form, represent the quantity of goods and services that each sector of the Quebec economy buys and sells from each of the other sectors of the province's economy in a year (Institut de la statistique du Québec, 2021).

34. The advantages and disadvantages of each of these methods are discussed by Loveridge (2004), Radtke et al. (2004) and Fouqueray (2016).

35. The Québec input-output model is used to estimate provincial taxes (QST, specific taxes: environment, tobacco, entertainment, etc.) and federal taxes (GST, excise taxes and duties).

Table 4-1. **Literature Review of the Contribution to GDP, Labour Income and Employment of the Commercial Fishing, Aquaculture, and Fish and Seafood Processing Sectors**

Authors	Model	Country (area)	Sector(s)/Industry(ies)	Reference Year	Results								
					Contribution to GDP ($M)			Income from Work ($M)			Jobs		
						Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Michaud et al. (2002)	Input-output	Canada (Quebec)	Commercial fishing	1998	68	40*	108	41	36*	77	1,229	302*	1,531
			Processing		67	70*	137	34	52*	86	2,068	772*	2,840
		Canada (Magdalen Islands)	Commercial fishing	1998	17	-	-	10	-	-	308	-	-
			Processing		15	-	-	8	-	-	464	-	-
Canmac Economics Ltd. et al. (2002)	Input-output	Canada (Prince Edward Island)	Commercial fishing	Average 1997-1999	-	-	59	-	-	59	-	-	2,173
			Processing		-	-	175	-	-	127	-	-	5,262
			Aquaculture		-	-	13	,	,	7	-	-	283
Newfoundland and Labrador Government, Economics and Statistics Branch (2005)	Input-output	Canada (Newfoundland and Labrador)	Commercial fishing	Average 2001-2004	249	163*	412	197	113*	310	7,800	4,821*	12,621
			Processing		203	300*	503	180	232*	412	7,002	5,298*	12,300
(Seung & Waters, 2006b)	SAM	United States (Alaska)	Commercial fishing	1998	-	-	-	6	11*	17	1,432	416*	1,848
			Processing		-	-	-	1	1*	2	237	77*	314
GSGislason & Associates Ltd et al. (2007)	Input-output	Canada (British Columbia)	Fish, seafood	2005	790	510*	1300	475	340*	815	12,900	8,670*	21,570
Pinfold (2009a)	Input-output	Canada	Commercial fishing	2006	930	221	1,453	624	120	957	10,098	3,416	16,961
			Processing		932	566	1,796	651	214	1,044	22,983	2,936	31,544
			Aquaculture		289	205	635	122	102	295	4,173	7,863	14,048
		Atlantic Canada	Commercial fishing	2006	786	170	1,192	541	88	802	9,621	2,758	15,487
			Processing		713	479	1,415	527	175	841	18,606	6,906	30,028
			Aquaculture		174	76	308	71	38	139	2,511	1,194	4,662
Pinfold (2009b)	Input-output	Canada (Gulf of St. Lawrence)	Commercial fishing	2006	228	49	346	157	25	233	2,790	800	4,491
			Processing		207	139	410	153	51	244	5,396	107	420
			Aquaculture		16	7	28	6	3	12	226	2,003	8,708
Gardner et al. (2009)	Input-output	Canada (Nova Scotia)	Commercial fishing	2006	332	204*	536	232	125*	357	3,462	3,659*	7,121
			Processing		175	402*	577	135	258*	393	3,710	6,255*	9,965
			Aquaculture		20	14*	34	9	9*	18	288	228*	516
Gardner et al. (2010)	Input-output	Canada (New Brunswick)	Commercial fishing	2008	111	44*	155	71	28*	99	1,682	701	2,383
			Processing		165	60*	225	116	38*	154	3,671	1,176	4,847
			Aquaculture		62	53*	115	26	28*	54	916	913	1,829
Dyck & Sumaila (2010)**	Input-output	Africa	Fish, seafood	2003	-	-	6	-	-	1	-	-	-
		Asia			-	-	133	-	-	35	-	-	-
		Europe			-	-	36	-	-	9	-	-	-
		Latin America			-	-	15	-	-	4	-	-	-
		North America			-	-	29	-	-	10	-	-	-
		Oceania			-	-	17	-	-	4	-	-	-
Vega et al. (2014)	Agri-food SAM	Europe (Ireland)	Processing	2005	-	-	340	-	-	-	-	-	874
Grealis et al. (2017)	Input-output	Europe (Ireland)	Processing	2010	117	26	143	-	-	-	476	328	805
			Aquaculture		71	29	100	-	-	-	552	208	760
National Marine Fisheries Service (2018)	FEAM	United States	Fish, seafood	2016	-	-	60,758	-	-	39,905	-	-	1,270,141
		California			-	-	8,141	-	-	4,912	-	-	124,803
		Florida			-	-	5,659	-	-	3,172	-	-	76,749
		Washington			-	-	3,048	-	-	2,004	-	-	55,325
		Massachusetts			-	-	3,045	-	-	1,999	-	-	87,201
		Alaska			-	-	2,074	-	-	1,654	-	-	47,151
		New Jersey			-	-	2,282	-	-	1,413	-	-	37,127
		New York			-	-	1,567	-	-	950	-	-	33,081
		Maine			-	-	1,236	-	-	856	-	-	41,960
		Louisiana			-	-	1,023	-	-	752	-	-	36,102
		Texas			-	-	899	-	-	597	-	-	21,507
		Other***			-	-	31,784	-	-	21,596	-	-	709,135
Ganter et al. (2021)	Input-output	Canada	Commercial fishing	2018	2,275	1,180*	3,455	-	-	-	11,431	7,600	23,420
			Processing		1,236	1,530*	2,765	-	-	-	16,489	8,548	30,713
			Aquaculture		687	725*	1,412	-	-	-	3,750	5,140	10,863

SAM = Social Accounting Matrix; FEAM = Fisheries Economic Assessment Models.

The results of the economic benefit in Canada, the United States and Europe are expressed in Canadian dollars, US dollars and euros, respectively.

Total effects may sometimes include induced effects.

*Includes induced effects.

**Results are expressed in US$millions.

***Virginia, Oregon, New Hampshire, Georgia, Maryland, Rhode Island, North Carolina, Hawaii, Alabama, Mississippi, Connecticut, South Carolina, Delaware

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), compiled from literature review.

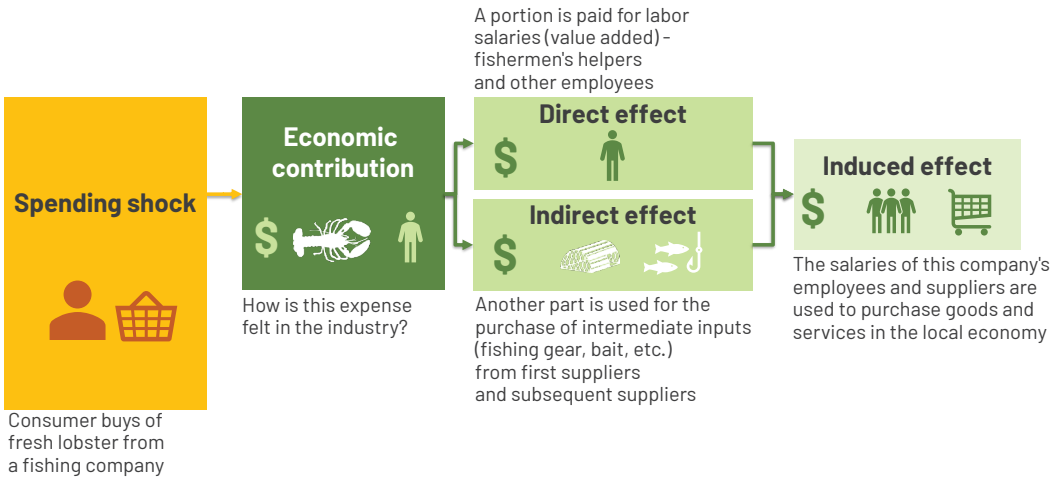
4.2. Methodology

4.2.1. Concept of economic benefits

The concept of economic benefits is relatively simple: any expenditure by an economic agent to make a purchase from a business helps stimulate the economy. For example, suppose a consumer buys fresh lobster from a fishing company. How does that spending stimulate the economy? First, some of the money will be used to pay the company's employees, in this case, the fisher helpers and possibly the skipper-owner. Second, another portion of the money will be used to purchase intermediate inputs (fuel, fishing gear, bait, ice and salt, etc.) from other companies, known as first-tier suppliers. The money spent by the company to make purchases from first-tier suppliers will help stimulate the first-tier suppliers' activities. In turn, the first-tier suppliers may also make purchases from subsequent suppliers, which will stimulate their activities.

This iterative process transforms the initial expenditure into successive rounds of expenditures and revenues until the initial demand is completely met (Institut de la Statistique du Québec, 2021). Thus, the initial spending shock in the economy will stimulate several economic sectors. All of the economic gains resulting from the initial expenditure are economic benefits (Figure 4 1).

Figure 4-1. **Illustration of the Concept of Economic Benefits Using the Example of a Consumer Purchasing Fresh Lobster from a Fishing Company**



Source: DFO, Strategic Services, Quebec Region, figure adapted from the Institut de la Statistique du Québec (2021).

In 2019, the combined output of the fishing and mariculture sector was valued at over $238.3 million. In addition, the expenditures of institutions in the Islands with a mandate directly related to fishery resources harvesting and production activities amounted to $3.9 million.

The iterative process is not indefinite, since the initial amount of money injected, which kicked off the process, diminishes with each round of spending because of imports and household savings. Imports and savings are regarded as system leaks that are not captured by the production process.

The economic benefits of the fishing and mariculture sector in the Magdalen Islands are measured using the ISQ's Québec input-output model. This model is used in Quebec to estimate the economic impacts associated with the fishing and mariculture sector. Economic benefits are measured in terms of employment, value added (wages, etc.), government revenues and, more recently, GHG emissions.

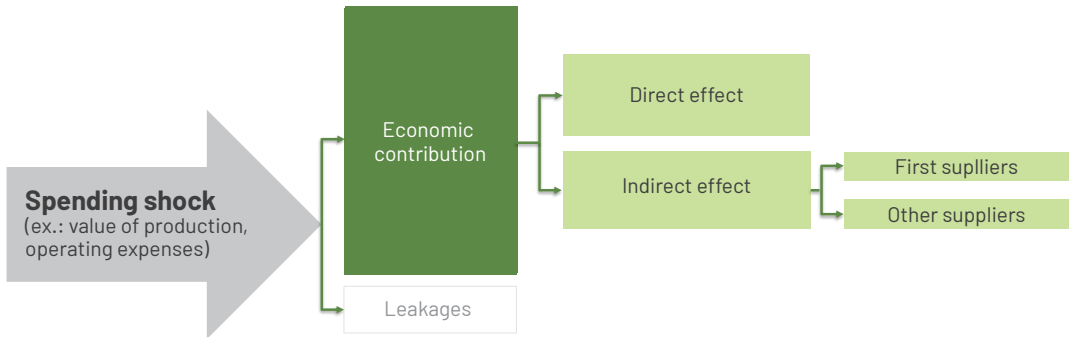
4.2.2. Québec input-output model: Measuring direct and indirect effects

Once the shock for a sector is specified, the Québec input-output model measures the economic impact by determining how the demand for products is distributed between the production sectors that are directly and indirectly involved. The iterative process that forms the basis of the model is used to break down the impact of the initial expenditure into direct and indirect effects. The direct benefits of an expenditure are those felt directly in the industry making the expenditure. In the case of this study, the direct effects are perceived by the Magdalen Islands fishing and mariculture sector. The indirect effects are generated by the fishing and mariculture sector's purchase of goods and services from first-tier suppliers (fuel, fishing gear, etc.) and then by the first-tier suppliers' purchases from other suppliers or subsequent suppliers (Figure 4 2).

Like any impact analysis tool, the Québec input-output model relies on some basic assumptions:

- First, it is a static, linear model, which means that it is more appropriate for short term marginal estimates.
- Second, since it is based on the input-output tables for the Quebec economy, the intersectoral relationships and market shares are fixed and independent of the activity sectors' level of production.
- Third, the model does not factor in the concepts of economies of scale, resource scarcity and substitution between production inputs. For example, the model does not consider the fact that a labour shortage may result in higher wages.

Figure 4-2. **Types of effects estimated by the ISQ's Québec input-output model**



Source: DFO, Strategic Services, Quebec Region, figure adapted from the Institut de la Statistique du Québec (2021).

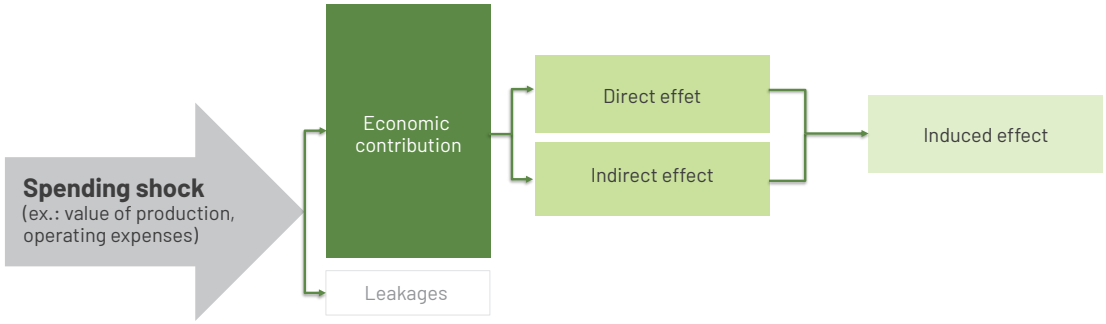
4.2.3. Provincial input-output multipliers: induced effects

The simulated direct and indirect economic benefits from an initial expenditure will generate jobs and wages. A portion of the wages will be injected into the economy to purchase various goods and services (clothing, food, entertainment, daycare, hospitals, etc.). The employment and wage benefits generated from this injection of money are known as induced effects (Figure 4 3).

The induced effects are estimated using Statistics Canada's provincial input-output multipliers. Their results are presented separately from the direct and indirect effects estimated using the ISQ's Québec input-output model.

Moreover, the basic assumptions used in the provincial multipliers also apply to the Québec input-output model, since it is an input-output model.

Figure 4-3. Types of Effects Estimated by Statistics Canada's Provincial Input-Output Multipliers



Source: DFO, Strategic Services, Quebec Region, figure adapted from the Institut de la Statistique du Québec (2021).

4.2.4. Types of estimated economic indicators

Direct and indirect economic benefits in the Québec input-output model are based on employment, value added, revenues of the two levels of government and parafiscal taxes and, more recently, GHG emissions.

Leakages, which do not generate economic activity in the region under consideration, are broken down by the intersectoral model as imports and inventory withdrawals (Textbox 1).

Employment

Employment is an outcome that is often highlighted in economic impact studies. The Québec input-output model estimates employment in full-time equivalents (FTEs) or "person-years." An FTE is a measurement of labour equal to the number of hours normally worked in a year by employees in the sector concerned. It includes all employment statuses (full-time, part time, casual, etc.).

Value added

Value added is the amount by which the value of an article is increased by a producer at each stage of the article's production, to satisfy demand. In the Québec input-output model, value added is obtained by adding up input compensation: wages and salaries before taxes, gross mixed income, and other gross income before taxes. This indicator is estimated before subtracting any deductions such as taxes and Employment Insurance.

Government revenues and parafiscal taxes

Government revenues consist of taxes on wages and salaries and indirect taxes (sales tax, specific taxes, excise taxes, customs duties). Corporate profit taxes or property taxes are not included in the calculations. Parafiscal taxes are the amounts paid by employees and employers to social security funds such as the Commission des normes, de l'équité et de la santé et de la sécurité du travail (CNESST), the Quebec Pension Plan (QPP) and Employment Insurance (EI).

GHG emissions

The Québec input-output model also produces estimates of greenhouse gas emissions (GHGs).[36] Many environmental impacts can be attributed to production activities. The externalities generated by those activities are not usually taken into account in economic impact studies. However, it is now essential to estimate environmental impacts, as sustainable development is becoming more of a priority for the public. This new addition to the Québec input-output model helps to quantify the environmental impact of initial expenditure by the fishing and mariculture industries and by federal and provincial institutions.

Québec input-output model versus provincial input-output multipliers

Provincial multipliers cannot estimate as many economic elements or indicators as the Québec input-output model (Appendix A-3). Input-output multipliers are used primarily to estimate economic benefits in the areas of value added, international imports and employment. Consequently, this study relies on input-output multipliers only to calculate induced economic benefits, since the Québec input-output model does not produce that type of estimate.

36. Gases that are naturally present in the Earth's atmosphere (CO_2 or carbon dioxide, CH_4 or methane, N_2O or nitrous oxide, O_3 or ozone) and help trap heat near the planet's surface. GHG emissions are measured in kilotons of CO_2 equivalent.

Textbox 1. Definitions of some economic indicators estimated by the Québec input-output model

- **Employment:** This includes both salaried jobs and self-employed workers. Self-employed workers are contractors who are sole proprietorships, such as a self-employed lawyer or a fisher (fisher-owner). Employment estimates are calculated in FTEs (an FTE is the number of hours normally worked by one person in a year in the sector concerned).
- **Value added (GDP):** Made up of three components, the sum of which corresponds to the value added at basic prices.
  - Wages and salaries before taxes: This is the gross compensation for employees. It includes various forms of compensation, such as tips, commissions, bonuses, vacation pay and sick leave. It is estimated as a gross amount before any deductions (taxes, parafiscal taxes and private and public pension funds).
  - Gross mixed income: This refers to the income of owners of unincorporated businesses (sole proprietorships). The term "mixed" refers to the fact that income includes both compensation for work performed by the owner and the income of the owner as a contractor.
  - Other gross income before taxes: Also known as "other operating surplus," this includes corporation and business income (except for unincorporated businesses), return on capital (amortization, depletion and depreciation of material and buildings), miscellaneous interest, and other expenses (employer costs, employee benefits, etc.).
- **Indirect taxes:** Payments to governments in the form of taxes:
  - Quebec sales tax (QST)
  - Federal sales tax (GST)
  - Federal excise taxes and
  - Specific Quebec taxes such as the accommodation tax, the tobacco tax, and property and capital taxes.
- **Subsidies:** Amounts paid to businesses by governments that include product subsidies, payable per unit good or service, and production subsidies, allocated for such things as job creation or training.
- **Leakages:** Spending that does not generate economic activity for the province during the reference period.
  - Imports: Amounts paid for goods and services purchased from abroad, including international imports and imports from other Canadian provinces.
  - Other outputs: Decrease in or withdrawal from inventory. These expenditures are considered to be leakages since they are not part of output for the reference period.

Source: DFO, Strategic Services, Quebec Region, compiled from the Institut de la Statistique du Québec (2021).

4.2.5. Interpretation of results

In any economic benefit study, the sum of the direct and indirect benefits is less than the initial expenditure because of system leakages. Hence, when the results of economic benefit studies are interpreted, the sum of the direct and indirect benefits should be considered to be a conservative estimate of the total benefits.

With the addition of induced benefits, that figure should be seen as an optimistic estimate of the total benefits. However, household consumption can be affected by many external factors that cannot be captured in economic models. For example, a worker at the beginning of their career may not have the same spending pattern as a worker approaching retirement. For that reason, it is best to consider the sum of direct, indirect and induced benefits as an optimistic estimate of total economic benefits.

4.2.6. Methodological limitations

The estimates generated by the Québec input-output model and the provincial input-output multipliers represent economic benefits for Quebec as a whole because the models are unable to produce regional estimates. In theory, then, the results of this study should be interpreted as the economic benefits of the Magdalen Islands fishing and mariculture sector for the Quebec economy as a whole. This methodological approach is realistic in a context where the structure of the Magdalen Islands fishing and mariculture sector is representative of the structure of the sector for all of maritime Quebec. However, given that the area studied consists of islands, the direct benefits can be almost entirely attributed to the archipelago's economy. It is quite possible that the Islands also reap many of the indirect and induced benefits, particularly through the daily spending of fishing and mariculture sector employees on such things as food and clothing. However, the economic models used in this study do not provide any information about how much the indirect and induced benefits contribute to the economy of the Magdalen Islands.

4.3. Baseline data for the study

4.3.1. Simulated industries and institutions

The objective of this study is to simulate the economic benefits of a spending shock for three key producing industries in the Magdalen Islands fishing and mariculture sector: commercial fishing, mariculture, and fish and seafood processing. This study also simulates the economic benefits of the services provided by federal and provincial institutions in the Magdalen Islands whose mandate is directly related to fishery resources management, conservation and research.[37]

Five economic benefit simulations were produced using the Québec input-output model and the input-output multipliers. The simulations were based on the North American Industry Classification System (NAICS). The benefits are estimated according to the average Quebec structure of the NAICS code (Table 4 2).

37. The economic benefits of recreational fishing could not be estimated since it is not a producing industry. Recreational fishing involves a range of industries associated with recreation and tourism activities, such as retail trade, accommodation, and entertainment and leisure services.

Table 4-2. **Definition of Industries Used for the Benefit Simulations**

Industry	NAICS code[1]	Description of sectors (in the ISQ's 2015 nomenclature)
Commercial fishing	114000	Fishing, hunting and trapping
Mariculture	112500	Aquaculture
Fish and seafood processing	311700	Seafood product preparation and packaging
Federal government services	GS911A	Other federal government services
Provincial government services	GS9120	Other provincial government services

Source: DFO, Strategic Services, Quebec Region, compilation based on Statistics Canada's 2002 North American Industry Classification System.

In some cases, the NAICS code is more aggregated than the industry for which the economic benefit is being estimated. That is the case for the mariculture industry, which appears under NAICS code 112500, "Aquaculture." This code includes both fish farming (freshwater farming) and mariculture (sea farming). Mariculture activities are scattered across the maritime areas of Quebec (Magdalen Islands, Gaspé Peninsula, Lower St. Lawrence and North Shore), while fish farming activities tend to be concentrated in the Estrie, Chaudière-Appalaches, Lower St. Lawrence and Laurentian regions (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, n. d.). For the Magdalen Islands, the mariculture results are an acceptable representation of the nature of the industry in order to be able to estimate the related direct, indirect and induced economic benefits.

Recreational fishing, a significant activity in the Magdalen Islands, was not included in the calculation of economic benefits because it is not an industry codified by the NAICS. Since recreational fishing is more of a recreation and tourism activity, unlike the commercial fishing and mariculture industries considered in this study, it cannot be assigned a production value.

4.3.2. Baseline data for the study

The 2019 value of production was used to run simulations of economic benefits for the three key industries—commercial fishing, mariculture, and fish and seafood processing—and for federal and provincial institutions. For the simulated industries, the value of production equals operating expenses. Those expenses consist mainly of purchases of inputs (oil and coal products, financial services, textile products, etc.) and remuneration of production factors (wages, return on capital). The breakdown of operating expenses associated with the activities of the key industries and federal and provincial institutions in the Magdalen Islands fishing and mariculture sector is provided in Appendices A- 4 to A- 8.

Simulated industry data

The total value of production for the Magdalen Islands commercial fishing, mariculture, and fish and seafood processing industries in 2019 was $238.3 million (Table 4 3).

Table 4-3. **Value of Production of the Commercial Fishing, Mariculture, and Fish and Seafood Processing Industries, Magdalen Islands, 2019**

Industry	Value of production or total expenditure
Commercial fishing	$118,208,519
Mariculture	$2,592,000
Fish and seafood processing	$117,489,681
Total of industries	**$238,290,199**

Source: DFO, Strategic Services, Quebec Region, compilation of data from the Quebec Department of Agriculture, Fisheries and Food (MAPAQ) and Statistics Canada.

For the commercial fishing industry, the economic benefits were simulated from the total value of landings by Magdalen Islands resident fishers in 2019, which was $118.2 million. This amount includes both landings made in the Islands and those made outside the archipelago by Magdalen Islands businesses. Landings in the Islands by non-resident fishers are not included in the calculation of economic benefits for the commercial fishing industry since the wages paid and the purchases of inputs almost entirely benefit the economy of a region other than the Magdalen Islands.

For the mariculture industry, the economic benefits are based on the 2019 mariculture value of production, which was $2.6 million.

For fish and seafood processing plants, the total value of production was $235.4 million in 2019. This amount includes fish and seafood bought by processing plants from Magdalen Islands fishers dockside ($115.9 million) and from other plants in the archipelago ($2.1 million). However, the value of fish bought for processing from these fishers and plants is already included in the calculation of the economic benefits of the commercial fishing industry. The value of this raw material must therefore be subtracted from the plants' total value of production n order to include only the value of production of this processing in the calculation of economic benefits. The fish and seafood bought by plants from non-resident fishers who landed their catches on the Islands, mainly crabbers from the Gaspé Peninsula, are included in the calculation of economic benefits. The value of raw material imports from other Canadian provinces and the United States is also factored in. After these adjustments, the simulated economic benefits for the processing industry are based on a production value of $117.5 million.[38]

Federal and provincial institutions in the Magdalen Islands

DFO, the Canadian Food Inspection Agency (CFIA), the Quebec Department of Agriculture, Fisheries and Food (MAPAQ) and Mérinov were identified as the federal and provincial institutions in the Magdalen Islands whose mandate is directly related to fishery resources management, conservation, protection and research. These four institutions were contacted directly to obtain data on expenditures directly related to the fishing and mariculture sector in the Islands in 2019. Provincial and federal operating expenses were $2.2 million and $1.7 million, respectively, for a total expenditure of $3.9 million (Table 4 4).

38. As the value-of-production data gathered from marine product dockside buyers (MPDBs) in the Magdalen Islands showed some anomalies/inconsistencies in sales and purchases, a methodology for estimating that value was developed. The methodology uses external data, including Statistics Canada's supply and use table, which is used to calculate the percentages of each component of the value of fish and seafood processing production for the Quebec Region. Then, the coefficient for 2019 is estimated from the three-year moving average to determine the 2019 value of production.

Table 4-4. **Operating Expenses of Provincial and Federal Institutions Whose Activities Are Directly Related to Fishery Resources, Magdalen Islands, 2019**

Institution	Operating expenses
Provincial institutions	**$2,227,353**
MAPAQ	$928,182
Mérinov	$1,299,171
Federal institutions	**$1, 716,186**
DFO	$1,550,086
CFIA	$166,100
Federal and provincial institutions total	**$3,943,539**

Source: Source: DFO, Strategic Services, Quebec Region, compilation of data from MAPAQ, Mérinov, DFO and CFIA.

The total value of production of the three key industries of the fishing and mariculture sector in the Magdalen Islands, as well as the operating expenses of federal and provincial services whose mandate is directly related to fisheries resources, amounted to $242.2M for 2019. The commercial fishing and fish and seafood processing industries each accounted for nearly 49% of the value of production for the entire sector. Mariculture, on the other hand, accounts for just over one percent of this value. For provincial and federal services, operating expenses account for less than one percent of the value of production for the entire sector.

4.4. Economic benefit results

In this section, the initial expenditure for each industry (commercial fishing, fish and seafood processing, mariculture) and institution (federal and provincial) is first broken down into wages and intermediate inputs. Next, the benefits for the Magdalen Islands economy are presented in terms of employment and value added. Benefits to governments are provided in terms of government revenues and parafiscal taxes. Lastly, one of the innovations of the Québec input-output model is to estimate the impact that the activities of each industry or institution has on the environment in terms of GHGs.[39]

4.4.1. Commercial fishing

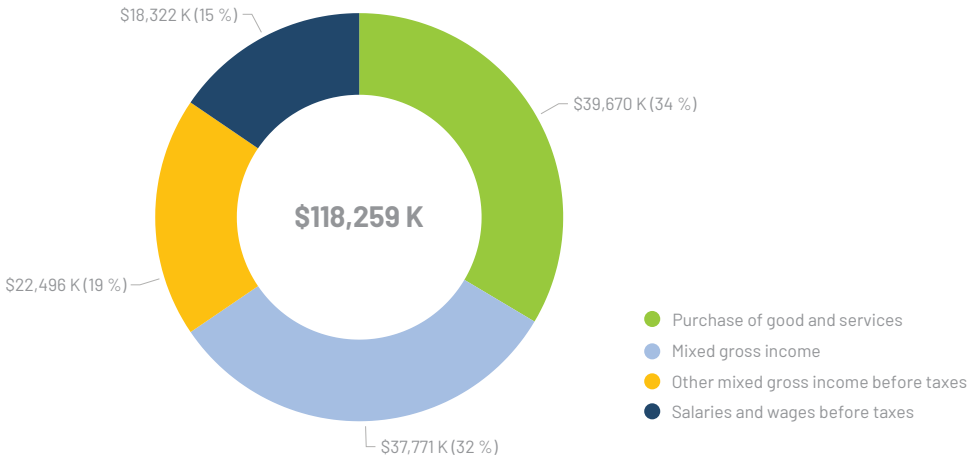
Breakdown of the initial expenditure

The breakdown of the commercial fishing industry's initial expenditure of $118.2 million shows that value added made up 66% of that total expenditure (Chart 4-1). A large portion consisted of wages and salaries (15%) and gross mixed income (32%). The latter includes the volume-based pay received by some fisher helpers. This indicates that the commercial fishing industry in the Magdalen Islands is very labour-intensive.

Intermediate input expenditures totalled $39.7 million in 2019. Petroleum and coal products (gasoline, diesel, etc.) made up about 26% of that amount and less than 9% of total expenses (see Appendix A-4).

39. Gases that are naturally present in Earth's atmosphere (CO_2 or carbon dioxide, CH_4 or methane, N_2O or nitrous oxide, O_3 or ozone) and help trap heat near the planet's surface. GHG emission flows are measured in kilotons of CO_2 equivalent.

Chart 4-1. **Breakdown of Initial Expenditure, Commercial Fishing, Magdalen Islands, 2019**



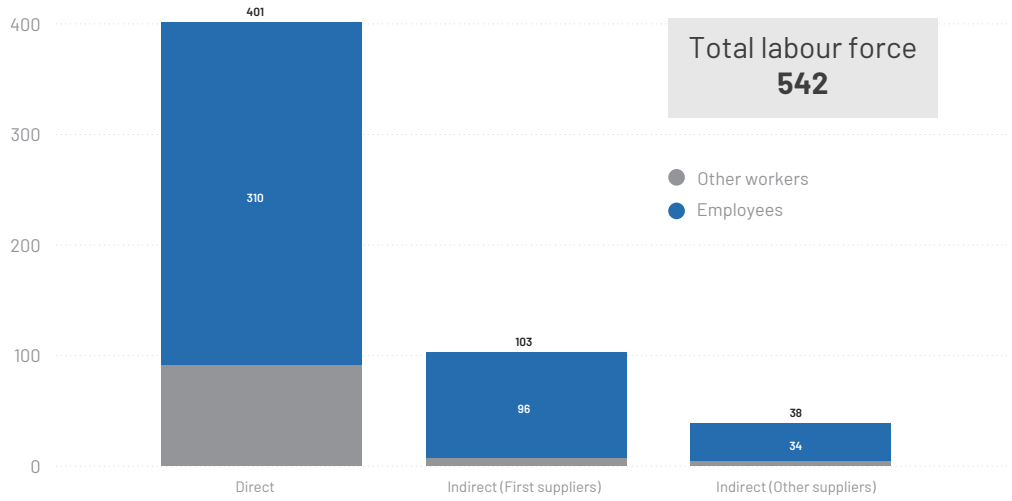
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec based on initial expenditure of $118.2 million in the commercial fishing industry.

Impact on employment

The $118.2-million value of production of the commercial fishing industry had direct and indirect benefits in the form of 542 FTE jobs. Of those, 401 (74%) were direct jobs, including 401 salaried employees (mostly fisher helpers) and 91 self-employed workers. Indirect employment associated with the industry's first-tier suppliers totalled 103 FTEs, accounting for 19% of estimated total employment (Chart 4 2).

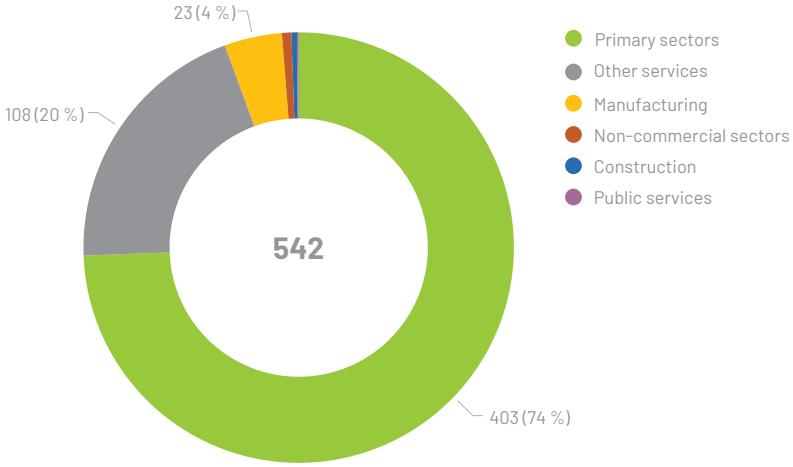
Most of the jobs generated in the commercial fishing industry, i.e., 403 FTE jobs (74%), were in the primary sectors. The services sector ranked second with 20% of the jobs generated by the industry, all of them indirect jobs (wholesale and retail trade, financial, scientific and administrative services, transportation and warehousing, etc.). The manufacturing sector also had 23 indirect jobs (4%) in the manufacturing of rubber and plastic products, machinery, computer and electronic products, metal products, etc. (Chart 4 3).

Chart 4-2. **Direct and Indirect Impact On Employment, Commercial Fishing, Magdalen Islands, 2019 (in person-years)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Chart 4-3. **Breakdown of Economic Impact on Employment by Sector, Magdalen Islands, 2019**

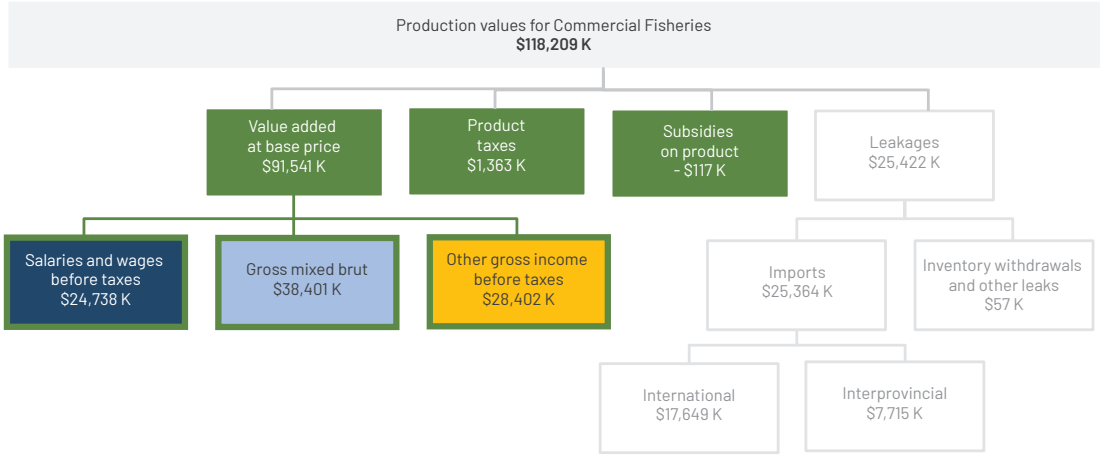


Source: DFO, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Economic impact

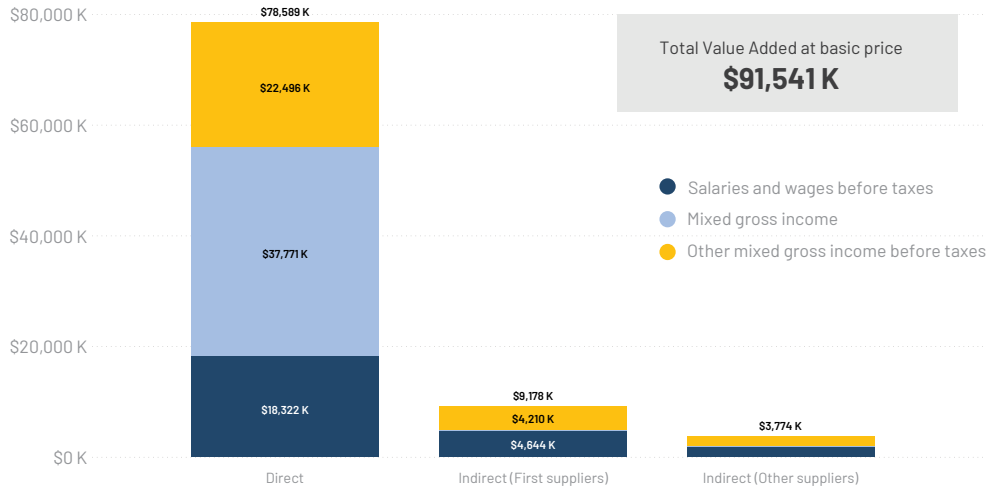
The total impact on value added associated with the commercial fishing industry's initial expenditure is estimated to be $91.5 million (Figure 4 4) or 77% of the initial amount ($118.2 million). Most of that value added came from direct effects, which are estimated at $78.6 million (Chart 4 5). A large portion of those direct effects consisted of gross mixed income of $37.8 million (32%) and wages and salaries before taxes of $18.3 million (15%). These indicators include the remuneration of some fisher helpers, which shows that the commercial fishing industry is labour-intensive. Other gross income before taxes amounted to $22.5 million, or 19% of the value of production, and consists of capital and interest to be repaid by skipper-owners (Chart 4-1).

Figure 4-4. **Total Economic Impact of a Spending Shock, Commercial Fishing, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

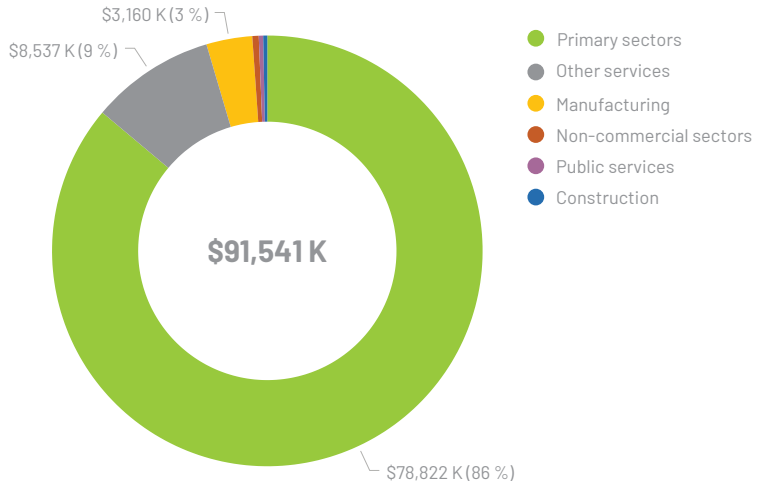
Chart 4-4. **Direct and Indirect Impact on Value Added, Commercial Fishing, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

The value-added effect was felt to some extent in all producing sectors of the economy, but mainly in the primary sectors (fishing, hunting and trapping, in particular). The value added associated with the primary sectors was estimated to be $78.8 million (86%), of which $78.6 million was direct value added. The indirect effects of the value added generated were highest in the "other services" sector (wholesale and retail trade, transportation and warehousing, etc.), at $8.5 million (9%), followed by the manufacturing sector, at $3.1 million (3%) (Chart 4-5).

Chart 4-5. Breakdown of the Economic Impact on Value Added by Sector, Commercial Fishing, Magdalen Islands, 2019 (in C$1,000s)



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Impact on government revenues and parafiscal taxes

The commercial fishing industry's expenditures had the following effects on Quebec government revenues: $2.3 million in taxes on wages and salaries, $34,000 in sales tax (QST) and $456,000 in specific taxes. Similarly, they generated the following revenues for the federal government: $1.5 million in taxes on wages and salaries, $36,000 in sales tax (GST), $660,000 in excise taxes and duties, and $178,000 in customs duties. Quebec and federal parafiscal taxes amounted to $5.1 million and $0.7 million, respectively (Table 4-5).

Table4-5. **Government Revenues and Parafiscal Taxes, Commercial Fishing, Magdalen Islands, 2019 (in C$1,000s)**

Tax revenues	Direct effects	Indirect effects		Total effects
		First-tier suppliers	Other suppliers	
Quebec government revenues	**2,145**	**487**	**205**	**2,837**
• Taxes on wages and salaries	1,791	396	161	2,347
• Sales taxes	–	20	14	34
• Specific taxes	354	72	30	456
Federal government revenues	**1,985**	**303**	**131**	**2,419**
• Taxes on wages and salaries	1,177	260	108	1,545
• Sales taxes	7	16	12	36
• Excise taxes and duties	631	20	9	660
• Customs duties	170	6	2	178
Local government revenues	**–**	**–**	**–**	**–**
• Municipal taxes[1]	–	–	–	–
Parafiscal taxes	**4,511**	**905**	**342**	**5,758**
• Quebec (QPP, HSF, CNESST, QPIP)	4,027	784	297	5,108
• Federal (Employment Insurance)	484	121	45	650
Total	**8,641**	**1,695**	**678**	**11,014**

Note: – Nil

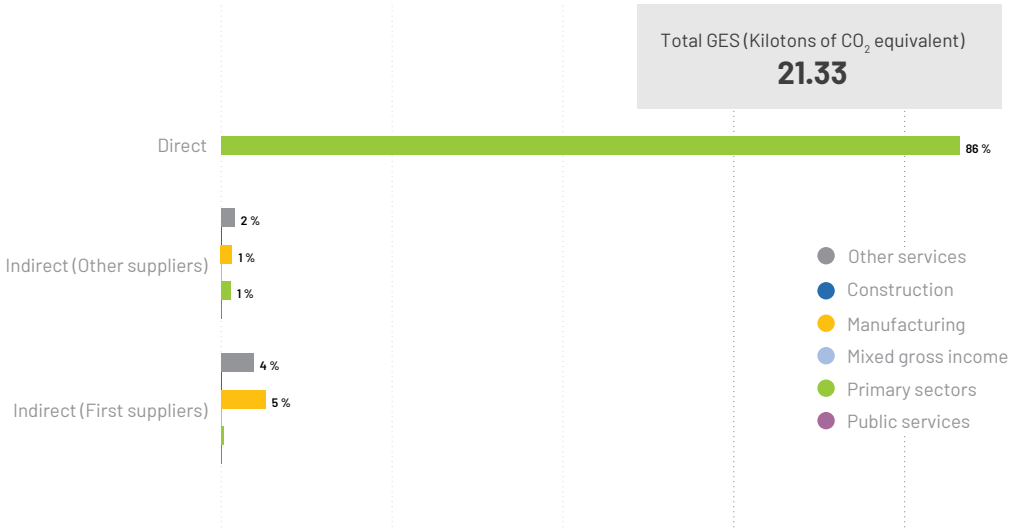
1: Local government revenues are the municipal taxes collected by cities in the form of transfer taxes. Only a simulation of final demand spending in the construction sector will generate a direct impact for this revenue category. Hence, the indirect impact will always be zero, as no municipal tax is levied on the producing sectors' purchases of intermediate inputs.

Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Environmental impact in terms of GHGs

The total impact on GHG emissions broken down by sector at the aggregate level is as follows: primary, 18.76 kilotons; utilities, 0.01 kilotons; construction, 0.01 kilotons; manufacturing, 1.39 kilotons; other services, 1.15 kilotons; and non-commercial, 0.01 kilotons. The total impact of 21.33 kilotons can also be broken down into percentages based on the respective contribution of the following sectors: primary, 88%; manufacturing, 7%; other services, 5%; and other sectors, less than 1% (Chart 4-6).

Chart 4-6. **Total Environmental Impact in Terms of GHG Emissions, by Sector, Commercial Fishing, Magdalen Islands, 2019**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

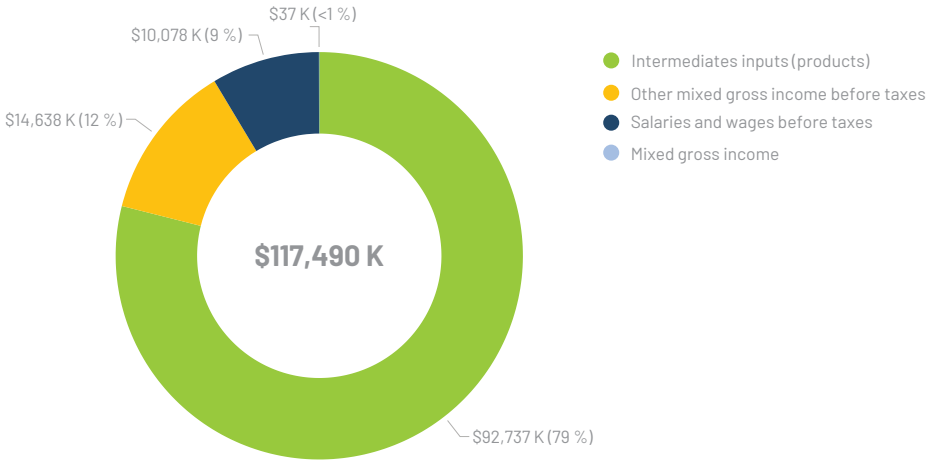
4.4.2. Fish and seafood processing

Breakdown of the initial expenditure

The bulk of initial spending in the fish and seafood processing industry was attributed to the purchase of intermediate inputs. Intermediate inputs accounted for 79% of total initial expenditures (Chart 4-7). Of this proportion, 74% of intermediate inputs came from fishery products (Appendix A- 6).

The fish and seafood processing industry's value added accounted for 21% of production expenditures and was proportionally much lower than the commercial fishing industry's value added. This indicates a more capital-intensive structure, as the amount spent on wages was 9% and other gross income, including profits, was 12%.

Chart 4-7. **Breakdown of Initial Expenditure, Fish and Seafood Processing, Magdalen Islands, 2019**



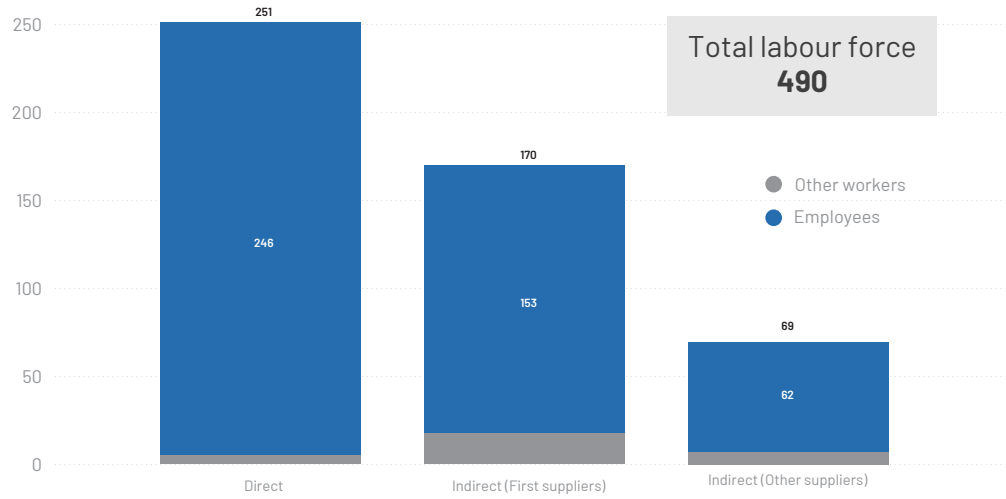
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Quebec, based on initial expenditure of $117.5 million in the fish and seafood processing industry.

Impact on employment

The $117.5-million value of production in the fish and seafood processing industry had direct and indirect benefits in the form of 490 FTE jobs. Of those, 251 (51%) were direct jobs,[40] including 246 salaried employees and 5 self-employed workers. Indirect employment associated with the industry's first-tier suppliers[41] totalled 170 FTEs, or 35% (Chart 4 8).

More than half of the total jobs generated by this industry were in the manufacturing sector (366 FTEs). The services sector ranked second with 29% of the jobs generated by the industry. This was followed by the primary sectors (12%) and non-commercial services (1%) (Chart 4 9).

Chart 4-8. **Direct and Indirect Impact on Employment, Fish and Seafood Processing, Magdalen Islands, 2019 (in person-years)**

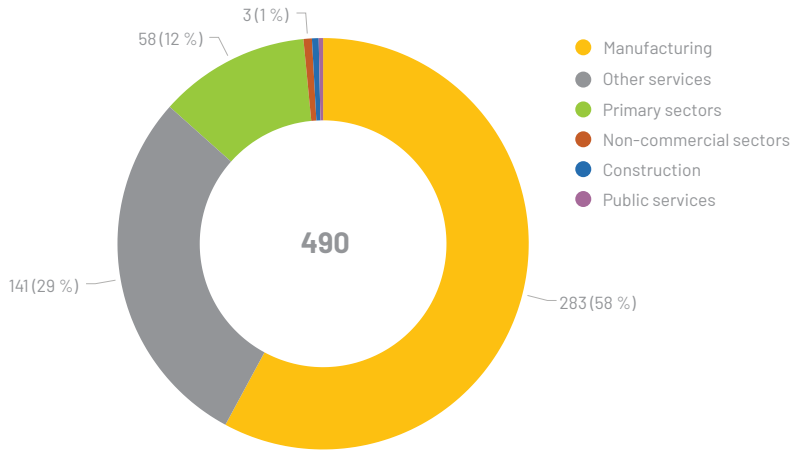


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

40. Primarily jobs in the food manufacturing subsector.

41. Most of the FTE jobs are in the following subsectors: fishing, hunting and trapping (49), wholesale and retail trade (56), transportation and warehousing (11), and financial services and insurance (8).

Chart 4-9. **Breakdown of Economic Impact on Employment by Sector, Fish and Seafood Processing, Magdalen Islands, 2019**

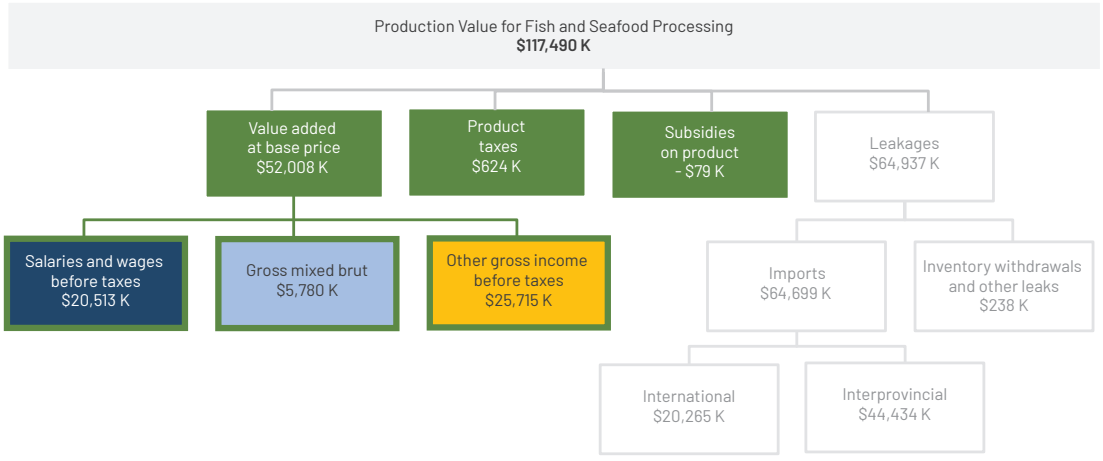


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Economic impact

The value added generated by the fish and seafood processing industry's $117.5 million initial expenditure was $52.0 million (Figure 4-5) or 44% of the initial expenditure. The direct value added associated with that amount was $24.8 million (21%), of which $10.1 million was paid in wages and salaries before taxes and $14.6 million in other gross income before taxes, including profits (Chart 4-10).

Figure 4-5. **Total Economic Impact of a Spending Shock, Fish and Seafood Processing, Magdalen Islands, 2019 (in C$1,000s)**



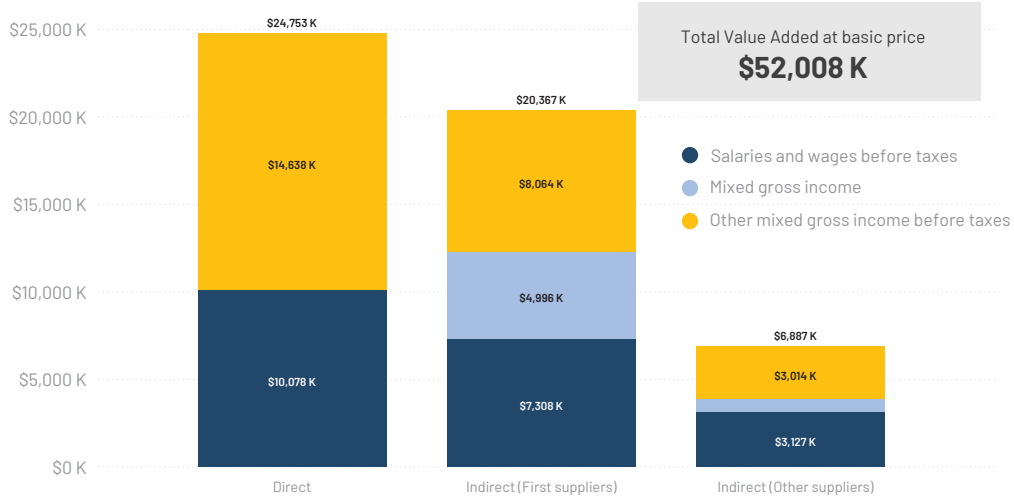
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Indirect value added, mostly associated with the industry's first-tier suppliers, accounted for a substantial $20.4 million (17%), which consisted of $7.3 million paid in wages and salaries before taxes, $8.1 million in other gross income before taxes, and $5.0 million in gross mixed income (Chart 4-10).

The majority of initial spending in the processing sector was attributed to the purchase of intermediate inputs. Intermediate inputs accounted for 79% of total initial spending, which indicates a more capital-intensive structure (Chart 4-7).

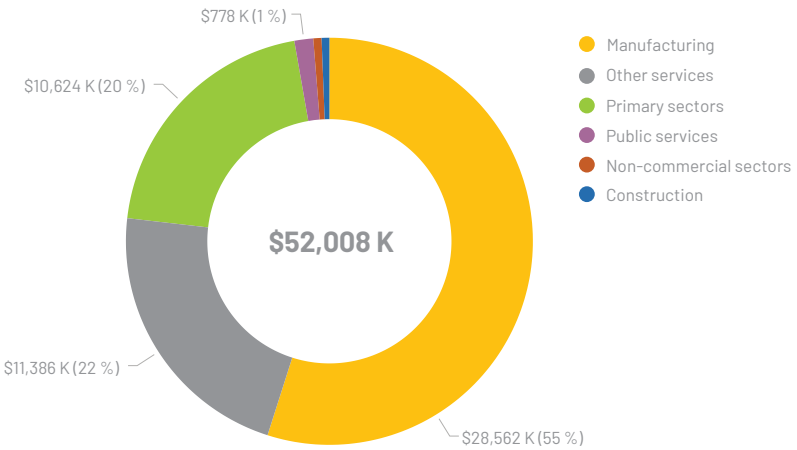
All producing sectors in the Quebec economy were affected. However, most of the value added, $28.6 million (55%), was generated in the manufacturing sector. Most of the indirect value added was generated in the "other services" sector, $11.4 million (22%), and in the primary sectors, $10.6 million (20%) (Chart 4-11).

Chart 4-10. **Direct and Indirect Impact on Value Added, Fish and Seafood Processing, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Chart 4-11. **Breakdown of Economic Impact on Value Added by Sector, Fish and Seafood Processing, Magdalen Islands, 2019 (in C$1,000s).**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Impact on government revenues and parafiscal taxes

The Magdalen Islands fish and seafood processing industry's expenditures generated $1.9 million and $1.3 million in revenues for the Quebec and federal governments, respectively. Quebec and federal parafiscal taxes amounted to $3.9 million and $0.6 million, respectively (Table 4-6).

Table 4-6. Government Revenues and Parafiscal Taxes, Fish and Seafood Processing, Magdalen Islands, 2019 (in C$1,000s)

Tax revenues	Direct effects	Indirect effects		Total effects
		First-tier suppliers	Other suppliers	
Quebec government revenues	**781**	**774**	**351**	**1,906**
• Taxes on wages and salaries	692	613	275	1,580
• Sales taxes	13	19	20	52
• Specific taxes	77	142	55	274
Federal government revenues	**547**	**547**	**226**	**1,320**
• Taxes on wages and salaries	443	397	183	1,022
• Sales taxes	6	18	18	41
• Excise taxes/duties	27	103	21	152
• Customs duties	70	29	5	105
Local government revenues	**–**	**–**	**–**	**–**
• Municipal taxes[1]	–	–	–	–
Parafiscal taxes	**2,226**	**1,607**	**619**	**4,452**
• Quebec (QPP, HSF, CNESST, QPIP)	1,936	1,409	538	3,883
• Federal (Employment Insurance)	290	198	81	569
Total	**3,554**	**2,928**	**1,196**	**7,678**

Note: – Nil

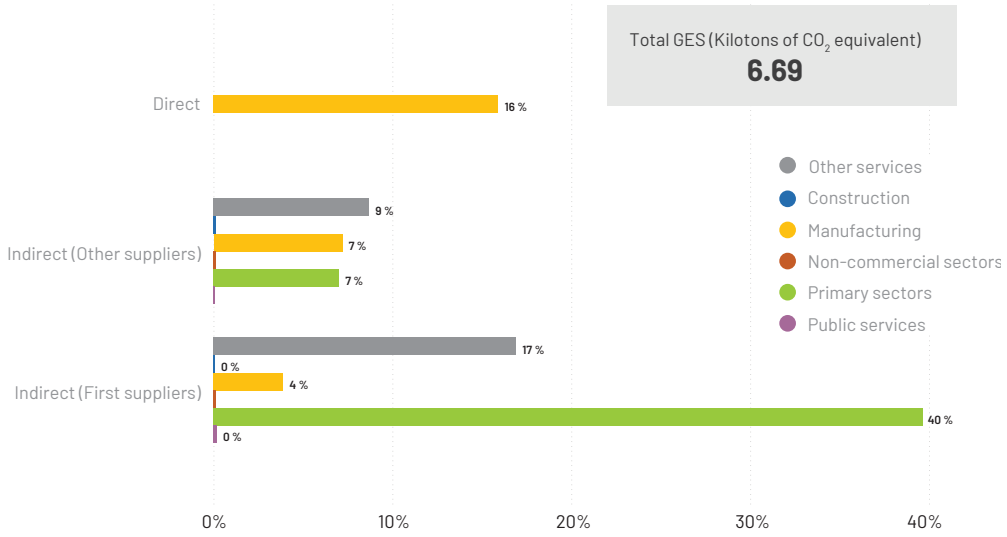
1: Local government revenues are the municipal taxes collected by cities in the form of transfer taxes. Only a simulation of final demand spending in the construction sector will generate a direct impact for this revenue category. Hence, the indirect impact will always be zero, as no municipal tax is levied on the producing sectors' purchases of intermediate inputs.

Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Environmental impact in terms of GHGs

The total impact on GHG emissions of the marine products processing sector was 6.69 kilotons and can be broken down into percentages based on the respective contributions of the following sectors: primary, 47%; manufacturing, 27%; and other services, 26% (Chart 4-12).

Chart 4-12. **Environmental Impact in Terms of GHG Emissions, by Sector, Fish and Seafood Processing, Magdalen Islands, 2019**



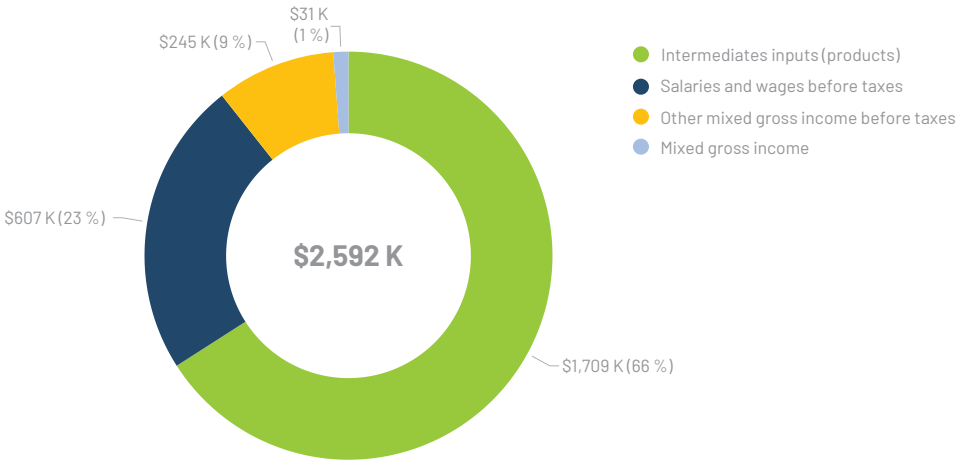
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

4.4.3. Mariculture

Breakdown of the initial expenditure

In contrast to the commercial fishing industry, intermediate inputs (fish and seafood, feed for other animals, natural gas, gasoline, diesel fuel, etc.) are a major expense in mariculture. In 2019, intermediate inputs totalled $1.7 million, or 66% of initial expenditure (Chart 4-13). Of that proportion, fruits, vegetables, feed and miscellaneous food products, and fishery products accounted for 50% and 13%, respectively (Appendix A-5).

Chart 4-13. **Breakdown of Initial Expenditure, Mariculture, Magdalen Islands, 2019**



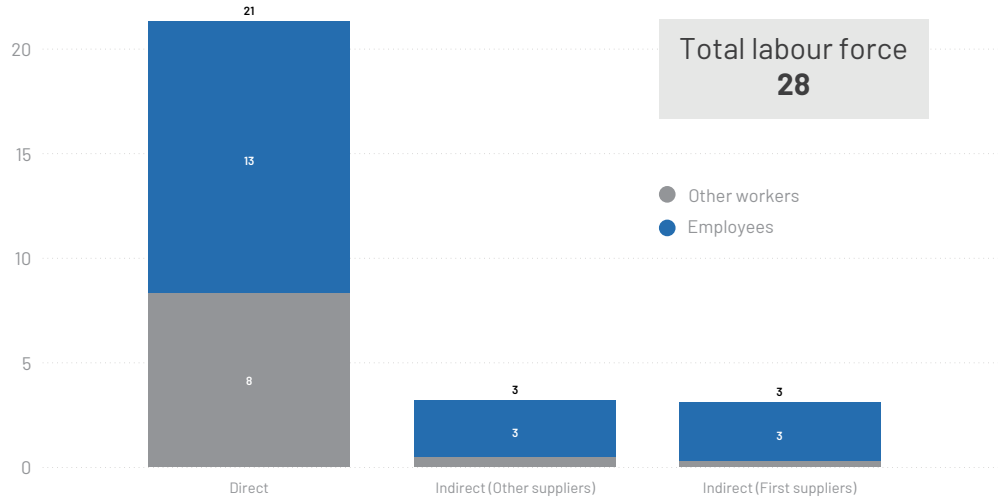
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure of $2.6 million in the mariculture industry.

Impact on employment

With a production value of $2.6 million in 2019, the mariculture industry supported a total of 28 FTE jobs. Of that number, 21 were direct jobs—i.e., they came directly from the mariculture industry—with 13 salaried employees and 8 self-employed workers. Six indirect jobs[42] were generated: three associated with first-tier suppliers and three with other suppliers (Chart 4 14).

The majority of the jobs generated were in the primary sectors[43] (82%), followed by other services[44] (12%), manufacturing[45] (5%), utilities, non-commercial services and construction (1%)(Chart 4 15).

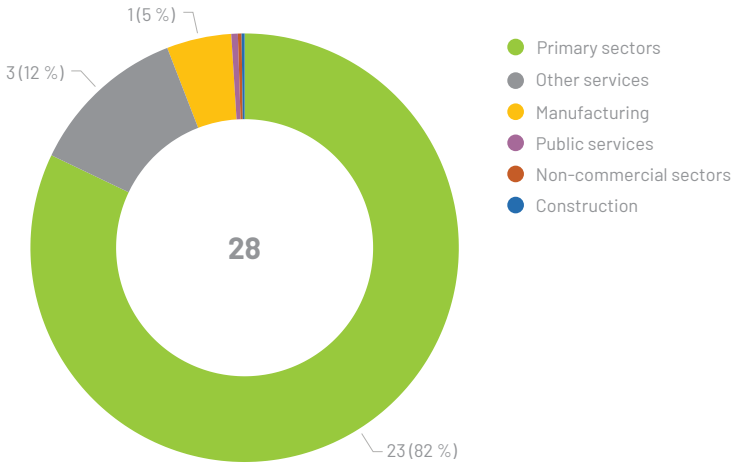
Chart 4-14. Direct and Indirect Impact on Employment, Mariculture, Magdalen Islands, 2019 (in person-years)



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

42. They were in wholesale and retail trade, transportation and warehousing, professional, scientific and technical services, financial and insurance services, food manufacturing, and crop and animal production.
43. Because the mariculture industry is part of the primary sector, it is not surprising that most of its jobs are in that sector.
44. Wholesale and retail trade, transportation and warehousing, professional, scientific and technical services, financial services and insurance.
45. Mainly food manufacturing.

Chart 4-15. **Breakdown of Economic Impact on Employment by Sector, Mariculture, Magdalen Islands, 2019**

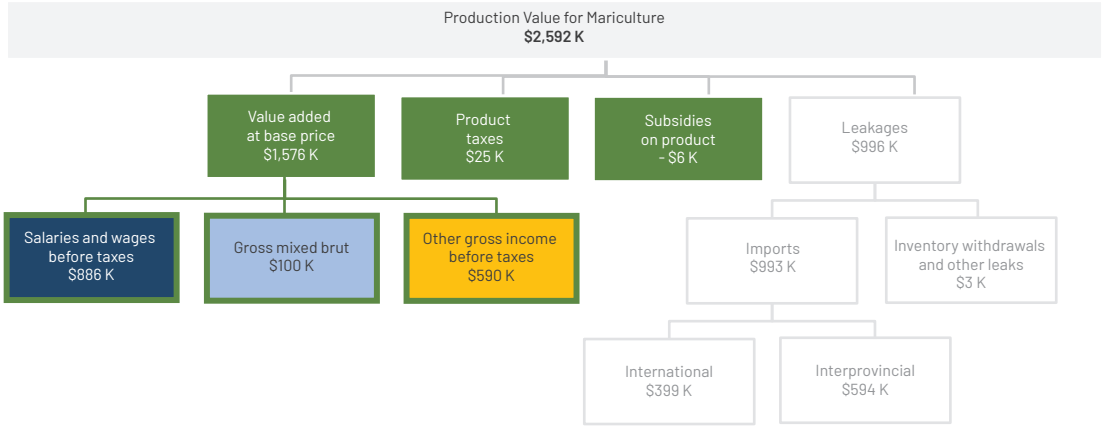


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Economic impact

The $2.6-million value of production in the mariculture industry generated $1.6 million (Figure 4-6) or 61% of that value. Of that amount, the direct value added was $883,000 or 34% of the industry's production value. Of that direct value added, $607,000 was paid in wages and salaries before taxes, $245,000 in other gross income before taxes, including profits, and $31,000 in gross mixed income (Chart 4-16).

Figure 4-6. **Total Economic Impact of a Spending Shock, Mariculture, Magdalen Islands, 2019**

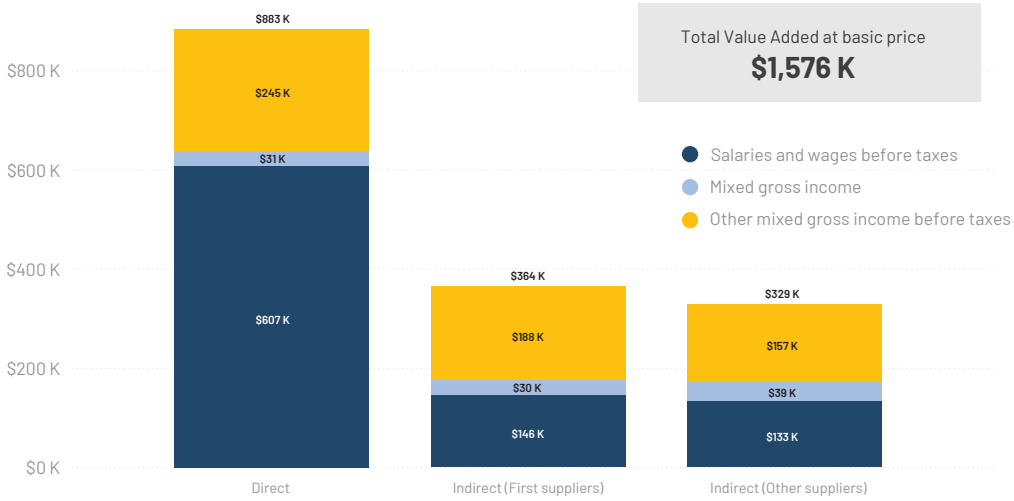


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Most initial spending in the mariculture industry went toward the purchase of intermediate inputs. Intermediate inputs accounted for 66% of total initial expenditure, which indicates a more capital-intensive structure (Chart 4-13).

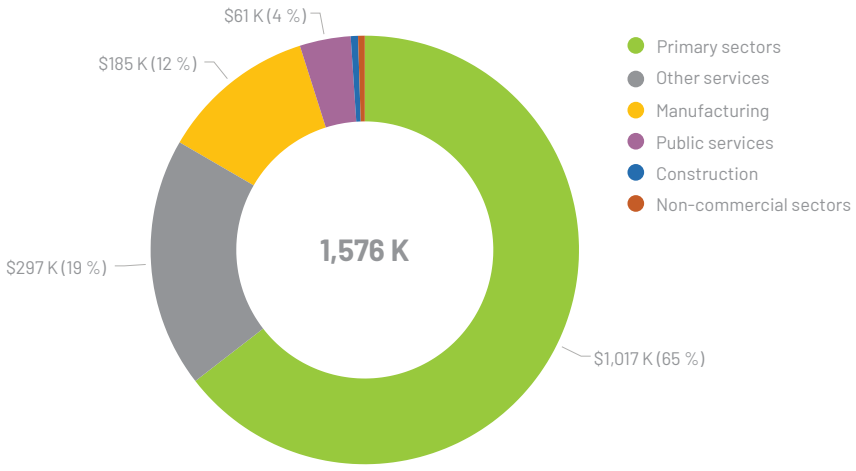
Most of the value added generated was in the primary sectors: $1,017,000 (65%). Indirect value added was generated in the other services sector, $297,000 (19%); manufacturing, $185,000 (12%); and utilities, $64,000 (4%)(Chart 4-17).

Chart 4-16. **Direct and Indirect Impact on Value Added, Mariculture, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Chart 4-17. **Breakdown of Economic Impact on Value Added by Sector, Mariculture, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Impact on government revenues and parafiscal taxes

Mariculture expenditures in the Magdalen Islands provided the Quebec and federal governments with total revenues of $86,000 and $59,000, respectively. Quebec and federal parafiscal taxes amounted to $178,000 and $24,000, respectively (Table 4-7).

Table 4-7. **Government Revenues and Parafiscal Taxes, Mariculture, Magdalen Islands, 2019 (in C$1,000s)**

Tax revenues	Direct effects	Indirect effects		Total effects
		First-tier suppliers	Other suppliers	
Quebec government revenues	**55**	**16**	**15**	**86**
• Taxes on wages and salaries	48	13	11	72
• Sales taxes	0	1	1	1
• Specific taxes	7	2	3	12
Federal government revenues	**40**	**11**	**9**	**59**
• Taxes on wages and salaries	31	9	8	47
• Sales taxes	0	1	1	1
• Excise taxes/duties	8	1	1	10
• Customs duties	0	0	0	1
Local government revenues	**–**	**–**	**–**	**–**
• Municipal taxes[1]	–	–	–	–
Parafiscal taxes	**147**	**29**	**26**	**202**
• Quebec (QPP, HSF, CNESST, QPIP)	130	26	23	178
• Federal (Employment Insurance)	17	4	3	24
Total	**241**	**56**	**50**	**347**

Note: – Nil

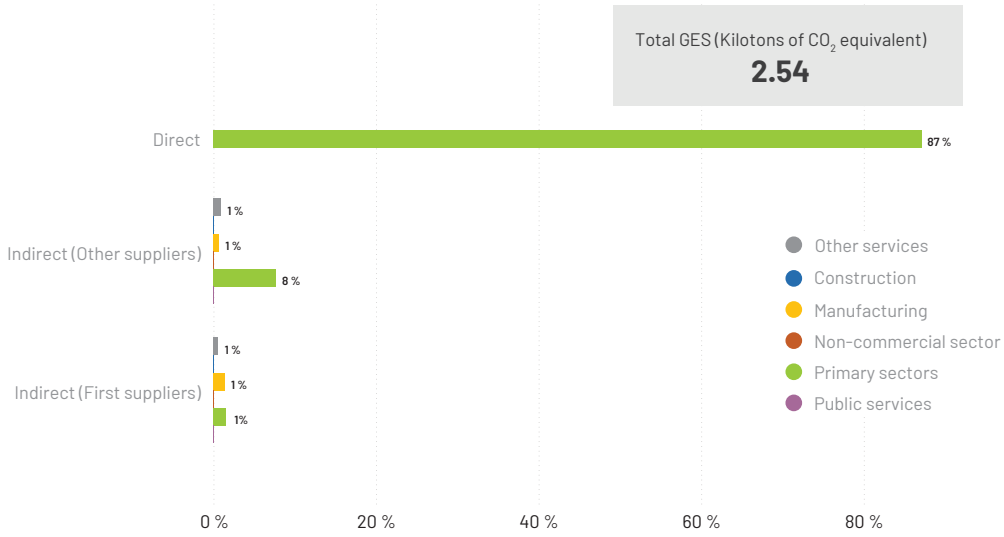
1: Local government revenues are the municipal taxes collected by cities in the form of transfer taxes. Only a simulation of final demand spending in the construction sector will generate a direct impact for this revenue category. Hence, the indirect impact will always be zero, as no municipal tax is levied on the producing sectors' purchases of intermediate inputs.

Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Environmental impact in terms of GHGs

The total impact on GHG emissions of the mariculture industry was 2.54 kilotons and can be broken down into percentages based on the respective contributions of the following sectors: primary, 96%; manufacturing, 2%; and other services, 2% (Chart 4-18).

Chart 4-18. **Environmental Impact in Terms of GHG Emissions, by Sector, Mariculture, Magdalen Islands, 2019**



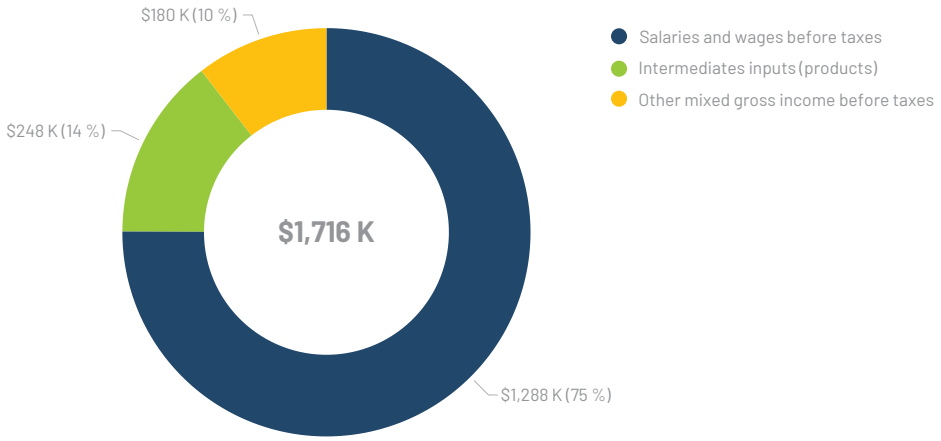
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

4.4.4. Federal government institutions

Breakdown of the initial expenditure

For federal institutions, wages and salaries made up the majority of spending and accounting for more than 75% of the total initial expenditure (Chart 4-19). The largest intermediate input purchases were made in professional and technical services, business services, construction and repairs, real estate, leasing and licensing, and chemicals and pharmaceuticals (Appendix A-7).

Chart 4-19. **Breakdown of Initial Expenditure, Federal Institutions, Magdalen Islands, 2019**

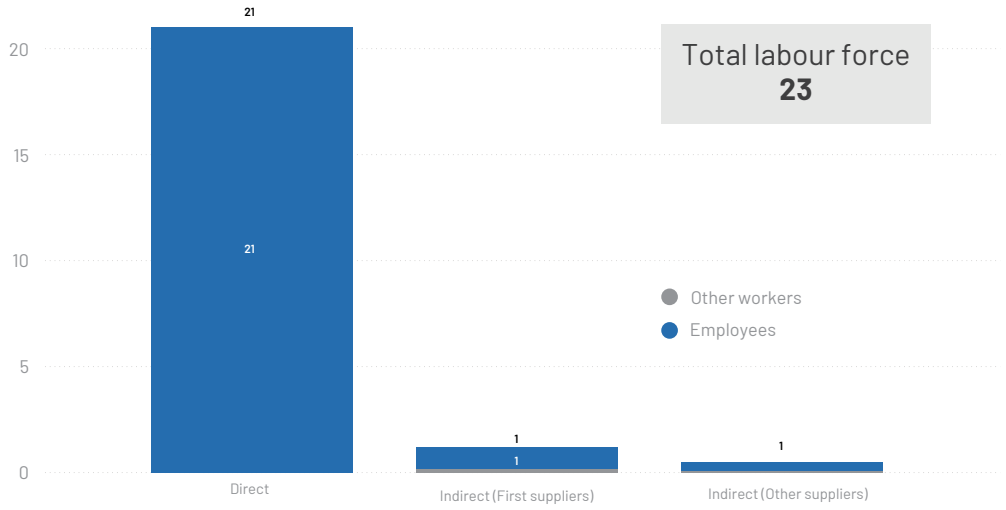


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure of $1.7 million by federal institutions whose activities are directly related to fishery resources.

Impact on employment

With total operating expenditures of $1.7 million, federal institutions with fishery-related mandates supported a total of 23 FTE jobs. Direct employment was estimated to be 21 FTEs. Indirect employment consisted of one FTE associated with first-tier suppliers and one FTE with subsequent suppliers (Chart 4-20).

Chart 4-20. Direct and Indirect Impact on Employment, Federal Institutions, Magdalen Islands, 2019 (in person-years)



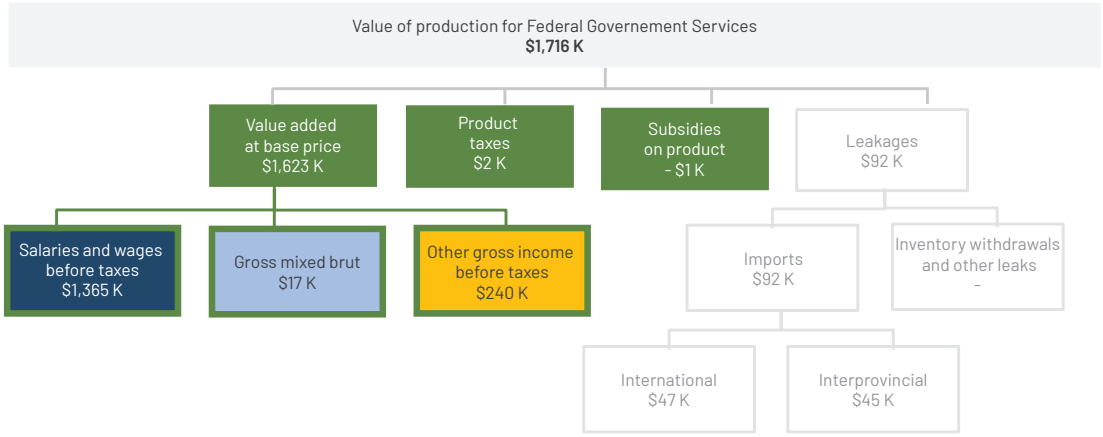
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Economic impact

The $1.7-million total operating expenditures of federal institutions with a mandate related to fisheries activities generated a total value added of $1.6 million, or 94% of operating expenditures (Figure 4-7).

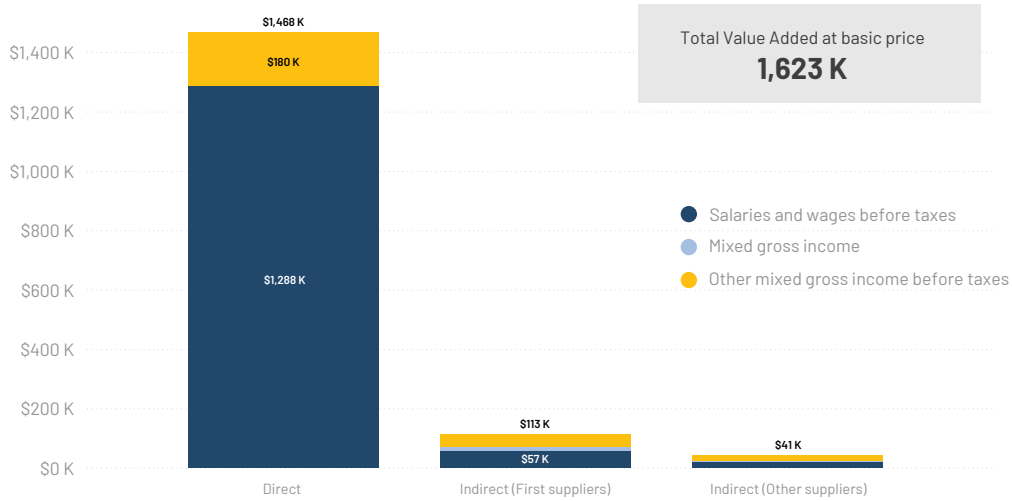
Most of this total value added came from direct effects: $1.5 million or more than 91%. A large portion of the total direct effects consisted of wages and salaries before taxes and other gross income before taxes: $1.3 million and $0.2 million, respectively. Indirect effects associated with first-tier suppliers amounted to $0.1 million (Chart 4-21).

Figure 4-7. **Total Economic Impact of a Spending Shock, Federal Institutions, Magdalen Islands, 2019**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Chart 4-21. **Direct and Indirect Impact on Value Added, Federal Institutions, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Impact on government revenues and parafiscal taxes

Salary and operating expenditures of federal institutions provided the Quebec and federal governments with total revenues of $137,000 and $93,000, respectively. Quebec and federal parafiscal taxes amounted to $222,000 and $35,000, respectively (Table 4-8).

Table 4-8. **Government Revenues and Parafiscal Taxes, Federal Institutions, 2019 (in C$1,000s)**

Tax revenues	Direct effects	Indirect effects		Total effects
		First-tier suppliers	Other suppliers	
Quebec government revenues	**129**	**6**	**2**	**137**
• Taxes on wages and salaries	129	5	2	136
• Sales taxes	–	0	0	1
• Specific taxes	0	0	0	1
Federal government revenues	**87**	**4**	**1**	**93**
• Taxes on wages and salaries	87	4	1	92
• Sales taxes	–	0	0	0
• Excise taxes/duties	0	0	0	0
• Customs duties	0	0	0	0
Local government revenues	**–**	**–**	**–**	**–**
• Municipal taxes1	–	–	–	–
Parafiscal taxes	**242**	**11**	**4**	**256**
• Quebec (QPP, HSF, CNESST, QPIP)	209	9	3	222
• Federal (Employment Insurance)	33	1	1	35
Total	**458**	**21**	**7**	**486**

Note: – Nil

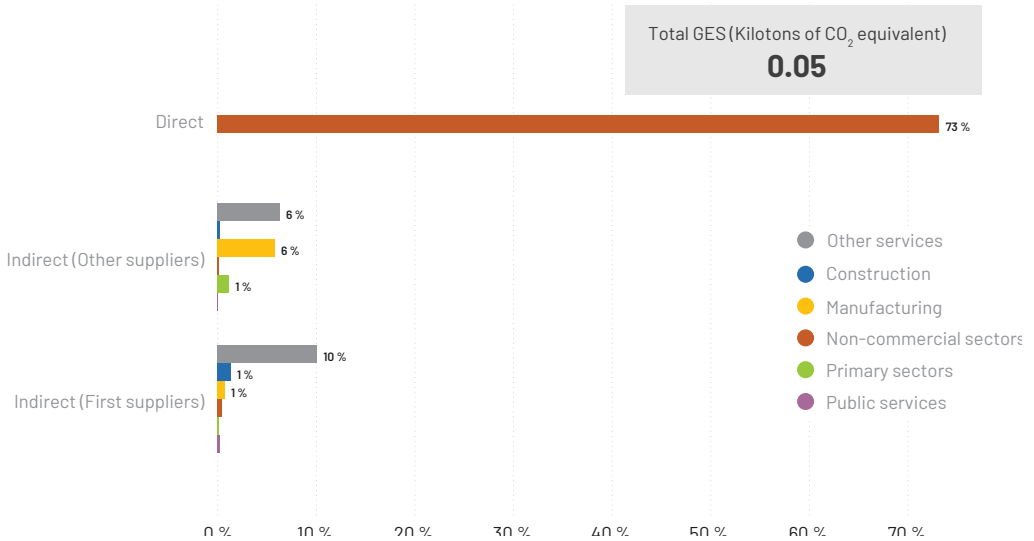
1: Local government revenues are the municipal taxes collected by cities in the form of transfer taxes. Only a simulation of final demand spending in the construction sector will generate a direct impact for this revenue category. Hence, the indirect impact will always be zero, as no municipal tax is levied on the producing sectors' purchases of intermediate inputs.

Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Environmental impact in terms of GHGs

The total impact on GHG emissions of federal institutions was 0.05 kilotons and can be broken down into percentage contributions from the following sectors: non-commercial, 74%; other services, 16%; manufacturing, 8%; primary sectors, 1%; and other sectors, 1% (Chart 4-22).

Chart 4-22. **Environmental Impact in Terms of GHG Emissions, by Sector, Federal Institutions, Magdalen Islands, 2019**



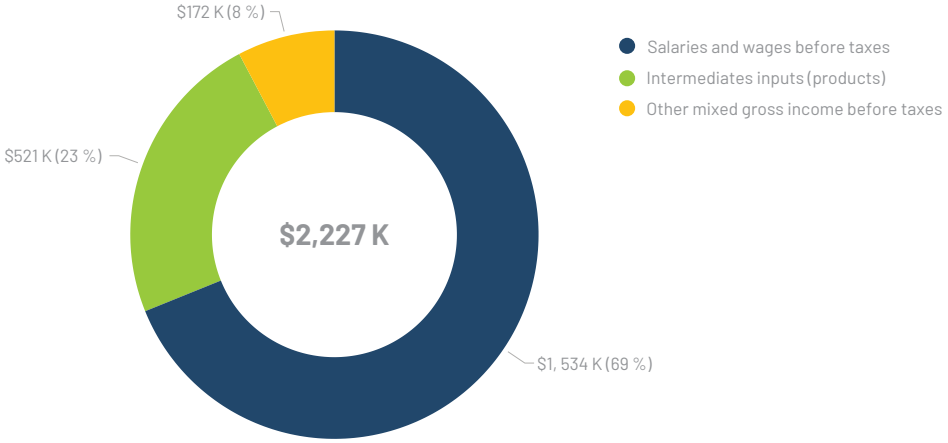
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

4.4.5. Quebec government institutions

Breakdown of the initial expenditure

As in the case of federal institutions, wages and salaries were the largest expense for Quebec institutions. They accounted for about 69% of total initial expenditure (Chart 4-23). The largest intermediate input expenditure was in health care and social assistance. That expenditure made up about 50% of spending on intermediate inputs (Appendix A-8).

Chart 4-23. **Breakdown of Initial Expenditure, Provincial Institutions, Magdalen Islands, 2019**

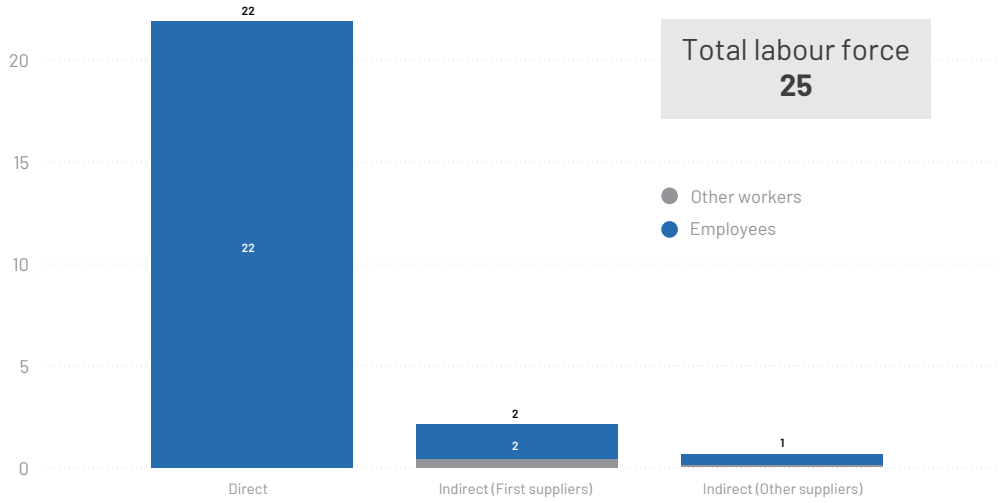


Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure of $2.2 million by provincial institutions whose activities are directly related to fishery resources.

Impact on employment

With total operating expenditures of $2.2 million, provincial institutions with fishery-related mandates supported a total of 25 FTE jobs. Direct employment was estimated to be 22 FTEs (88%) and indirect employment associated with first-tier suppliers was 2 FTEs (8%) (Chart 4-24).

Chart 4-24. Direct and Indirect Impact on Employment, Provincial Institutions, Magdalen Islands, 2019 (in person-years)



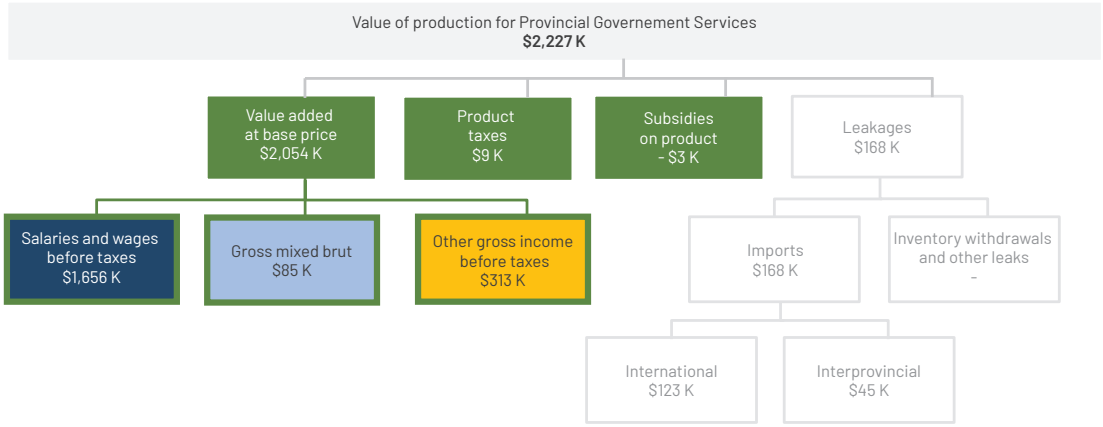
Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Economic impact

The $2.2-million salary and operating expenditures of provincial organizations with fishery-related mandates generated a total value added of $2.1 million or 95% of expenditures (Figure 4-8).

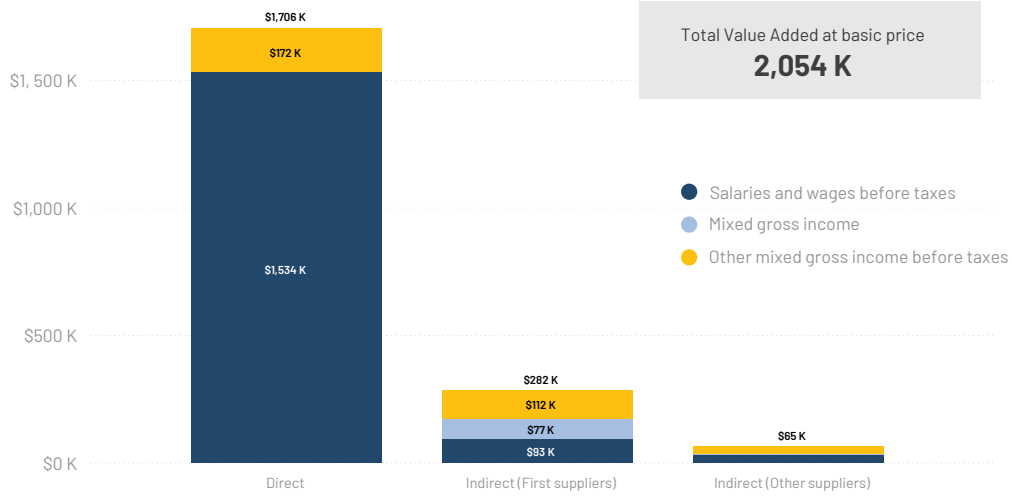
Most of that value-added came from direct effects, i.e., $1.7 million or more than 77% of expenditures. A large portion of the total direct effects were wages and salaries before taxes and other gross income before taxes: $1.5 million (68% of expenditures) and $0.2 million (9% of expenditures) respectively. The total indirect effects were $0.4 million or 19% of the total value added generated (Chart 4-25).

Figure 4-8. **Total Economic Impact of a Spending Shock, Provincial Institutions, Magdalen Islands, 2019**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Chart 4-25. **Direct and Indirect Impact on Value Added, Provincial Institutions, Magdalen Islands, 2019 (in C$1,000s)**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Impact on government revenues and parafiscal taxes

Provincial institutions' salary and operating expenditures of $2.2 million provided the Quebec and federal governments with total revenues of $183,000 and $127,000, respectively. Quebec and federal parafiscal taxes amounted to $251,000 and $38,000, respectively (Table 4-9).

Table 4-9. **Government Revenues and Parafiscal Taxes, Provincial Institutions, Magdalen Islands, 2019 (in C$1,000s)**

Tax revenues	Direct effects	Indirect effects		Total effects
		First-tier suppliers	Other suppliers	
Quebec government revenues	**166**	**14**	**3**	**183**
• Taxes on wages and salaries	166	9	3	177
• Sales taxes	–	5	0	5
• Specific taxes	0	0	0	1
Federal government revenues	**117**	**8**	**2**	**127**
• Taxes on wages and salaries	117	6	2	125
• Sales taxes	–	2	0	2
• Excise taxes/duties	0	0	0	0
• Customs duties	0	0	0	0
Local government revenues	**–**	**–**	**–**	**–**
• Municipal taxes1	–	–	–	–
Parafiscal taxes	**266**	**17**	**6**	**289**
• Quebec (QPP, HSF, CNESST, QPIP)	231	15	5	251
• Federal (Employment Insurance)	35	2	1	38
Total	**549**	**39**	**11**	**599**

Note: – Nil

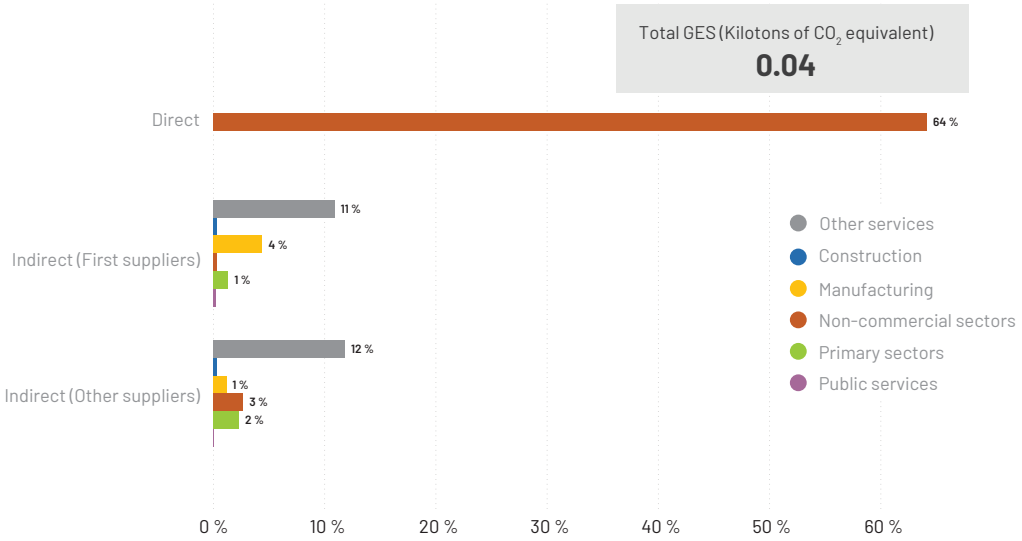
1: Local government revenues are the municipal taxes collected by cities in the form of transfer taxes. Only a simulation of final demand spending in the construction sector will generate a direct impact for this revenue category. Hence, the indirect impact will always be zero, as no municipal tax is levied on the producing sectors' purchases of intermediate inputs.

Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

Environmental impact in terms of GHGs

The total impact on GHG emissions of provincial institutions was 0.04 kilotons and can be broken down into percentages based on the respective contributions of the following sectors: non-commercial, 67%; other services, 23%; manufacturing, 6%; and primary, 1% (Chart 4-26).

Chart 4-26. **Environmental Impact in Terms of GHG Emissions, by Sector, Provincial Institutions, Magdalen Islands, 2019**



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure.

4.5. Value-added ratio associated with Quebec content

The ratio of "Quebec content," particularly for value added, is used to measure the total economic impact that one dollar of spending by an economic sector has on the Quebec economy. It therefore answers the following question: "For every dollar spent in the simulated sector, how much will be left for the Quebec economy?" The value-added ratio, commonly referred to as a *multiplier*, must therefore be less than one, because of the various leakages in the system (Institut de la Statistique du Québec, 2021).

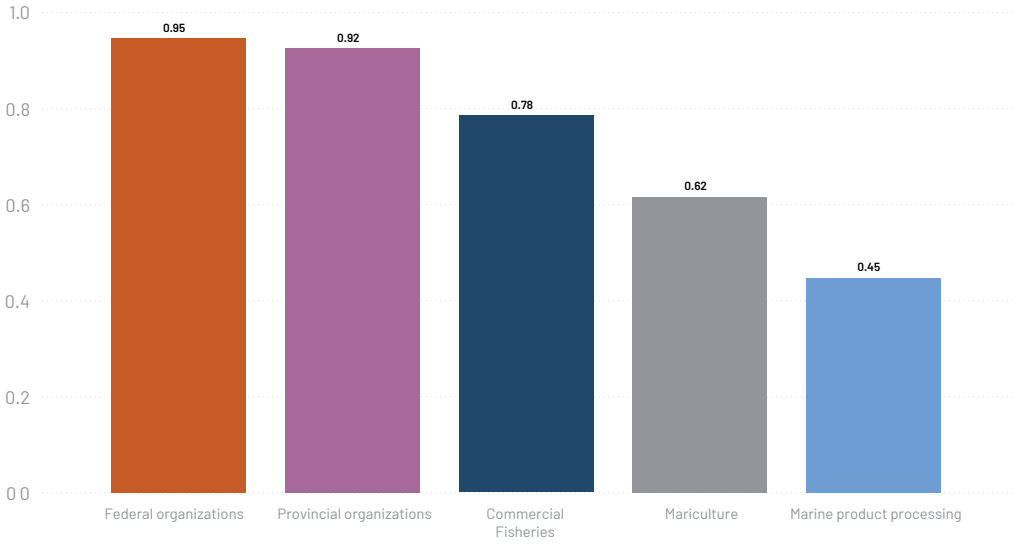
The percentage of Quebec content is calculated as being the ratio, expressed as a percentage, between the value added at market price (value added at basic price[46] includes net taxes of subsidies) and the initial expenditure.

In the private sector, the commercial fishing industry had the highest value-added ratio, 0.78. This means that 78% of the commercial fishing industry's operating expenditures were made in the Quebec economy. The mariculture industry, which also had a high Quebec content, came second with a value-added ratio of 0.62. The fish and seafood processing industry had the lowest value-added ratio in the private sector, at 0.45. Federal and provincial institutions' operating expenditures have a proportionally greater impact on the Quebec economy than the private sector's expenditures. The value-added ratio is estimated to be 0.95 for federal institutions and 0.92 for provincial institutions (Chart 4-27).

46. Corresponds to the sales prices at the factory gate. For a domestic company, these are the selling prices net of all taxes and various margins. In the case of imports, factory prices correspond to the value (including insurance and freight) at the Quebec border, excluding taxes and margins, but including import duties (Institut de la Statistique du Québec, 2021).

...despite the major changes that have occurred over the years in the marine ecosystem surrounding the Magdalen Islands, stakeholders in the fisheries and mariculture sector have shown great resilience by continually adapting to their environment and finding ways to develop profitable commercial activities that benefit several economic sectors in the region...

Chart 4-27. Value-Added Ratio Associated with Quebec Content



Source: DFO, Strategic Services, Quebec Region, economic impact simulation by the Institut de la statistique du Québec, based on initial expenditure

4.6. Induced effects based on Statistics Canada's input-output multipliers

The induced economic benefits based on the provincial input-output multipliers for the entire fishing and mariculture sector and federal and provincial institutions was 228 FTE jobs, for a value added of $20.4 million (Table 4-10). Of this induced value added, 50% can be attributed to the commercial fishing industry, and 44% to the fish and seafood processing industry.

Table 4-10. Induced Effects on Employment and Value Added, Magdalen Islands, 2019

Industry/institutions	Employment (in person-years)	Value-added ($000)
Commercial fishing	115	10,284
Mariculture	4	373
Fish and seafood processing	101	9,047
Federal institutions	4	372
Provincial institutions	4	321
Total des industries	**228**	**20,397**

Source: DFO, Strategic Services, Quebec Region, economic impact simulation based on initial expenditure.

4.7. Summary of overall economic benefits

4.7.1. Employment

Based on simulations using the MISQ and the provincial input-output multipliers, the total initial spending of $242.2M by the three key fisheries and mariculture industries in the Magdalen Islands and the federal and provincial services, whose mandate is directly related to fisheries resources, supported 1,335 salaried jobs and jobs in self-employment (FTEs) in Quebec (see Table 4-11). Of this number, 716 jobs were supported directly and 390 indirectly in the Magdalen Islands.

The commercial fishing and fish and seafood processing industries in the Magdalen Islands support the most direct, indirect and induced jobs. These two industries together support over 93% of the total jobs in this sector, with the commercial fishing industry accounting for over 49%.

Table 4-11. Direct, Indirect and Induced Economic Effects on the Labour Force, Magdalen Islands, 2019 (person-years)

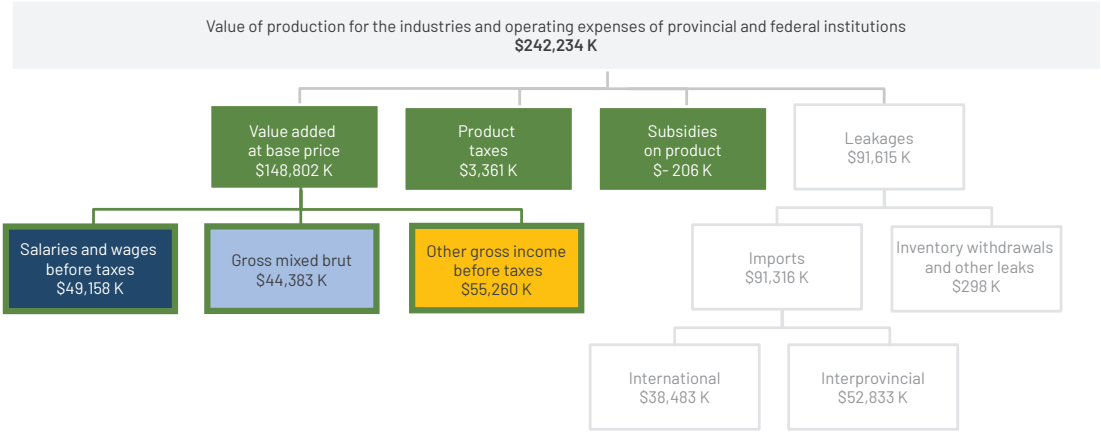
Private and public sector	Simulated Initial Spending ($K)	Labour Force (Person-Years)			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
Commercial fishing	118,209	401	141	115	657
Mariculture	2,592	21	6	4	31
Seafood processing	117,490	251	239	101	591
Federal services	1,716	21	2	4	27
Provincial services	2,227	22	3	4	28
Total	**242,234**	**716**	**390**	**228**	**1,334**

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region.

4.7.2. Value added

The $242.2M in operating expenses of the fishing and mariculture sector and the federal and provincial services generated a total of $148.8M in value added for Quebec, consisting mainly of wages and salaries ($49.2M, 20%) and other gross income ($55.3M, 23%) (Figure 4-9). The total direct and indirect economic benefits for the entire Magdalen Islands fishing and mariculture sector can be broken down as follows: value added (61%), leakages (38%) and indirect taxes (1%).

Figure 4-9. **Overall Direct and Indirect Economic Impact, Fishing and Mariculture Industries and Federal and Provincial Services, Magdalen Islands, 2019 (in C$1,000s at 2020 values)**



Source: DFO, Strategic Services, Quebec Region (2021), economic impact simulation of initial spending using the Institut de la statistique du Québec's Québec input-output model and Statistics Canada's provincial input-output multipliers.

By including induced impacts, the total value added generated by the entire fishing and mariculture sector and the federal and provincial services was estimated to be $169.2M for the province of Quebec. The commercial fishing and processing industries had the largest total economic impact, with $101.8M and $61.1M in value added, respectively. Federal and provincial services generated a contribution of $4.4M to Quebec's GDP. Direct economic benefits in terms of value added for the Magdalen Islands economy accounted for 63% of the total economic benefits and amounted to $107.4M. Indirect benefits totalled $41.4M, which is equivalent to 24% of the total benefits and, lastly, induced benefits generated nearly $20.4M for Quebec's GDP, for 12% of the total benefits (Table 4-12).

Table 4-12. **Direct, Indirect and Induced Economic Effects on Value Added, Magdalen Islands, 2019 (person-years)**

Industry/service	Simulated Initial Spending ($K)	Value-Added ($K)			
		Direct Effects	Indirect Effects	Induced Effects	Total Effects
Pêches commerciales	118,209	78,589	12,952	10,284	101,825
Mariculture	2,592	883	693	373	1,949
Transformation des poissons et fruits de mer	117,490	24,753	27,255	9,047	61,054
Services fédéraux	1,716	1,468	155	372	1,995
Services provinciaux	2,227	1,706	348	321	2,374
Total	**242,234**	**107,399**	**41,402**	**20,397**	**169,198**

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region.

4.7.3. Government revenues and incidental taxation

Government revenues and incidental taxation generated by the three industries as well as federal and provincial services with a mandate related to fishery resources amounted to $20.1M in direct and indirect effects. About 55% of this value came from the commercial fishing industry, or $11M. The seafood processing industry was the second largest source of revenue and incidental taxes for governments with $7.7M or 38% of total revenue. Provincial services were third with $0.6M (3%), followed by federal services with $0.5M (2%) and lastly, the mariculture sector with $0.3M (1%) (Table 4-13)

Table 4-13. Direct and Indirect Impact on Government Revenues and Incidental Taxation, Magdalen Islands, 2019 (in C$1,000s)

Industry/service	Simulated Initial Spending	Government revenues and incidental taxation		
		Direct Effects	Indirect Effects	Total Effects
Commercial fishing	118,209	8,641	2,373	11,014
Mariculture	2,592	3,554	4,124	7,678
Seafood processing	117,490	241	106	347
Federal services	1,716	458	28	486
Provincial services	2,227	549	50	599
Total	**242,234**	**13,443**	**6,681**	**20,124**

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region.

4.7.4. Environmental impact in terms of greenhouse gas emissions

Initial spending by the three industries and by federal and provincial services was $242.2M. Total greenhouse gas (GHG) emissions from these production activities were 30.6 kilotons (Table 4-13). The total impact includes not only the direct impact of the simulated sector(s), but also the indirect impact of all suppliers in the production chain. The total GHG impact can therefore be broken down into the contribution of the simulated sectors (21.8 kilotons), that of the first suppliers (6.2 kilotons) and that of the other suppliers (2.7 kilotons).

In terms of direct impact, the spending of the commercial fishing industry contributed the most to greenhouse gas emissions, at 85%, followed by the mariculture industry, at 5% (Chart 4-28), with the primary sector contributing 100% for both of these industries (Appendix A-9). This result can be explained by the fact that these two industries are part of the primary sector, which uses mostly raw materials such as fuel (diesel and gasoline to run the boats used for fishing), materials used to manufacture boats, the use of polluting engines, and so on.

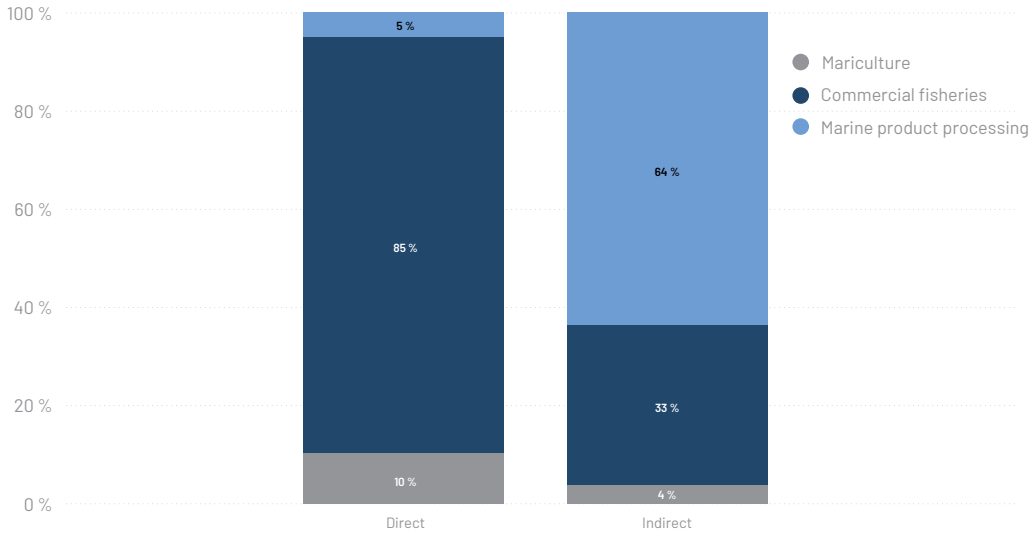
In contrast, in terms of indirect effects (for all suppliers in the production chain), the processing industry emitted the most greenhouse gases (5.6 kilotons), at 64%.

Table 4-14. Direct and Indirect Impact on Greenhouse Gas Emissions, Fishing and Mariculture Industries and Federal and Provincial Services, Magdalen Islands, 2019 (kilotons of CO_2 equivalent)

Industry/service	Simulated Initial Spending ($M)	Greenhouse Gas Emissions (kilotons of CO_2 Equivalent)		
		Direct Effects	Indirect Effects	Total Effects
Commercial fishing	118.2	18.45	2.88	21.33
Mariculture	2.6	2.22	0.33	2.55
Seafood processing	117.5	1.07	5.62	6.69
Federal services	1.5	0.03	0.01	0.04
Provincial services	2.2	0.03	0.01	0.04
Total	**242**	**21.80**	**8.85**	**30.65**

Source: DFO, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

Chart 4-28. Environmental Impact in Terms of Greenhouse Gas Emissions by Industry, Magdalen Islands, 2019



Source: DFO, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

4.8. Comparison with the results of the 2014 study

A comparison made as part of this project between the results presented above and those of the 2014 DFO report entitled *Contribution économique du secteur des pêches et de la mariculture des Îles-de-la-Madeleine* [economic contribution of the Magdalen Islands fishing and mariculture sector] shows that the commercial fishing industry has seen an increase in Quebec content. It increased from 70% in 2012 to 78% in 2019, an increase of 8 percentage points (see Table 4-14). In turn, leakages in this industry decreased by the same number of percentage points. This reflects the fact that the spending of the commercial fishing industry contributed more to the gross domestic product (GDP) of the Quebec economy than the spending of other industries.

As for mariculture, the contribution to the Quebec economy has not changed, compared with 2012 (62% of spending). Leakages (interprovincial and international imports) also remained the same, compared with 2012. In contrast, subsidies for products used in this industry to generate the final product have fallen from 20% to less than 1%. This can be explained by the innovations that were introduced in this industry after 2012, including the change in production and, as a result, a change in inputs.

Lastly, in the seafood processing industry, the contribution to Quebec's GDP fell from 48% to 45%, a drop of three percentage points. Leakages in this industry increased by the same number of percentage points, compared with 2012. This decreasing contribution is due to the decrease in value added, particularly with regard to wages and salaries. This reflects the fact that the processing industries use less physical labour to process fish and seafood. This could also be explained by an increase in processing automation.

One of the recent innovations of the 2021 Québec input-output model is the quantification of the environmental impacts of the initial spending of the simulated industries. The commercial fishing industry emits the most CO_2 in terms of direct impact, while the seafood processing industry emits the most greenhouse gases in terms of indirect impact.

The analyses performed do not take into account the post-pandemic period resulting from COVID-19, with 2019 as the base year. Taking this shock into account can affect the results obtained.

Table 4-15. **Comparison of Main Results, 2012 versus 2019, Fishing and Mariculture Industries and Federal and Provincial Services, Magdalen Islands.**

Industries/ services	Indicators	Quebec Content: 2012 Base Year	Quebec Content: 2019 Base Year
Commercial fishing	**Value-added at market prices**	**62%**	**62%**
	Value-added at basic prices	80%	61%
	Taxes on products	1%	1%
	Subsidies on products	-20%	0%
	Leakages	**38%**	**38%**
	Imports	37%	38%
	Inventory withdrawals and other leakages	2%	0%
	Expenses net from subsidies	100%	100%
Mariculture	**Value added at market prices**	**48%**	**45%**
	Value added at basic prices	48%	44%
	Taxes on products	1%	1%
	Subsidies on products	-1%	0%
	Leakages	**52%**	**55%**
	Imports	52%	55%
	Inventory withdrawals and other leakages	0%	0%
	Expenses net from subsidies	100%	100%
Seafood processing	**Value added at market prices**	**94%**	**92%**
	Value added at basic prices	94%	92%
	Taxes on products	0%	0%
	Subsidies on products	0%	0%
	Leakages	**6%**	**8%**
	Imports	6%	8%
	Inventory withdrawals and other leakages	0%	0%
	Expenses net from subsidies	100%	100%
Provincial services	**Value added at market prices**	**89%**	**95%**
	Value added at basic prices	89%	95%
	Taxes on products	1%	0%
	Subsidies on products	0%	0%
	Leakages	**11%**	**5%**
	Imports	11%	5%
	Inventory withdrawals and other leakages	0%	0%
	Expenses net from subsidies	100%	100%
Federal services	**Value added at market prices**	**89 %**	**95 %**
	Value added at basic prices	89 %	95 %
	Taxes on products	1 %	0 %
	Subsidies on products	0 %	0 %
	Leakages	**11 %**	**5 %**
	Imports	11 %	5 %
	Inventory withdrawals and other leakages	0 %	0 %
	Expenses net from subsidies	100 %	100 %

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region

4.9. Summary: Part III

The combined output of fishing, mariculture and processing of marine products accounted for $238.3M in sales in 2019. In addition to this amount, there was $3.9M in spending by federal and provincial departments in the Magdalen Islands that have a mandate directly related to fishery resources development and production activities.

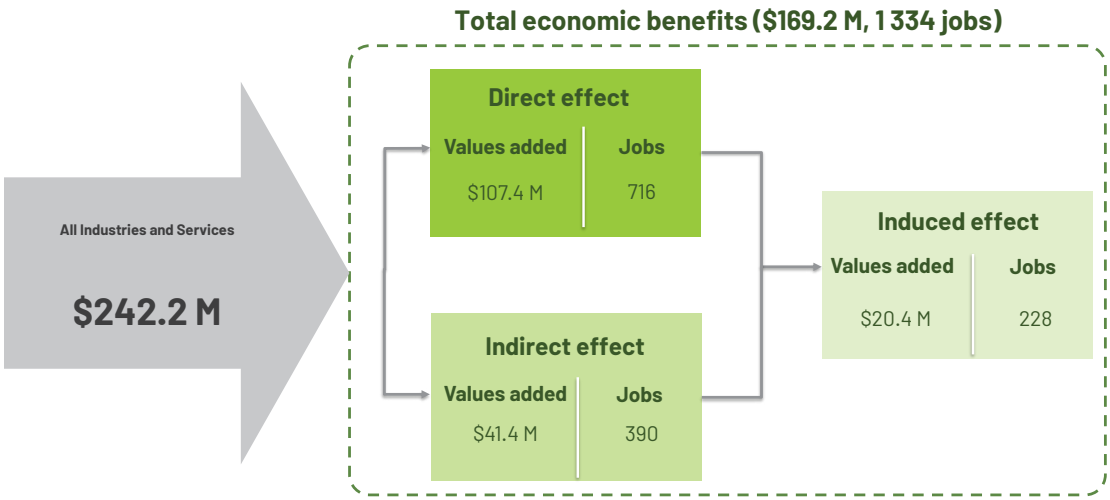
The purpose of this component of the study was to estimate the overall economic impact generated by this $242.2M economic contribution from the Magdalen Islands fishing and mariculture sector. More specifically, the assessment of the direct, indirect and induced economic benefits generated by the fishing and mariculture sector in the Magdalen Islands was carried out using the Québec input-output model and Statistics Canada's input-output multipliers.

According to the results of the estimates, value added constitutes the largest share of the economic impact generated by the total value of production in this sector. The total value added (direct, indirect and induced) accounts for $169.2M or nearly 70% of the total value of production. This sector directly supports a total of 716 FTE jobs in the Magdalen Islands and generates a direct value added of $107.4M, which is more than 44% of the total value of production in the Magdalen Islands. Of this direct value added, more than 73% can be attributed to the Magdalen Islands commercial fishing industry, which generates $78.6M. The indirect and induced economic benefits are estimated to be 618 FTE jobs in the Magdalen Islands and $61.8M in value added (Figure 4-10).

When compared with the 2014 study (2012 base year), the economic impact in 2019 amounts to an increase of more than 168% in terms of value added generated by the Magdalen Islands fishing and mariculture sector. This hefty increase is due to the increase in production value in the commercial fishing industry, particularly the value of landings ($40.1M in 2012, compared with $118.2M in 2019). It is also a testament to a growing sector capable of generating significant value added in terms of wages and salaries and other gross income.

Moreover, despite a significant amount of leakage, i.e., spending that does not generate economic activity for either the province of Quebec or the Magdalen Islands (in this case, imports), the leakage proportion in the value of production remains the same as in 2012, at 38% of the total value of production.

Figure 4-10. **Overall Economic Benefits of Fishing and Mariculture Industries and Federal and Provincial Institutions, Magdalen Islands, 2019**



Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region

This study is intended to provide a conservative estimate of the economic impact of the Magdalen Islands fishing and mariculture sector, since it includes only those industries and public services directly related to the extraction or production of fishery resources. The study could be improved by taking into account the impact of tourism activities related to the fisheries sector, such as deep-sea fishing trips, seal hunting trips or lobster trap launching events. The data needed to estimate the economic impact of these activities could be obtained through a questionnaire distributed to visitors and tourism businesses as part of future work.

Lastly, it should be noted that the multipliers used to determine these economic impacts were not specifically designed for the Magdalen Islands, but rather for the province of Quebec. However, given the insular nature[47] of the Islands, it is reasonable to assume that the direct jobs and direct value added contribute almost entirely to the Magdalen Islands economy. It may also be assumed that a significant share, if not the vast majority, of the indirect and induced economic impact is concentrated in the archipelago. The businesses that supply goods and services to commercial fishers and mariculturists are generally based in the Magdalen Islands, as are some of the businesses supplying seafood processors.

47. This insular character of the archipelago implies that employees in the sector—fishers, fisher helpers, mariculturists, employees of processing plants and of the public sector—are based almost exclusively in the Magdalen Islands.

Magdalen Island residents are therefore highly dependent on foreign markets, both for supplies and for selling their products, which results in higher costs compared with other maritime communities in Quebec.

5. Conclusion

In connection with the proposal to establish a marine protected area, the study of the economic contribution of the Magdalen Islands' commercial fishing and mariculture sector had two main objectives. The first was to develop an overall socio-economic profile of the Magdalen Islands in terms of demographics, educational attainment and socio-economic characteristics. The second was to prepare a sector analysis of fishing and mariculture and this sector's socio-economic importance. The third objective was to estimate the economic benefits of the main industries and institutions making up the sector.

In the commercial fishing industry, landings in the Magdalen Islands in 2019 accounted for about 31% of the total value of landings in maritime Quebec as a whole. Of the 10 harbours in the Islands where catches were landed in 2019, four were among the top-ranking fishing harbours in all of maritime Quebec. Lobster and snow crab are the two main species harvested in the Magdalen Islands and in the rest of maritime Quebec. In 2019, the two species accounted for about 95% of the total value of landings in the archipelago (70% for lobster and 25% for snow crab).

Mariculture is a small industry in the Magdalen Islands, consisting of just four companies that mainly cultivate three types of shellfish: mussels, scallops and oysters. In 2019, the value of production in this industry was $2,592,000, or 75% of all production in maritime Quebec.

The fish and seafood processing industry had 13 MPDBs in 2019, or 18% of all MPDBs in maritime Quebec. An estimated 696 people are employed in the industry, more than 18% of the total for maritime Quebec. In more than 87% of the processing jobs, employees processed lobster and snow crab, the two main species,.

Moreover, according to the results of the estimates, value added made up the largest portion of the economic benefits generated by the sector's total value of production. In total, the value added (direct, indirect and induced) was $169.2 million, or nearly 70% of the total value of production. This sector directly supports a total of 716 FTE jobs in the Magdalen Islands and generates a direct value added of $107.4 million, which is more than 44% of the total value of production in the Islands. In comparison with the 2014 study (reference year 2012), the economic benefits in 2019 amount to an increase of more than 168% in terms of value added generated by the Magdalen Islands fishing and mariculture sector. This very significant growth is mainly due to the increase in the commercial fishing industry's value of production, particularly the value of landings ($118.2 million in 2019, compared with $40.1 million in 2012). It also indicates that this booming industry is capable of generating significant value added in terms of wages and salaries and other gross income.

This study of the economic benefits of the Magdalen Islands fishing and mariculture sector provides a comprehensive overview and a detailed quantitative analysis that clearly demonstrates the economic importance of these activities for the archipelago and for Quebec's economy. The potential for growth in this sector in light of the sharp increase in demand for fishery products in Canada[48] and abroad,[49] as well as future investments in the sector, are expected to be major assets for the sector. Consequently, the economic benefits may be even greater in a few years' time.

48. According to DFO data, sales of Quebec fishery products in Canada increased by more than 250% between 2010 and 2019, from $131 million to $360 million.

49. Between 2010 and 2019, the value of international exports of Quebec fishery products increased by more than 50%, from $166 million to $250 million.

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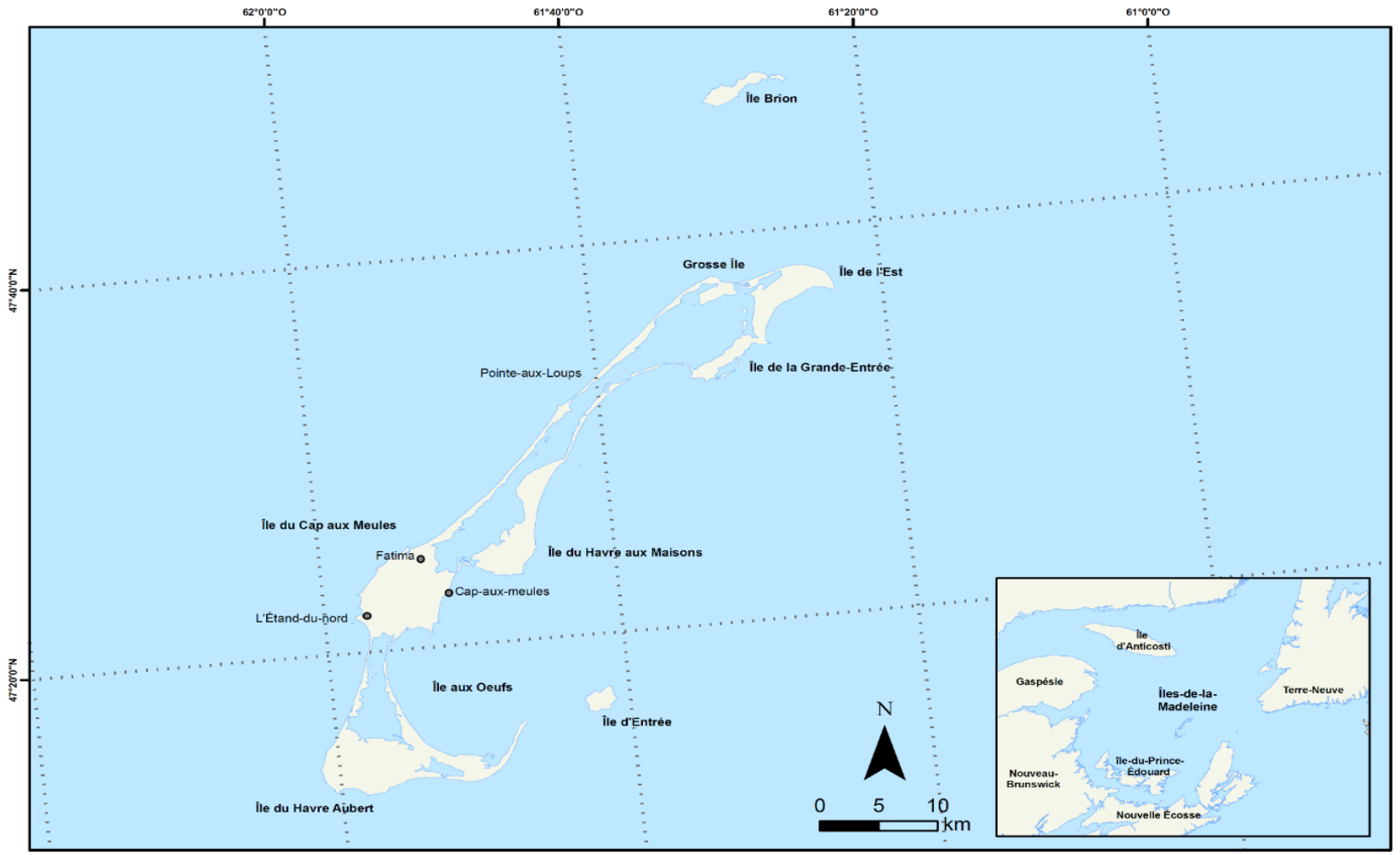
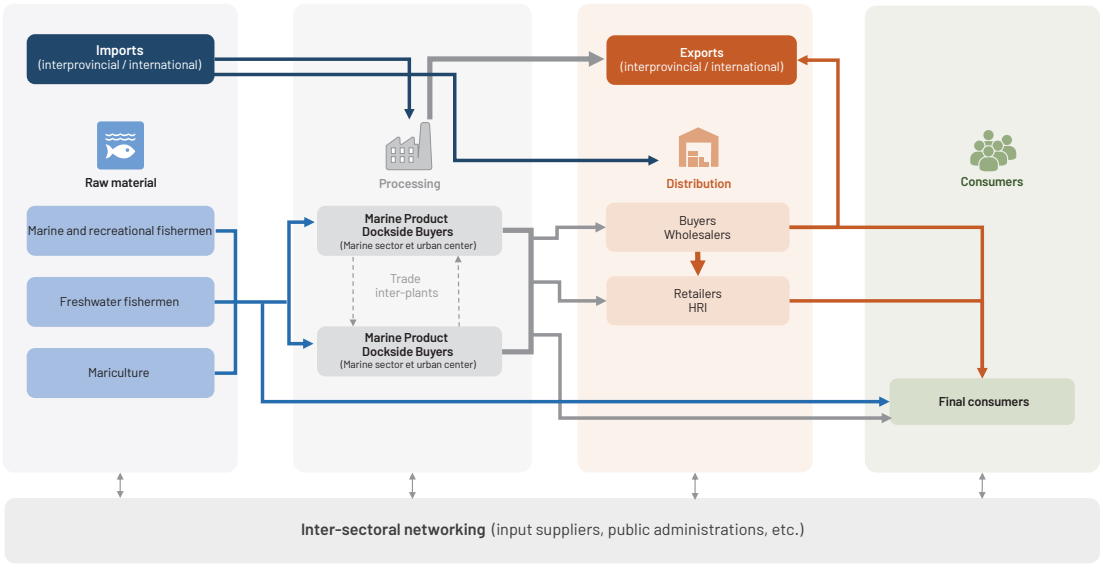
7. Appendix

A–1. Map of the Magdalen Islands



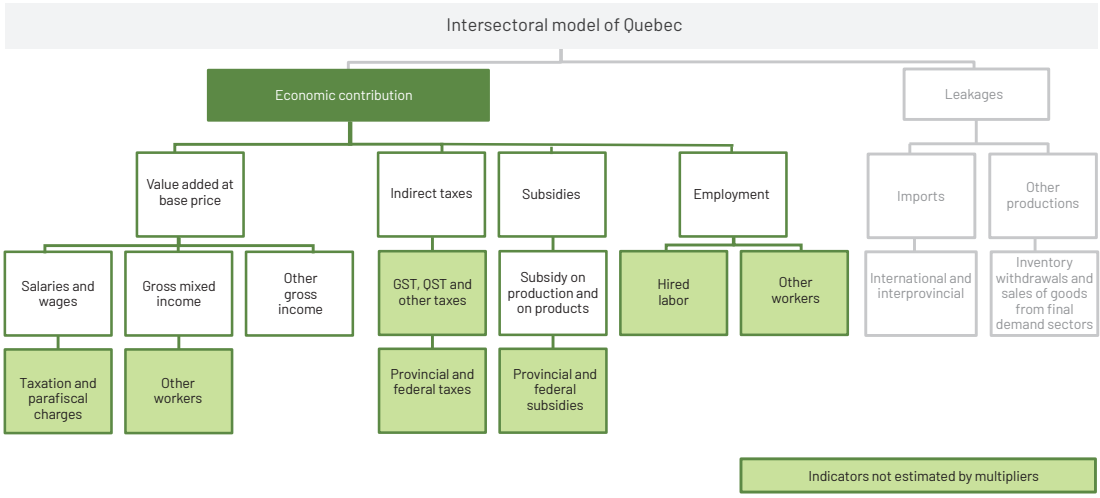
Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region

A–2. Diagram of the fishing and mariculture sector



Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region, figure adapted from Bureau (2018).

A–3. Types of Indicators Estimated by Intersectoral Model of Quebec (i.e., Québec Input-Output Model) and the Provincial Input-Output Multipliers



Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region, compiled from Institut de la statistique du Québec (2021)

A–4. C$118.2M in Operating Expenses, Commercial Fishing, Magdalen Islands, 2019

No	Code	Goods and Services	Intermediate Demand ($K)	% of Total Expenses
1	bs01	Grains	85	0.2%
3	bs03	Other agricultural products	28	0.1%
5	bs05	Fish and seafood products	606	1.5%
7	bs07	Mineral fuels	42	0.1%
11	bs11	Utilities	103	0.3%
15	bs15	Repair construction	188	0.5%
16	bs16	Meat, fish and dairy products	826	2.1%
17	bs17	Fruit, vegetables and other food products, feeds	1,211	3.1%
18	bs18	Soft drinks and alcoholic beverages	1,836	4.6%
20	bs20	Textile products	2,505	6.3%
21	bs21	Clothing, hosiery and leather accessories	514	1.3%
22	bs22	Wood products	148	0.4%
23	bs23	Wood pulp, paper and paper products	1,211	3.1%
24	bs24	Printing and publishing	225	0.6%
25	bs25	Petroleum and coal products	10,288	25.9%
26	bs26	Chemicals, pharmaceuticals and chemical products	915	2.3%
27	bs27	Rubber and plastic products	3,081	7.8%
28	bs28	Non-metallic mineral products	111	0.3%
29	bs29	Primary metal products	317	0.8%
30	bs30	Fabricated metal products	1,128	2.8%
31	bs31	Machinery	2,211	5.6%
32	bs32	Computer and electronic products	1,824	4.6%
33	bs33	Electrical equipment and components	1,09	2.7%
34	bs34	Transportation equipment	398	1.0%
36	bs36	Miscellaneous manufactured products	1,058	2.7%
39	bs39	Transportation and storage services	1,97	5.0%
40	bs40	Published and recorded media products	58	0.1%
41	bs41	Telecommunications	11	0.0%
42	bs42	Other information and cultural services	82	0.2%
43	bs43	Finance, insurance	2,395	6.0%
44	bs44	Real estate and rental services, licensing	203	0.5%
46	bs46	Professional and technical services	553	1.4%
47	bs47	Software	2	0.0%
49	bs49	Administrative, support and related services	755	1.9%
53	bs53	Accommodation and food services	451	1.1%
54	bs54	Other services, except NPISH and public administration	930	2.3%
56	bs56	Other government services	311	0.8%
		Total expenses, goods and services	**39,67**	**100%**
		Wages and salaries before tax	18,322	
		Gross mixed income	37,771	
		Other gross income before tax	22,496	
		Total expenses	**118,259**	
		Subsidies on products	-50	
		Total expenses, net from subsidies	**118,209**	
		Labour (Person-years)		
		Salaried workers	310.4	
		Other workers	90.5	

Notes: The model simulation version is based on the 2017 supply and use tables. The average salaries in the affected sectors are those for 2020, since the expenses in this study were considered as if they were all incurred in 2020. The labour charge quantified in this study reflects 2020 average salaries. The indirect taxation template used for the simulation in this study also considered the 2020 tax system, with a 5% Goods and Services Tax (GST) and a 9.975% Quebec Sales Tax (QST).

The sum of the values for each item may differ from the total because of rounding.

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

Reference: 20210531-1-2 2017C-2020C-2020C.

A–5. C$2.6M in Operating, Mariculture, Magdalen Islands, 2019

No	Code	Goods and Services	Intermediate Demand ($K)	% of Total Expenses
5	bs05	Fish and seafood products	226	13.2%
6	bs06	Support services related to farming and forestry	39	2.3%
7	bs07	Mineral fuels	82	4.8%
11	bs11	Utilities	39	2.3%
17	bs17	Fruit, vegetables and other food products, feeds	858	50.2%
21	bs21	Clothing, hosiery and leather accessories	2	0.1%
23	bs23	Wood pulp, paper and paper products	3	0.2%
24	bs24	Printing and publishing	6	0.4%
25	bs25	Petroleum and coal products	128	7.5%
26	bs26	Chemicals, pharmaceuticals and chemical products	37	2.2%
27	bs27	Rubber and plastic products	43	2.5%
30	bs30	Fabricated metal products	9	0.5%
31	bs31	Machinery	25	1.5%
33	bs33	Electrical equipment and components	11	0.6%
34	bs34	Transportation equipment	6	0.4%
39	bs39	Transportation and storage services	21	1.2%
40	bs40	Published and recorded media products	2	0.1%
43	bs43	Finance, insurance	92	5.4%
44	bs44	Real estate and rental services, licensing	23	1.3%
46	bs46	Professional and technical services	37	2.2%
49	bs49	Administrative, support and related services	9	0.5%
53	bs53	Accommodation and food services	8	0.5%
54	bs54	Other services, except NPISH and public administration	3	0.2%
		Total expenses, goods and services	**1,709**	100%
		Wages and salaries before tax	607	
		Gross mixed income	31	
		Other gross income before tax	245	
		Total expenses	**2,592**	
		Subsidies on products	0	
		Total expenses, net from subsidies	**2,592**	
		Labour (Person-years)		
		Salaried workers	13.0	
		Other workers	8.3	

Notes: The model simulation version is based on the 2017 supply and use tables. The average salaries in the affected sectors are those for 2020, since the expenses in this study were considered as if they were all incurred in 2020. The labour charge quantified in this study reflects 2020 average salaries. The indirect taxation template used for the simulation in this study also considered the 2020 tax system, with a 5% Goods and Services Tax (GST) and a 9.975% Quebec Sales Tax (QST).

The sum of the values for each item may differ from the total because of rounding.

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

Reference: 20210531-1-1 2017C-2020C-2020C

A–6. C$117.5M in Operating, Seafood Processing, Magdalen Islands, 2019

No	Code	Goods and Services	Intermediate Demand ($K)	% of Total Expenses
5	bs05	Fish and seafood products	68,435	73.8%
7	bs07	Mineral fuels	98	0.1%
9	bs09	Non-metallic minerals	7	0.0%
11	bs11	Utilities	704	0.8%
15	bs15	Repair construction	205	0.2%
16	bs16	Meat, fish and dairy products	11,072	11.9%
17	bs17	Fruit, vegetables and other food products, feeds	125	0.1%
18	bs18	Soft drinks and alcoholic beverages	104	0.1%
20	bs20	Textile products	52	0.1%
21	bs21	Clothing, hosiery and leather accessories	5	0.0%
22	bs22	Wood products	155	0.2%
23	bs23	Wood pulp, paper and paper products	1,452	1.6%
24	bs24	Printing and publishing	125	0.1%
25	bs25	Petroleum and coal products	405	0.4%
26	bs26	Chemicals, pharmaceuticals and chemical products	48	0.1%
27	bs27	Rubber and plastic products	998	1.1%
28	bs28	Non-metallic mineral products	2	0.0%
30	bs30	Fabricated metal products	451	0.5%
31	bs31	Machinery	322	0.3%
32	bs32	Computer and electronic products	20	0.0%
33	bs33	Electrical equipment and components	138	0.1%
36	bs36	Miscellaneous manufactured products	332	0.4%
37	bs37	Wholesaling margins and services	12	0.0%
39	bs39	Transportation and storage services	2,652	2.9%
40	bs40	Published and recorded media products	13	0.0%
41	bs41	Telecommunications	84	0.1%
42	bs42	Other information and cultural services	217	0.2%
43	bs43	Finance, insurance	2,201	2.4%
44	bs44	Real estate and rental services, licensing	420	0.5%
46	bs46	Professional and technical services	760	0.8%
49	bs49	Administrative, support and related services	625	0.7%
53	bs53	Accommodation and food services	369	0.4%
54	bs54	Other services, except NPISH and public administration	129	0.1%
		Total expenses, goods and services	**92,737**	100%
		Wages and salaries before tax	10,078	
		Gross mixed income	37	
		Other gross income before tax	14,638	
		Total expenses	**117,49**	
		Subsidies on products	0	
		Total expenses, net from subsidies	**117,49**	
		Labour (Person-years)		
		Salaried workers	246.0	
		Other workers	4.8	

Notes: The model simulation version is based on the 2017 supply and use tables. The average salaries in the affected sectors are those for 2020, since the expenses in this study were considered as if they were all incurred in 2020. The labour charge quantified in this study reflects 2020 average salaries. The indirect taxation template used for the simulation in this study also considered the 2020 tax system, with a 5% Goods and Services Tax (GST) and a 9.975% Quebec Sales Tax (QST).

The sum of the values for each item may differ from the total because of rounding.

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending. Reference: 20210531-1-3 2017C-2020C-2020C

A–7. C$1.7M in Operating Expenses, Federal Services, Magdalen Islands, 2019

No	Code	Goods and Services	Intermediate Demand ($K)	% of Total Expenses
7	bs07	Mineral fuels	1	0.4%
11	bs11	Utilities	4	1.6%
15	bs15	Repair construction	31	12.5%
24	bs24	Printing and publishing	2	0.8%
26	bs26	Chemicals, pharmaceuticals and chemical products	23	9.3%
34	bs34	Transportation equipment	1	0.4%
36	bs36	Miscellaneous manufactured products	1	0.4%
39	bs39	Transportation and storage services	6	2.4%
41	bs41	Telecommunications	1	0.4%
42	bs42	Other information and cultural services	6	2.4%
43	bs43	Finance, insurance	2	0.8%
44	bs44	Real estate and rental services, licensing	30	12.1%
46	bs46	Professional and technical services	78	31.5%
47	bs47	Software	7	2.8%
49	bs49	Administrative, support and related services	35	14.1%
50	bs50	Education services	2	0.8%
51	bs51	Health and social assistance services	6	2.4%
53	bs53	Accommodation and food services	2	0.8%
54	bs54	Other services, except NPISH and public administration	5	2.0%
56	bs56	Other government services	5	2.0%
		Total expenses, goods and services	**248**	100%
		Wages and salaries before tax	1,288	
		Gross mixed income	0	
		Other gross income before tax	180	
		Total expenses	**1,716**	
		Subsidies on products	0	
		Total expenses, net from subsidies	**1,716**	
		Labour (Person-years)		
		Salaried workers	21.0	
		Other workers	0.0	

Notes: The model simulation version is based on the 2017 supply and use tables. The average salaries in the affected sectors are those for 2020, since the expenses in this study were considered as if they were all incurred in 2020. The labour charge quantified in this study reflects 2020 average salaries. The indirect taxation template used for the simulation in this study also considered the 2020 tax system, with a 5% Goods and Services Tax (GST) and a 9.975% Quebec Sales Tax (QST).The sum of the values for each item may differ from the total because of rounding.

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

Reference: 20210531-1-4 2017C-2020C-2020

A–8. C$2.2M in Operating Expenses, Provincial Services, Magdalen Islands, 2019

No	Code	Goods and Services	Intermediate Demand ($K)	% of Total Expenses
6	bs06	Support services related to farming and forestry	3	0.6%
11	bs11	Utilities	1	0.2%
15	bs15	Repair construction	6	1.2%
24	bs24	Printing and publishing	1	0.2%
25	bs25	Petroleum and coal products	1	0.2%
26	bs26	Chemicals, pharmaceuticals and chemical products	125	24.0%
34	bs34	Transportation equipment	3	0.6%
36	bs36	Miscellaneous manufactured products	7	1.3%
39	bs39	Transportation and storage services	6	1.2%
41	bs41	Telecommunications	6	1.2%
42	bs42	Other information and cultural services	6	1.2%
43	bs43	Financial and insurance services	6	1.2%
44	bs44	Real estate and rental services, licensing	19	3.6%
46	bs46	Professional and technical services	40	7.7%
49	bs49	Administrative, support, and related services	5	1.0%
50	bs50	Education services	24	4.6%
51	bs51	Health and social assistance services	259	49.7%
54	bs54	Other services, except NPISH and public administration	1	0.2%
55	bs55	Other services by NPISH	1	0.2%
56	bs56	Other public administration services	1	0.2%
		Total expenses, goods and services	**521**	100%
		Wages and salaries before tax	1,534	
		Gross mixed income	0	
		Other gross income before tax	172	
		Total expenses	**2,227**	
		Subsidies on products	**0**	
		Total expenses, net from subsidies	**2,227**	
		Labour (Person-years)		
		Salaried workers	21.9	
		Other workers	0.0	

Notes: The model simulation version is based on the 2017 supply and use tables. The average salaries in the affected sectors are those for 2020, since the expenses in this study were considered as if they were all incurred in 2020. The labour charge quantified in this study reflects 2020 average salaries. The indirect taxation template used for the simulation in this study also considered the 2020 tax system, with a 5% Goods and Services Tax (GST) and a 9.975% Quebec Sales Tax (QST).

The sum of the values for each item may differ from the total because of rounding.

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.

Reference: 20210531-1-5 2017C-2020C-2020C

A–9. Direct and Indirect Impact on Greenhouse Gas Emissions by Activity Sector, Kilotons of CO_2 Equivalent

Sectors / Services	Direct Effects	Indirect Effects		Total Effects
		First Suppliers	Other Suppliers	
Commercial fishing				
Primary sectors	18.45	0.07	0.24	18.76
Utilities	-	0.00	0.01	0.01
Construction	-	0.00	0.01	0.01
Manufacturing	-	1.11	0.28	1.39
Other services	-	0.81	0.34	1.15
Non-commercial	-	0.01	0.01	0.01
Total for the sector	**18.45**	**2.01**	**0.87**	**21.33**
Mariculture				
Primary sectors	2.22	0.04	0.19	2.45
Utilities	-	0.00	0.00	0.00
Construction	-	0.00	0.00	0.00
Manufacturing	-	0.03	0.02	0.05
Other services	-	0.02	0.02	0.04
Non-commercial	-	0.00	0.00	0.00
Total for the sector	**2.22**	**0.09**	**0.24**	**2.54**
Fish and seafood processing				
Primary sectors	-	2.65	0.47	3.12
Utilities	-	0.01	0.01	0.02
Construction	-	0.00	0.01	0.01
Manufacturing	1.07	0.26	0.48	1.81
Other services	-	1.13	0.58	1.71
Non-commercial	-	0.01	0.01	0.02
Total for the sector	**1.07**	**4.07**	**1.56**	**6.69**
Federal services				
Primary sectors	-	0.000	0.001	0.001
Utilities	-	0.000	0.000	0.000
Construction	-	0.001	0.000	0.001
Manufacturing	-	0.000	0.003	0.003
Other services	-	0.005	0.003	0.007
Non-commercial	0.033	0.000	0.000	0.034
Total for the sector	**0.033**	**0.006**	**0.006**	**0.046**
Provincial services				
Primary sectors	-	0.00	0.00	0.00
Utilities	-	0.00	0.00	0.00
Construction	-	0.00	0.00	0.00
Manufacturing	-	0.00	0.00	0.00
Other services	-	0.00	0.00	0.01
Non-commercial	0.03	0.00	0.00	0.03
Total for the sector	**0.03**	**0.01**	**0.01**	**0.04**

Note: – Zero Value

Source: Department of Fisheries and Oceans, Strategic Services, Quebec Region (2021), economic impact simulation by the Institut de la statistique du Québec, based on initial spending.