FINAL REPORT

EVALUATION OF THE SUSTAINABLE AQUACULTURE PROGRAM

PROJECT NUMBER 96031

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EVALUATION DIRECTORATE
CHIEF FINANCIAL OFFICER SECTOR
FISHERIES AND OCEANS CANADA

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ACRONYMS

AAR	*Aquaculture Activities Regulations*
AFR	*Atlantic Fisheries Regulations*
AMD	Aquaculture Management Directorate
BCARP	British Columbia Aquaculture Regulatory Program
CEPA-DAS	*Canadian Environmental Protection Act* – Disposal at Sea
CCFAM	Canadian Council of Fisheries and Aquaculture Ministers
C&P	Conservation and Protection (Fisheries and Oceans Canada's directorate)
CSAS	Canadian Science Advisory Secretariat
CSSP	Canadian Shellfish Sanitation Program
DEIP	Detailed Enforcement Implementation Plan
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ENGO	Environmental Non-Governmental Organization
EOS	Ecosystems and Oceans Science (DFO's sector)
FGR	*Fishery (General) Regulations*
FO	Fishery Officer (job classification)
FPP	Fisheries Protection Program
FTE	Full-Time Equivalent
HC	Health Canada
I&T	Introductions and Transfers
MPFR	*Maritime Provinces Fishery Regulations*
MCFR	*Management of Contaminated Fisheries Regulations*
MOU	Memorandum of Understanding
NAAHP	National Aquatic Animal Health Program
NCR	National Capital Region
O&M	Operations and Maintenance
PARR	Program for Aquaculture Regulatory Research
PMRA	Pest Management Regulatory Agency (Health Canada)
RAMO	Regional Aquaculture Management Office
SAIP	Science Advice Implementation Plan
SAP	Sustainable Aquaculture Program
SASP	Sustainable Aquaculture Science Program
POFO	Senate Standing Committee on Fisheries and Oceans

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EXECUTIVE SUMMARY

Introduction

The following report presents the evaluation of the Sustainable Aquaculture Program (SAP), conducted by DFO's Evaluation Directorate from October 2016 to October 2017, in accordance with the Treasury Board's *Policy on Results* (2016). The evaluation assessed the relevance, performance and efficiency of the Program and the impacts of the *Aquaculture Activities Regulations* (AAR) on the Program's operations over the period from 2013-2014 to the first quarter of 2017-2018. Emphasis was placed upon Atlantic Canada, because an evaluation of the British Columbia Aquaculture Regulatory Program (BCARP) was completed in August 2015 and because only limited marine finfish activities take place in the other DFO regions. The last evaluation of SAP was completed in 2012.

Program Profile

SAP derives its regulatory mandate from the *Fisheries Act*. SAP's overall goal is to contribute to an environmentally, economically and socially sustainable Canadian aquaculture industry. Regulation and policy development activities are supported by aquaculture research and peer-reviewed science advice, which are carried out and provided by the Ecosystems and Oceans Science (EOS) division of DFO. The Conservation and Protection (C&P) Directorate is responsible for enforcing the AAR and, in British Columbia, the *Pacific Aquaculture Regulations*. The Program spent an average of $22.1 million dollars annually and employed between 179 and 195 people over the five-year period of the evaluation.

Evaluation Methodology

The evaluation focused heavily on risk areas and current information gaps that were identified in consultations with senior management during the evaluation's planning phase. The evaluation was calibrated to focus on determining:

- the need for the Program in light of DFO's mandate;
- the appropriateness of federal roles and responsibilities, including the need for an Aquaculture Act in Canada to address current regulatory barriers;
- the achievement of the Program's objectives;
- the extent to which the AAR is enforced by DFO; and
- the operational challenges and costs associated with the development and implementation of the AAR.

The evaluation used a mixed methods approach and triangulation of multiple lines of evidence to corroborate its findings. Lines of evidence included analyses of financial, administrative and performance data; two case studies of scientific research supporting aquaculture regulatory decisions; 50 key informant interviews; three site visits to Atlantic Canada; and a costing study.

Evaluation Findings

Aquaculture Management Directorate

Departmental responsibilities stemming from the *Fisheries Act* create an ongoing need for DFO to administer the operational requirements of the regulatory framework and to develop new regulations to adapt the framework to an evolving and increasingly complex industry context. Evidence also suggests that there is a need for AMD to address a limited number of minor longstanding DFO-specific regulatory incongruences that are negatively affecting the industry. Although there is a need for AMD to address these minor incongruences, the evaluation found that other barriers have acted as greater impediments to the growth of the sector. This finding challenges the industry's position, which is articulated in its advocacy documents, that federal regulations are key impediments to the growth of the sector. Furthermore, the evaluation found that amending DFO regulations would sufficiently address the identified DFO-specific regulatory incongruences.

During the period covered by the evaluation, one of AMD's key achievements was the development of the *Aquaculture Activities Regulations* (AAR), including the systems and tools to support its implementation. The evidence shows that the AAR did not result in a streamlined regulatory framework. In fact, the AAR created regulatory overlap with benthic impact monitoring programs in some provinces, increased the reporting burden on the industry and did not provide the level of legal clarity that was expected by the industry and other key stakeholders. The evaluation also found that AMD has made significant progress in implementing the reporting systems and tools necessary to collect and publish information on the environmental performance of the industry, by the end of fiscal year 2017-2018.

With respect to the efficiency and economy of the Program, the evaluation identified only minor inefficiencies in the delivery of the Canadian Shellfish Sanitation Program (CSSP) and opportunities for improvement in DFO's involvement in provincial siting decision-making processes. Aquaculture Management at both headquarters and in the regions appears to have the right resources to deliver SAP; although some regional offices in the Maritimes and Newfoundland and Labrador regions reported operating slightly below capacity.

Ecosystems and Oceans Science

There is an ongoing need for aquaculture-related research to support decision-making and policy development at DFO. Science-based policy is a priority of the current government, a best practice, and increases public confidence in the sustainability of the aquaculture sector. Although the science funded as part of the Program for Aquaculture Regulatory Research (PARR) was found to align with the needs of DFO decision- and policy-makers, the evaluation identified a need for increased research advice and knowledge in the fields of fate and biological effects of contaminants. The evidence shows that as of August 2017, EOS did not have the research competencies to address the needs of policy- and decision-makers in either area of research.

Overall, decision- and policy-makers consulted as part of the evaluation expressed a strong level of satisfaction with the knowledge and advice produced by EOS. Case studies and interviews showed that the knowledge and advice provided by EOS is used by policy- and decision-makers. EOS operates in an efficient manner, although the nature of the B-base funding of PARR has

created minor inefficiencies. The evaluation also found that the AAR and the anticipated growth of the industry have created a need for additional resources in order to maintain an equivalent level of service to policy- and decision-makers. The costing study concluded that the AAR could generate additional costs of approximately $2.8M annually for EOS in addition to requiring an additional $800K for the acquisition of research equipment to support research in the field of fate and biological effects.

Conservation and Protection

C&P made progress towards the establishment of key elements required for the enforcement of the AAR and the transfer of s. 36 of the *Fisheries Act*. However, many other activities will have to be completed before a comprehensive and proactive enforcement system is in place. These include: the training of Fishery Officers, the development of policies and guidelines, the development of enforcement plans inclusive of the aquaculture industry, and the development of formal agreements with key partners to access information and expertise in forensic toxicology.

C&P did not receive any funding from SAP II to support its new responsibilities under the AAR, and this has had a significant impact on C&P activities. A costing study completed by the evaluation team revealed that the implementation of the AAR is also expected to create significant financial pressures on the regions and detachments where marine finfish activities are taking place. Interviewees from C&P mentioned that C&P does not have the resources to deliver enforcement activities that match their preliminary assessment of the risks of non-compliance with the aquaculture regulations by the aquaculture industry; and that any effort directed toward AAR-related activities will be done at the expense of other C&P enforcement activities. The costing study concluded that on average, over the next five years, the additional costs per year associated with the AAR for C&P may be **$**3.4M for the NL, Maritimes and Pacific regions combined.

Recommendations

From the above evidence and findings, the following five recommendations are being made for the Sustainable Aquaculture Program and Conservation and Protection:

Recommendation 1: It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, as part of the upcoming program funding renewal process, clarifies and better articulates the program objectives to ensure that these objectives align with its core responsibilities.

Recommendation 2: It is recommended that the Assistant Deputy Minister, Ecosystems and Oceans Science develop, or secure access to, research in the fields of fate and biological effects of contaminants. This research should allow EOS to:

- support DFO's commitments identified in the Science Advice Implementation Plan in a timely manner; and,
- meet, to the extent possible, the other knowledge and advice needs of DFO regarding the fate and biological effects of contaminants used by the aquaculture industry.

Recommendation 3: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management assess the risk of non-compliance with the aquaculture regulations by the aquaculture industry; and, use this assessment to develop a proposal for enhanced enforcement of aquaculture regulations by C&P detachments across Canada to inform the renewal of the Sustainable Aquaculture Program.

Recommendation 4: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management establish Regional Working Agreements with the relevant federal and provincial partners in the Atlantic regions to ensure that C&P has access to key information and expertise; and that a coordinated enforcement regime is put in place.

Recommendation 5: It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, in collaboration with the Assistant Deputy Minister, Ecosystems and Oceans Science, review the siting decision process to:

- clarify the roles and responsibilities between the Fisheries Protection Program and the Regional Aquaculture Management Division in the provincial siting decision process;
- define the roles and responsibilities and expected level of involvement of EOS in the provincial siting decision process;
- define clear criteria for decision-making that are harmonized and applied consistently across the regions; and
- establish service standards to ensure timely delivery of advice to the provinces.

1.0 INTRODUCTION

1.1 Purpose of the Evaluation

This report presents the results of the Evaluation of the Sustainable Aquaculture Program (SAP) undertaken by the Evaluation Directorate within Fisheries and Oceans Canada (DFO). In accordance with Treasury Board's *Policy on Results* (2016) and consultations with Aquaculture Management Directorate (AMD) and Ecosystems and Oceans Science (EOS) management, the main objectives of the evaluation were to provide information to support decision-making and to assess the impacts of the *Aquaculture Activities Regulations* (AAR) on the Program's operations.

1.2 Evaluation Scope and Context

The evaluation covered the period from 2013-14 through the first quarter of 2017-18, since the previous SAP evaluation was in 2012 and this evaluation addressed the three core evaluation issues of relevance, effectiveness and efficiency. While the evaluation covered the National Capital Region (NCR) and all six DFO regions, it placed emphasis on Eastern Canada because an evaluation of the British Columbia Aquaculture Regulatory Program (BCARP) was recently completed in August 2015 and because of the limited marine finfish activities that take place in the Québec, Gulf, and Central and Arctic (C&A) regions. The role played by DFO's Conservation and Protection (C&P) Directorate as it pertains to the enforcement of the AAR and, when necessary, other aquaculture-related regulations was also examined as part of the evaluation.[1]

The evaluation commenced in October 2016 and concluded in October 2017. The evaluation was presented to the Performance Measurement and Evaluation Committee on January 17, 2018. It was approved secretarially on February 16, 2018.

2.0 PROGRAM PROFILE

2.1 Program Context

The Sustainable Aquaculture Program's overall goal is to contribute to an environmentally, economically and socially sustainable Canadian aquaculture industry. To achieve that goal, the Program leads and manages DFO regulatory frameworks associated with aquaculture activities. The Program derives its regulatory mandate from the *Fisheries Act* and also takes a lead role in the regulation of aquaculture in British Columbia. In all provinces and territories, DFO builds partnerships with other federal departments and provincial/territorial governments to coordinate and implement regulatory frameworks and management decisions. Partnerships are also maintained with Indigenous peoples and the aquaculture industry. The Program's regulation and policy development activities are supported by aquaculture research and peer-reviewed science advice carried out and provided by the Department. As of 2016-17, the Program included three

[1] Indigenous communities were not included in the scope of the evaluation given the project timeline and resources available.

sub-programs; 1) Aquaculture Management, 2) BCARP and 3) the Sustainable Aquaculture Science Program.

Aquaculture Management

The objective of the Aquaculture Management sub-program is to enhance the Department's aquaculture management regime, using regulations, and policies to implement its regulatory mandate for the aquaculture sector. The sub-program endeavours to improve current regulations and policies and/or develop new ones, which are streamlined and coherent across federal and provincial/territorial regimes, while ensuring protection of the aquatic environment. Activities are delivered by the Aquaculture Management Directorate (AMD) located in Ottawa and the Regional Aquaculture Management Offices (RAMOs) located in the six DFO regions.

British Columbia Aquaculture Regulatory Program

The objective of this sub-program is to effectively manage, administer and regulate aquaculture in British Columbia; and to govern all aquaculture activities, including finfish, shellfish, freshwater and land-based operations. BCARP is governed by the *Pacific Aquaculture Regulations* under the *Fisheries Act*.

Sustainable Aquaculture Science Program

The Sustainable Aquaculture Science Program (SASP) conducts research activities, which produce knowledge and advice to support aquaculture-related management decisions. The evaluation focused on the knowledge and advice produced by projects funded by the Program for Aquaculture Regulatory Research (PARR) but did not cover the Aquaculture Collaborative Research and Development Program component of this sub-program.[2] SASP is administered by the Aquaculture, Biotechnology and Aquatic Animal Health Science Branch located in Ottawa and research activities are performed by the Regional Science Divisions located in the six DFO regions.

Conservation and Protection Directorate

Federal fishery officers assess compliance for all national and regional regulations under the *Fisheries Act* that apply to aquaculture, including the AAR and, in British Columbia, the *Pacific Aquaculture Regulations* (PAR). C&P is provided specific funding to enforce aquaculture-related regulations in British Columbia; however, it did not receive any dedicated funding to enforce the new responsibilities that stemmed from both the implementation of the AAR and the transfer of authority of Section 36 (s. 36) of the *Fisheries Act* from Environment and Climate Change Canada (ECCC) to DFO for occurrences taking place on or close to aquaculture sites.

2.2 Program Resources

SAP activities have been directly supported by the following resources:

[2] The ACRDP sub-program does not include a regulatory research component and is, therefore, out of the evaluation scope.

Table 1: Total SAP Actual Expenditures and Full-Time Equivalent (FTE) Utilization by Fiscal Year between 2013-14 and 2016-17[3]

Sub-Program	Resources	2013-14	2014-15	2015-16	2016-17
Aquaculture Management	Expenditures	$ 5,705,012	$ 6,046,782	$ 5,492,204	$ 5,190,905
	FTE	49.9	53.8	51.6	48.6
BCARP	Expenditures	$ 3,823,295	$ 3,673,562	$ 3,484,523	$ 3,424,613
	FTE	33.0	35.8	33.9	34.0
SASP	Expenditures	$ 12,720,454	$12,465,609	$ 12,412,162	$ 13,798,593
	FTE	96.1	100.5	108.3	112.6
Total SAP	Expenditures	$22,248,762	$22,185,954	$21,388,889	$ 22,414,111
	FTE	179.0	190.1	193.8	195.2

Source: Integrated Business Management Services, DFO

The SAP resource profile shows that a total of approximately $10.8 million per year for the five year period between 2013-14 and 2017-18 was allocated to DFO as part of the Sustainable Aquaculture Program II (SAP II), a sunset program for which funding ends in 2017-18.[4] Basing such a significant proportion of SAP's resources on sunset funding has created two key risks for the Program. First, approximately 51 percent of the positions created by SAP II temporary funding to support AMD have been staffed on an indeterminate basis (i.e., permanently). This has created a major financial risk for the Program should SAP II not be renewed at the end of 2017-18. Second, all regulatory science research funded through PARR was provided via SAP II. In the absence of PARR funding, there would be no Operation and Maintenance (O&M) resources available to conduct regulatory science research or produce aquaculture-related peer reviewed science advice via the Canadian Science Advisory Secretariat (CSAS) to support decision- and policy-making.

[3] Please note that the expenditures presented in Table 1 do not fully align with the scope of the evaluation. As indicated previously, the evaluation did not cover the BCARP sub-program and ACRDP components of the SASP sub-program.

[4] This amount represents a ten percent reduction of resources (equivalent of five FTEs) when compared to the original SAP program launched in 2008-09 (SAP I).

3.0 EVALUATION METHODOLOGY

3.1 Evaluation Approach and Design

The evaluation's scope and questions were determined on the basis of the Treasury Board's *Policy on Results* (2016), a review of key Program documents, results from preliminary discussions with DFO senior management (Ecosystems and Oceans Science, Aquatic Ecosystems Sector, AMD, C&P) and findings and recommendations from previous reports.

The evaluation focused heavily on risk areas and current information gaps identified in consultations with senior management during the planning phase. This emphasis allowed the evaluation to respond to the current needs of senior management in order to best support departmental decision-making. Based on this preliminary work, the evaluation was calibrated to focus on determining:

- The need for the Program in light of DFO's mandate;
- The appropriateness of federal roles and responsibilities, including the need for an Aquaculture Act in Canada to address current regulatory barriers;
- The achievement of the Program's objectives;
- The extent to which the AAR is enforced by DFO; and,
- The operational challenges and costs associated with the development and implementation of the AAR.

3.2 Data Sources

In order to maximize the possibility of generating useful, valid and meaningful findings, the evaluation used a mixed methods approach, where both qualitative and quantitative data were collected. Extensive use of triangulation was undertaken as an analytical method, in which multiple lines of evidence helped to corroborate findings. The following methods were used to collect data:

- A review of internal and external documents;
- An analysis of financial, administrative and performance data;
- Two case studies on PARR-funded projects:
    - Research to support shellfish aquaculture regulatory issues in Prince Edward Island (PEI) (i.e., Gulf region).
    - Research to support finfish aquaculture regulatory decisions concerning monitoring for pesticides (i.e., Maritimes region).
- Key informant interviews (n=50):
    - DFO interviewees (n=35).
    - External interviewees (n=15):
        - Industry associations (n=5);
        - Environmental non-governmental organizations (n=4);
        - Provincial governments and federal departments (n=6).
- Three site visits to Atlantic Canada:
    - Gulf region;

- Newfoundland and Labrador (NL) region; and,
- Maritimes region (southwest New-Brunswick).

- A costing study.[5]

The evaluation matrix (Annex A) provides an overview of the evaluation questions, as well as the research methods that were used.

3.3 Methodological Limitations and Mitigation Strategies

Methodological limitations were mitigated, where possible, through the use of multiple lines of evidence and the triangulation of data. Other mitigation strategies were also used when deemed appropriate (see Table 2). This approach was taken in order to establish the reliability and validity of the findings and to ensure that the evaluation's conclusions and recommendations are based upon neutral and documented evidence. Details on limitations and their associated mitigation strategies are described in Table 2.

Table 2: Limitations and Mitigation Strategies

Limitations	Mitigation Strategies
Challenges documenting the use of science advice and knowledge by end-users	While AMD management reported making extensive use of scientific advice to support policy- and decision-making, it was often challenging to attribute specific decisions to particular research projects or CSAS advisory reports. Moreover, because many other factors usually play a role in the decision-making process, it was deemed inappropriate to assess the quality of the science produced by Ecosystems and Oceans Science (EOS) based solely on the frequency of its use by AMD. In order to mitigate these challenges, the evaluation design was adjusted as follows: ▪ The evaluation focused on assessing the level of satisfaction of AMD management with the quality and timeliness of the science advice produced by EOS; ▪ AMD managers were asked to provide anecdotal evidence of how science knowledge and advice was used ▪ Two cases studies were conducted in order to get an in-depth understanding of specific regulatory issues and how science is providing support to decision makers; and, ▪ The evaluation examined the extent to which science advice was used in the development of the AAR and its Monitoring Standard, two key policy deliverables produced by SAP during the period covered by the evaluation.
Challenges assessing the extent to which the RAMOs have the correct resources (number of FTEs and expertise) to deliver	There was a lack of clarity surrounding regional workloads and the resources available to support operations at the regional level, particularly for regional offices located in Eastern Canada. The evidence suggests that over the last four years, the varying responsibilities (i.e., SAP, Introductions and Transfers (I&T), CSSP) and workloads have increased in some regions, while the number of FTEs has remained the same. However, these increased responsibilities have

[5] The purpose of this study was to determine and cost the minimum operational and financial impacts of the AAR on DFO and to assess any current/future resource gaps that could compromise regulatory compliance and effective program delivery.

Limitations	Mitigation Strategies
the Program	affected the workloads of regions in an asymmetrical manner, based on a variety of factors.[6] Additionally, the lack of clarity regarding the funding available to support SAP and other aquaculture-related programs in some regions resulted in an inability to fully assess whether the current resources available are sufficient to meet the increased workloads in these regions.[7] In order to mitigate these challenges, the evaluation relied upon interviewees' opinions and available financial information to answer the evaluation questions.
Limitations concerning cost estimates used for the Costing Study and its results	A key challenge for the Costing Study was to identify all current and future operational impacts that the AAR and the transfer of s. 36 from ECCC to DFO is expected to have upon the Department. Furthermore, the absence of baseline information and/or reliable data around the level of effort associated with each activity, made it challenging to estimate the level of effort associated with each new operational requirement.[8] Consequently, the total cost of the AAR proposed by the Costing Study represents the minimum impact of this regulation. In order to mitigate this challenge, C&P was asked to develop an alternative costing model based upon a comprehensive and proactive enforcement regime similar to the model used as part of BCARP. The results of the C&P study were reviewed and included in the costing study when deemed credible and reasonable, based upon evaluation findings from other lines of evidence.
Challenges assessing the level of compliance for all aquaculture-related regulations	Project timelines and resources meant that it was not possible for evaluators to examine the industry's level of compliance with respect to every aquaculture-related regulation. In order to remain consistent with the evaluation's scope, the evaluation focused on assessing the industry's level of compliance with the AAR since the regulations' adoption in 2015.

[6] Examples of factors that have affected the workload of regions differently include: 1) the transfer of responsibilities from the Fisheries Protection Program to the Aquaculture Management Directorate in some regions for site assessments, and 2) the impacts of CSSP on various regions based on the level of shellfish activity in each province.

[7] For example, it appears that some DFO regions in the Atlantic have historically reallocated SAP funding to support programs that are not related to aquaculture and that some SAP positions located in the RAMOs were not funded directly by SAP.

[8] Please note that the identification and costing of activity was not as challenging for AMD and EOS.

4.0 FINDINGS – AQUACULTURE MANAGEMENT DIRECTORATE

4.1 Relevance – Aquaculture Management Directorate

4.1.1. Aquaculture's contribution to the Canadian economy

Key Finding: The aquaculture industry provides a significant contribution to the Canadian economy, particularly in rural and coastal communities.

Canada's aquaculture industry provides a significant contribution to the national economy. In 2015, the industry generated close to a billion dollars in total production value.[9] Aquaculture is also a driver of employment in Canada: it generates at least 14,000 full time jobs in the country, most of which are in rural or coastal communities (including Indigenous communities). The industry is of particular significance to British Columbia and the Atlantic provinces, as it is credited with revitalizing many low-income communities.[10] In the Atlantic Provinces, NL, Nova Scotia (NS) and PEI have made the growth of the aquaculture industry a key priority to ensure their economic prosperity. Based on 2013 figures, Canada ranked 29th world-wide based on total aquaculture production volume.[11] When the potential offered by Canada's shoreline is examined in conjunction with the growing global demand for seafood products and the stagnating of the capture fisheries sector, there is an opportunity for Canada to increase its aquaculture production volume and global market share.[12]

Although the aquaculture industry is a strong contributor to the Canadian economy, its production volume and value has remained relatively stable since 2010, while other countries have experienced growth.[13] The documentation consulted as part of the evaluation suggests that the complexity of the industry's regulatory framework may partially explain why the industry has become stagnant. Since the regulatory framework developed and administered by DFO has the potential to influence the future growth of the industry and, as a result, the economic prosperity of some of the Atlantic Provinces, there is a need for DFO to provide a regulatory framework that does not unnecessarily constitute a barrier for the growth of the sector.

[9] DFO (2015), "2015 Canadian Aquaculture Production Statistics". Site consulted on June 21, 2017: HTTP://WWW.DFO-MPO.GC.CA/STATS/AQUA/AQUA15-ENG.HTM

[10] Fisheries and Oceans Canada, "Communities and Employment", http://www.dfo-mpo.gc.ca/aquaculture/sector-secteur/commun/index-eng.htm, (February 26, 2015).

[11] Organization for Economic Co-operation and Development (2016), "Aquaculture Production". Site consulted on June 21, 2017:HTTPS://DATA.OECD.ORG/FISH/AQUACULTURE-PRODUCTION.HTM

[12] DFO (2015), "Farming the Seas- A Timeline". Site consulted on June 21, 2017: HTTP://WWW.DFO-MPO.GC.CA/AQUACULTURE/SECTOR-SECTEUR/FRM-TML-ENG.HTM

[13] DFO (2017), "Aquaculture – Production Quantities and Value". Site consulted on June 28, 2017: HTTP://WWW.DFO-MPO.GC.CA/STATS/AQUA/AQUA-PROD-ENG.HTM

4.1.2 Alignment of SAP activities with DFO's departmental responsibilities

Key Finding: SAP activities directly support DFO's obligations related to s.35 and s.36 of the *Fisheries Act*. There is a need for DFO to regulate the operations of the aquaculture industry in Canada, given the environmental risks associated with the industry.

Finfish and shellfish aquaculture activities in the marine environment create stressors on the aquatic ecosystem.[14] DFO has a responsibility under s. 35 (i.e., fisheries protection) and s. 36 (i.e., release of deleterious substances on aquaculture facilities) of the *Fisheries Act* to ensure that mitigation measures are in place to protect Commercial, Recreational and Aboriginal fisheries from these stressors. In order to ensure that the industry complies with s. 35 and s. 36, DFO has developed a suite of regulations with various national and regional reaches. Departmental responsibilities stemming from the *Fisheries Act* create an ongoing need for DFO to administer the operational requirements of the regulatory framework and to develop new regulations to adapt the framework to an evolving and increasingly complex industry context.

In fact, the evidence confirms that AMD is operating in an increasingly complex regulatory environment that is driven by various stakeholder groups that have competing views on the future of the aquaculture sector. The evaluation identified the following pressures on AMD's operations:

- Pressure from Indigenous peoples, Canadians, ENGOs and other organizations to increase DFO's understanding of the ecological risks of aquaculture activities and to provide an adequate regulatory response to these risks;
- Pressure from the United States to adjust Canada's regulatory framework in order to facilitate market access (i.e., changes to CSSP and the National Aquatic Animal Health Program – NAAHP);
- Pressure from industry to address minor regulatory incongruences that are specific to DFO's current regulatory framework; and
- Pressure from industry and the provinces to streamline the regulatory framework at the federal level because the current framework contains overlapping responsibilities for DFO, the Canadian Food Inspection Agency (CFIA), Health Canada (HC) and ECCC, which have resulted in uncertainties and inefficiencies.

4.1.3 Regulatory incongruences and overlap

Key Finding: The regulatory framework is not a major barrier to industry growth. Only a limited number of DFO-specific regulatory incongruences were identified and other factors appear to explain the stagnation of the aquaculture industry in Canada over the last 10 years. Amending DFO regulations would sufficiently address the identified regulatory incongruences.

[14] DFO (2010), "Pathways of effects for finfish and shellfish aquaculture", CSAS Science Advisory Report (2009/071), 22 pages

Evidence suggests that there is a need for AMD to address a limited number of minor longstanding DFO-specific regulatory incongruences that are negatively affecting the industry (Table 3). The findings show that these regulatory issues have affected the ability of the industry to operate efficiently but that they do not constitute a barrier to its development. The regulatory incongruences identified as part of the evaluation have resulted in higher compliance costs for the industry or are creating a barrier to entry for niche markets (i.e., cocktail oyster market).

Table 3: Summary of DFO-Specific Regulatory Incongruences

Regulations / Code	Description of Incongruences
Atlantic Fisheries Regulations (AFR) *Maritime Provinces Fishery Regulations* (MPFR) *Management of Contaminated Fisheries Regulations* (MCFR)	▪ Fisheries-specific clauses developed for the conservation of wild capture fisheries (i.e., shellfish) that were not designed for the management of aquaculture.
Fishery (General) Regulations (FGR) – Section 56	▪ Overlap with CFIA authorizations issued under the NAAHP. DFO and the CFIA issue different authorizations but may review the same movement (i.e. species, origin, and destination), based upon the same disease risks.
Aquaculture Activities Regulations (AAR)	▪ Inconsistencies across the regions regarding a few specific elements of the AAR Monitoring Standard.

Although there is a need for AMD to address these minor incongruences, other barriers (see Annex B) were found to act as greater impediments to the growth of the sector. This finding contradicts the importance placed by the sector on streamlining the regulatory framework, which is found in SAP's documentation. It also challenges the industry's position, which is articulated in its advocacy documents, namely that federal regulations are key impediments to the growth of the sector. Further, the evaluation found that the streamlining of DFO's regulatory framework represented only a small fraction of AMD's activities. Most Program activities are operational and support the delivery of the aquaculture industry's regulatory framework. All the activities delivered under SAP aligned with DFO's core responsibilities under the *Fisheries Act*.

The evidence also suggests that most of the regulatory incongruences identified could be addressed by amending the current regulations, rather than developing a new legislation. The aquaculture industry has been advocating for the development of an Aquaculture Act in Canada for several years. The industry believes that an Act would satisfy a number of sectoral challenges, and that there is a need for the federal government to affirm its commitment to the development of the aquaculture industry through legislative reforms and additional non-regulatory Program investments. The importance of an Act was echoed by the Senate Standing Committee on Fisheries and Oceans (POFO) in its 2015 report on aquaculture in Canada. However, most of the challenges and demand identified by the industry and the POFO report would involve a significant shift with regards to DFO mandate (and/or the federal government mandate) as it pertains to aquaculture and, thus was found to be beyond the scope of this evaluation.

4.2 Effectiveness – Aquaculture Management Directorate

AMD's key achievements and their associated benefits are summarized in Table 4, below.

Table 4: Summary of Key Achievements of AMD and Associated Benefits

Key Deliverables	Key Achievements and Benefits
Aquaculture Activities Regulations and the systems and tools to support implementation	▪ The AAR is the first national aquaculture-specific set of regulations in Canada. ▪ Development of the systems and tools to support the implementation of the AAR, including: o monitoring standards (two versions as of June 2017); o a guidance document; o reporting templates; o the national Aquaculture Integrated Information System (AQUIIS); and, o a Government of Canada website for the upcoming publication of AAR data. ▪ Preliminary and up-to-date information about who the aquaculture producers are in Canada. ▪ Information about the types and quantities of pesticides, drugs and chemicals released into the ecosystem. ▪ Information about the impact of organic loading from aquaculture activities on the benthic environment.
Memorandum of Understanding (MOU) on Pollution Prevention	▪ Improved coordination with other federal departments.
Multi-year licensing in BC	▪ Reduced administrative burden on DFO and industry. ▪ Long-term security for aquaculture operators.
Canada-USA Regulatory Cooperation Council	▪ Enhanced regulatory cooperation with the USA, which represents the main market for Canadian aquaculturists.
I&T Code 2013	▪ Renewed the National Code on Introductions and Transfers of Aquatic Organisms, which was led by the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) I&T Renewal Task Group with representatives from DFO, CFIA and the provinces and territories.
I&T Code 2017 Amendment	▪ Amended the I&T Code, which includes reference to the Atlantic province finfish health policy and other updates such as enhanced service standards.
CCFAM Aquaculture Development Strategy	▪ Developed and implemented the CCFAM Aquaculture Development Strategy 2016-2019 that outlines the strategic objectives for Canadian aquaculture and the actions required to achieve the desired outcomes.
RAMOs: On-going activities to support	▪ DFO delivered on its core responsibilities (s. 35 and s. 36 of the *Fisheries Act*).

Key Deliverables	Key Achievements and Benefits
DFO's mandate[15]	▪ Implementation of the AAR in collaboration with AMD-NCR and industry partners. ▪ Delivery of CSSP in collaboration with ECCC and CFIA. ▪ Approval of I&T licences. ▪ Managed relationships with stakeholders.

4.2.1 Achievement of SAP objectives – a streamlined regulatory framework

Key Finding: The federal regulatory framework is more complex than it was four years ago.

Over the last four years, SAP has focused its efforts on the development of the AAR and the delivery of other priorities (e.g., consultations on the potential development of an Aquaculture Act). As such, most of the regulatory incongruences identified in the report have not been addressed over the last four years.[16] There is, however, evidence that progress has been made with regards to the amendment of the FGR, AFR, MCFR and MPFR. Further, evidence shows that on-going consultation is taking place between federal partners to address the regulatory overlap associated with other regulations (i.e., CEPA-DAS).

According to interviewees, the adoption of the AAR did not to contribute to the achievement of a 'streamlined regulatory framework' and resulted in three unintended outcomes, which had a negative impact on the achievement of this objective. These unintended outcomes include:

- **Regulatory overlap with provincial programs**: In some provinces, the AAR created regulatory overlap with benthic impact monitoring programs. The involvement of the federal government in this area resulted in a need for provinces to adjust their provincial requirements to DFO's Monitoring Standard. In the worst cases, some provisions of the Monitoring Standard developed by DFO were perceived to conflict with the specific needs of each province, given provincial differences in geography.
- **Increased reporting burden on the industry**: Under the AAR, all producers are required to submit an annual report to DFO. Some interviewees noted that this requirement is duplicating requirements in some provinces.
- **Persisting uncertainties regarding the release of deleterious substances**: The main objective of the AAR was to provide legal clarity around the deposit of deleterious substances (i.e., drugs, pesticides and biological oxygen demanding substances) by the aquaculture sector. While the evidence shows that the AAR provided legal clarity regarding industry compliance with the requirements of the *Fisheries Act*, the industry continues to face uncertainties as it pertains to its compliance with the CEPA-DAS. In fact, interviewees from both the industry and the provinces expressed frustration from the uncertainties arising from ECCC's investigation under s.17 of the CEPA-DAS that was launched in spring of 2017.

[15] Please note that the key achievements of the RAMOs are anecdotal and do not capture all the accomplishments of the regions over the last four years. The evaluation focused on describing the achievements of AMD in terms of delivering a streamlined and transparent regulatory framework for the aquaculture industry.
[16] Only the implementation of multi-year licensing in BC has contributed to streamlining the regulatory framework in BC.

These interviewees believed that the AAR would help address the requirements associated with all the federal acts and regulations that apply to the release of drugs and chemicals used in aquaculture. The inability of the federal government to cooperate in order to provide a coherent and comprehensive regulatory framework as part of the AAR was emphasized by several interviewees.

4.2.2 Achievement of SAP objectives –a transparent regulatory framework

Key Finding: AMD is well-positioned to publish the information collected as part of the AAR annual reports.

AMD has made significant progress to increase the transparency of the regulatory framework. First, AMD has been successful at implementing all the reporting systems and tools necessary to collect and publish the information that is planned to be released to the public at the end of FY 2017-18. Second, AMD has begun to collect annual reports from aquaculture producers.

Since the AAR was implemented in 2015, the number of aquaculture producers who have provided their annual reports on time has varied across provinces and sector of activity. Interviewees noted that although the compliance level for finfish producers was almost 100 percent in 2016, these numbers are lower for shellfish, freshwater and in-land producers. The AMD and regional offices are involved in ongoing efforts to educate the industry about these new requirements.

Delays in releasing the information to the public are explained by: 1) challenges surrounding the quality and reliability of the data provided by aquaculture producers, and 2) their significant objection to publicly reporting on their use of drugs and pesticides at the site level. AMD and the regional offices are currently fixing software issues and are working with aquaculture producers to provide the support required to ensure that they understand what is required under the AAR. Consultations are also taking place with provincial and industry representatives to determine the level of information that will be made available to the public. While the industry's preference is for DFO to not report any information publicly, ENGOs have expressed a desire for detailed information at the site-level.

A few interviewees stressed that a key weakness of the current reporting system is the absence of a verification/audit system to ensure the accuracy of the information reported by the industry. These interviewees noted that it will be critical for the Department to validate the information provided to the Minister before it is released to the public. The Program is currently exploring quality control and auditing options; however, no actions have been taken so far.

4.3 Economy and Efficiency – Aquaculture Management Directorate

4.3.1 Efficiency of program operations (AMD-NCR and regional Offices)

Key Finding: Minor inefficiencies in the delivery of the Canadian Shellfish Sanitation Program and opportunities for improvement in the siting decision process, were identified.

The interviewees consulted as part of the evaluation reported a small number of challenges to the efficiency of the SAP with respect to the CSSP and the siting decision process. The issues are described in the following paragraphs.

Lack of tangible results were associated with the delivery of CSSP

Regional offices have been actively involved in the delivery of CSSP; however, many DFO interviewees noted that budget restrictions within ECCC and CFIA, a lack of clear direction for CSSP, and communication issues between national and regional offices have produced limited tangible results. Some interviewees explained that the slow progress faced in reclassifying the waters for which DFO is responsible has been costly for the department, because closed areas need to be patrolled by C&P until they are appropriately reclassified.

Opportunities for improvement were found, concerning the site assessment, amendment and review process

Historically, the Fisheries Protection Program (FPP) was responsible for supporting the provinces in their siting decisions, to ensure compliance with s.35 and s.36 of the *Fisheries Act* and components of the *Species at Risk Act.*[17] FPP provided aquatic biology expertise to support the siting decision-making process, which is led by the provinces. When the AAR were implemented, at least two regions, NL and Maritimes, decided to transfer the responsibility of site assessment to the RAMOs. This transfer of responsibility resulted in the following risks and issues:

- **Inconsistent roles and responsibilities across regions and loss of resources/expertise:** Interviews with internal stakeholders suggest that the decision to transfer the aquaculture siting decision-making process from FPP to the RAMOs was not applied consistently across the regions. Additionally, one interviewee mentioned that FPP retained the funding provided under the Program for Sustainable Aquaculture in 1999-2000. In NL and the Maritimes regions where the transfer occurred, it resulted in increased responsibilities for the RAMOs with no additional resources and a loss of expertise, because RAMOs do not have the biologists to support their activities.
- **Inconsistent and unclear involvement of the Ecosystems and Oceans Sciences Sector in the provincial siting decision-making process:** The involvement of EOS in the decision-making process also varies from one region to another. One region appears to systematically rely on the peer reviewed scientific advice published by the Canadian Scientific Advisory Secretariat; however, it was unclear how other regions involve EOS. In order to achieve the

[17] Evidence suggest that the location of an aquaculture site can have significant impacts on its productivity (e.g., prevalence of sea lice) and the ecological risk the site presents, including the impacts on species at risk.

SAP objective to provide a science-based regulatory framework, the systematic involvement of EOS is critical to ensure that scientific advice is available to decision-makers when assessing the ecological risks associated with a proposed site.

- **Lack of clear and consistent criteria to support decision making:** Each region uses its own criteria to guide aquaculture siting decisions. The use of clear and harmonized criteria is critical to ensure certainty of outcomes for the industry and transparency in the process. However, regional differences in the marine environment, as well as associated risks, may require the inclusion of region-specific criteria for siting decisions.
- **Lack of service standards:** Several internal and external interviewees raised concerns about DFO's ability to provide advice to provincial partners in a timely manner in a context where two provinces are expected to experience significant aquaculture industry growth in the near future. These interviewees noted that DFO does not always provide a timely response to requests for advice and that there are currently no service standards.

Given the lack of clarity around the roles and responsibilities of FPP, the RAMOs and EOS, with respect to provincial siting decision-making processes, it was not possible to provide a judgment on the level of resources required and where this expertise should be housed.

4.3.2 Economy – Access to resources and expertise to deliver the program

Key Finding: Overall, AMD has the right resources to deliver its Program. Some regional offices have reported operating at full capacity.

Over the last four years, several new responsibilities were transferred to the Program, which have had significant repercussions on the regional offices. These new responsibilities include: 1) the provision of advice to support the site assessment, amendment and review process led by the provinces; 2) the delivery of key components of the CSSP in collaboration with federal partners (ECCC and the Canadian Food Inspection Agency); and 3) the implementation of key elements of the AAR.[18] Some regions were also required to support C&P in the development of enforcement policies and are expected to play a key role with the consultation of Indigenous Peoples. No additional resources were provided to the regional offices to handle these increased responsibilities, which have resulted in an increased workload in the RAMOs. Most of the interviewees consulted mentioned that some Atlantic regional offices are operating at full capacity and, in the case of the NL and Maritimes regions, slightly below capacity as demonstrated by the annual salary deficit experienced by these regions over recent years. Interviewees in these two regions raised concerns about their ability to handle an increase in workload resulting from the growth of the industry or the transfer of further new responsibilities. One interviewee stressed the fact that SAP does not have a plan in place to face the expected growth of the industry.

[18] Regarding the development, implementation and ongoing delivery of the AAR, the study concluded that the additional workload in the regional offices will be minimal once the reporting process is well-established and functional. Consequently, the costing study contains no additional costs for the regional offices since it is expected that the reporting requirements and involvement in the Aquaculture Occurrence Management Process will be delivered using the resources currently available.

5.0 FINDINGS – CONSERVATION AND PROTECTION

5.1 Effectiveness – Conservation and Protection

5.1.1 Industry compliance with DFO aquaculture legislation and regulations

Key Finding: It was not possible to determine the finfish aquaculture industry's compliance rate with the *Aquaculture Activities Regulations.*

Since June 2015, only one violation related to the release of deleterious substances by the finfish aquaculture industry has been detected in the Atlantic region. However, this violation was detected and reported to C&P by Health Canada's Pest Management Regulatory Agency, rather than being identified as a result of proactive enforcement activities by C&P. This instance and the absence of a proactive enforcement regime for the finfish industry's use of illegal pesticides suggests that there is a real risk that other violations may have occurred and not been detected. As such, for the period under evaluation, the evaluation team was not able to assess with an adequate level of confidence the extent to which the aquaculture industry complies with the AAR and other aquaculture regulations, especially in the Atlantic region.[19]

C&P is currently in the process of establishing the plans, policies, procedures and training required to enforce the AAR. C&P management reported that the resources currently available will not be sufficient to establish a proactive enforcement regime in Canada and that any effort directed toward AAR-related activities will be done at the expense of other enforcement activities. The following section describes the progress made, as well as the current gaps with regards to the implementation of a proactive enforcement regime by C&P.

5.1.2 Progress made concerning the enforcement of the Aquaculture Activities Regulations

Key Finding: C&P made progress towards the establishment of key elements required for the enforcement of the AAR and the transfer of s. 36. However, many other activities will have to be completed before a comprehensive and proactive enforcement system is in place.

The enforcement of the AAR and the responsibilities associated with s. 36 of the *Fisheries Act* have presented unique operational challenges when compared with regulations associated with traditional capture fisheries. First, some of its elements, like the collection and testing of fish samples for the use of illegal pesticides, require a specific expertise for which not all Fishery Officers (FO) have been trained. Second, finfish aquaculture sites cannot be inspected as part of regular C&P patrols, due to the risk of biological contamination. The development of policies, processes, tools and training to address these two operational challenges explains the delays experienced by C&P with regards to the establishment of a pro-active and comprehensive enforcement of the AAR. However, there is evidence that C&P has made significant progress since 2015.

[19] C&P in the Pacific region is collecting robust information about occurrences and violations of aquaculture-related regulations. Given the scope of the evaluation on the Atlantic region, these data were not included in the analysis.

C&P's key achievements in the context of the implementation of the AAR include the following:

- Development of training plans and delivery of four training sessions in two regions
- Implementation of the Aquaculture Occurrence Management Process and development of some policies/bio-security protocols/guidance documents
- Negotiation of the Detailed Enforcement Implementation Plan in collaboration with ECCC and PMRA (in progress)
- Signature of a service-level agreement for forensic toxicology services (i.e., pesticide testing) in the Maritimes region (in progress). Other service-level agreements are currently being negotiated in the NL and Pacific regions.

Although evidence of progress toward the implementation of a proactive enforcement regime has been observed, significant gaps remain. These include:

- **Assessment of the risk of non-compliance with the aquaculture regulations by the aquaculture industry:** C&P did not conduct a risk assessment of the likelihood and impacts associated with finfish aquaculture industry activities. This analysis is critical to assess the level of effort required by C&P to enforce the AAR.
- **Lack of clear enforcement plans that are consistent across the regions:** The evidence available showed that only two enforcement plans in one region explicitly identified aquaculture as a formal enforcement priority for which FO are accountable. Moreover, interviews with C&P representatives have shown that DFO regions have different interpretations of what enforcement actions are required under the AAR: for example, one region felt that education activities should be prioritized over proactive inspections.
- **Access to key information for the planning of operations**: Some information that is obtained and managed by the provinces is critical to effective C&P operations. Notably, provinces possess sea lice levels and the presence of ISA by site; this information is critical knowledge for C&P to avoid bio-contamination when inspecting sites and to ensure that C&P's operations are conducted at the right time. C&P does not have a formal process to access this information.
- **Access to expertise in forensic toxicology:** C&P does not have toxicology expertise or the resources to build these capabilities in-house. Testing fish samples for illegal pesticides will need to be outsourced to either Health Canada's PMRA or ECCC's regional labs to ensure an efficient use of federal government resources. C&P currently only has one formal agreement in place in the Maritimes region to ensure its access to the right expertise at the right time to conduct successful investigations. Agreements will be needed in the NL and Pacific regions.
- **Coordination with local enforcement partners**: The roles and responsibilities of federal and provincial enforcement agencies vary significantly across the Atlantic Provinces. In order to ensure that a coordinated and harmonized enforcement regime is in place, C&P should collaborate with other federal and provincial agencies to alleviate the pressure on industry.

5.2 Economy and Efficiency – Conservation and Protection

Key Finding: Due to increased responsibilities and limited funding, C&P management recognizes that it will not be able to conduct enforcement activities and site coverage to a level that matches the estimated level of risk associated with the finfish aquaculture industry.

The adoption of the AAR and the transfer of authority of s. 36 of the *Fisheries Act* have had a significant impact on C&P activities and is expected to result in additional costs for C&P. As noted previously, C&P did not receive any funding from SAP II to support its new responsibilities under the AAR and the transfer of s. 36, which means that these additional costs will have to be absorbed by C&P as part of their current budget. The new responsibilities associated with the enforcement of s. 36 were found to present unique challenges for C&P. In fact, over the years, ECCC developed a unique expertise related to investigations of the deposit of deleterious substances into the waters of aquaculture sites and C&P is slowly developing this expertise. The evaluation found that the implementation of the AAR and the transfer of Section 36 will result in the following additional costs:

- **Salary costs:** The Maritimes and NL regions are proposing to hire additional FOs in order to support the enforcement of the AAR.[20]
- **Training costs:** Fishery Officers (FOs) who are responsible to enforce the AAR and to investigate the release of deleterious substances on aquaculture sites have been trained and will continue to be trained in the coming years. The costs associated with this activity include the purchasing of equipment.
- **Costs associated with the development of operational documents:** The development of new policies, processes and operational guidance documents to support aquaculture-related operations has affected the workload of C&P employees.
- **Costs associated with increased enforcement activities:** For the Maritimes and NL regions, an increase in the number of hours dedicated to the enforcement of AAR are expected. This should result in an increased number of FO-hours dedicated to aquaculture-related activities and an increased in the number of sites inspected by region over the next five years.
- **Costs associated with the testing of fish samples:** Under the AAR, finfish samples need to be collected and tested to detect if illegal pesticides were used. Given that DFO does not possess the capabilities to test finfish samples in-house, testing will need to be contracted out to an external party.
- **Costs associated with investigations/prosecutions**: C&P is now responsible for leading investigations in the following three situations: 1) reported fish mortality on a lease or close to a fish farm, 2) pollution occurrences (e.g., hydrocarbon spills), and 3) when illegal pesticides are found on site or when traces of illegal pesticides are detected in fish samples.

Interviews with C&P management revealed that the AAR is expected to create significant financial pressures on the regions and detachments where marine finfish activities are taking place. These interviewees mentioned that C&P does not have the resources to deliver

[20] It has to be noted that the additional salary costs will only be necessary in the case where C&P create a task force that is entirely dedicated to aquaculture-related operations, along the BC model. C&P management indicated that unless new funding is provided, it does not have the budget to hire additional Fishery Officers.

enforcement activities that match their preliminary assessment of the risks of non-compliance with the aquaculture regulations by the aquaculture industry..

Table 5, on the next page, provides an estimate of the AAR's additional costs to C&P for the following three DFO regions: Maritimes, NL and Pacific regions. These estimates are based upon a scenario in which all three regions hire additional FTEs who are fully dedicated to aquaculture-related operations.

Table 5: Summary of the C&P Specific Costs Associated with the AAR (five year projection)

Tasks	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Additional FTEs	$3,239,298	$3,239,298	$3,239,298	$3,239,298	$3,239,298
Training & Equipment for FOs	$368,662	$55,193	$55,193	$55,193	$55,193
Finfish Sampling Costs (contracted out)	$108,942	$108,942	$108,942	$108,942	$108,942
Total	$3,716,902	$3,403,433	$3,403,433	$3,403,433	$3,403,433

6.0 FINDINGS – ECOSYSTEMS AND OCEANS SCIENCE

6.1 Relevance – Ecosystems and Oceans Science

6.1.1 Need for science knowledge and advice to support decision-making

Key Finding: There is an ongoing need for aquaculture-related research to support decision-making and policy development at DFO.

The importance of science knowledge and advice to inform the decision-making process was confirmed by all federal and provincial decision- and policy-makers who were consulted as part of this evaluation. The need to conduct aquaculture-related science activities to support decision-making is supported by the following key arguments:

- **Science-based policy is a government priority and a best practice**: Science-based policy is a priority of the current government as expressed in the Minister's Mandate Letter. The role of science in support of policy development was also confirmed as a best practice in a federal government publication titled "*A Framework for Science and Technological Advice*" (1999)
- **Science-based policy increases social acceptability:** Concerns about aquaculture industry practices and a lack of social acceptance is a key barrier for the growth of the industry, especially for the finfish aquaculture sector. Evidence from the documentation suggests that science-based policy helps to increase public confidence in the sustainability of the sector. Science is also critical to support the Department when litigations occur.
- **Other regulators rely on DFO**: Provinces tend to have limited research capacity and often rely upon science advice provided by DFO to meet some of their needs (e.g., site assessment)
- **Increasing complexity of the aquaculture regulatory environment**: Evidence demonstrates that there is an ongoing need to increase our knowledge of the environment in which aquaculturists operate. Regulatory research is required to provide science advice into marine spatial planning, environmental interactions, and the carrying capacity of bodies of water. Advice is influenced by complexities such as climate change and aquatic invasive species.

The provincial and federal regulators consulted also noted that aquaculture is a relatively recent activity when compared to agriculture; and several knowledge gaps continue to exist on the ecological impacts of the industry. Interviewees identified many areas that will need further and ongoing regulatory research in the future, including:

- research in support of siting decisions and marine spatial planning;
- wild-cultured fish health interactions;
- biological effects and fate of drugs and pesticides;
- escapes (i.e., containment, recapture, ecological risks, triploids);
- depositional modeling to support s. 8 (1) of the AAR and MOU with provinces;
- benthic Impact Monitoring, including the impact on hard bottom substrates; and
- freshwater net pen benthic impact monitoring and water quality.

6.1.2 Alignment of research advice with decision-makers' information needs

Key Finding: Overall, AMD management in both the national and regional offices reports that the PARR projects funded, and science advice provided, over the last four years have aligned with information needs. However, interviewees in certain Regional Science Divisions (four in total) feel that the prioritization process led by AMD does not accurately reflect regional needs.

The perceived level of alignment between the science funded under PARR and the information needs of interviewees was found to vary significantly depending upon the group of stakeholders consulted. Almost all DFO policy- and decision-makers in both national and regional offices felt that the science funded by PARR over the last four years was aligned with their information needs. This perception was not shared in two of the four DFO Regional Science Divisions. In these two regions, there was general agreement among the interviewees consulted (i.e., two researchers in each region) that the science was primarily aligned with the needs of the Aquaculture Management Directorate in the National Capital Region (AMD-NCR); thus, that the science priorities identified by AMD as a result of the annual prioritization process did not accurately reflect their regional needs.

Other federal and provincial regulators were not fully aware of the research being conducted as part of PARR and therefore could not comment on the level of alignment of DFO's research with their information need. However, they expressed a strong interest in accessing and using DFO science knowledge and advice and identified several other needs that are not currently being met by their organizations, due to a lack of in-house R&D capabilities. The involvement of other federal and provincial regulators stakeholders in the AMD-led annual consultation process varied significantly across the regions.

6.1.3 Unmet and emerging need for research into the fate and biological effects of contaminants

Key Finding: Interviewees from both AMD and EOS identified an unmet and emerging need for research concerning the field of fate and biological effects of contaminants. EOS does not have the resources and expertise to support this emerging need.

As a result of the transfer of authority of s. 36 for the release of deleterious substances on aquaculture sites, a Memorandum of Understanding (MOU) was established between ECCC, DFO and HC to ensure that the use of contaminants by the industry is adequately monitored and enforced. As part of this process, the partners agreed to negotiate and sign three detailed implementation plans, including the Science Advice Implementation Plan (SAIP). The purpose of the SAIP is to "*establish an interdepartmental science-based research and advisory process for a science-based review of post-deposit monitoring and remedial actions for drugs and pesticides used by the aquaculture industry to inform the evolution of the Aquaculture Activities Regulations (AAR) and/or its related standards.*"[21] To achieve this, it was agreed that DFO will "*undertake specific research as necessary to augment the existing knowledge base* [i.e., on the

[21] DFO (2017). Science Advice Implementation Plan, p.1.

fate and biological effects of aquaculture contaminants]."[22] The need to conduct research in these fields has become a departmental priority, due to the results of a recent ECCC-led investigation, which concluded that more research was needed and likely more stringent measures need to be applied by the industry when drugs and pesticides are used for the treatment of sea lice. ECCC believes that this additional research and more stringent measures are necessary for the industry to comply with the Canadian Environmental Protection Act's Disposal at Sea provision (CEPA-DAS) and to demonstrate the impacts of such drugs and pesticides on the environment.

According to AMD and EOS management, and further to previous decisions, DFO no longer undertakes this kind of research in-house. Most DFO interviewees believe that more research is required to better assess the ecological risks associated with the use of drugs and pesticides in aquaculture, and to therefore assess the legitimacy of the concerns raised by ECCC as part of their investigation. EOS does not currently have the staff (i.e., chemists), equipment or core operational funding to deliver on the commitment made under the SAIP. Developing these capabilities as part of the current SAP budget or contracting out the research would have a significant impact on the availability of other AMD research priorities. The costing study revealed that developing in-house capabilities in the field of fate and biological effects of contaminants would cost approximately $1,975,000 in salaries and O&M costs and would require an initial investment of $800,000 in equipment. The salaries and O&M required to develop these capabilities represent 38 percent of the budget available under PARR in 2016-17.

Furthermore, the evaluation noted other unmet needs related to research on the fate and biological effects of contaminants, which were not directly related to the SAIP. These unmet needs include:

- **POFO recommendation:** The Senate committee recommended that DFO should prioritize research in the fields of biological effect and fate to support industry demand for a minor use, minor species program.
- **Support to C&P investigations:** Access to in-house research expertise in the fields of fate and biological effects will be essential to support C&P investigations as demonstrated by the ECCC-led investigation conducted against Cooke Aquaculture Inc. in 2010. Some interviewees noted that having access to in-house capabilities is essential to ensure the confidentiality, chain of custody and timeliness of science advice. Interviewees also identified a need to develop tools for the detection of various types of contaminants.
- **PMRA**: This agency used DFO science advice to support their pesticide risk assessment framework before 2012. The agency expressed an ongoing interest in this type of research.
- **Analysis of AAR data**: Eco-toxicology expertise will be required to conduct trend analysis on the data provided to AMD by the industry.

AMD management clearly stated that the implementation of the AAR in 2015 created a significant and pressing need for DFO to conduct research around the fate and biological effects of contaminants. In the words of one interviewee: "*DFO got out of the business of contaminants in 2012, but the development of the AAR has got us back in that business as it pertains to aquaculture.*" Most of the needs identified in this section only emerged over the last year and

[22] Idem.

were not identified by AMD management during the period between 2013 and early 2016. While EOS is aware of the growing needs for such research, it has not conducted a thorough needs assessment of internal and external policy- and decision-makers, with respect to research into fate and biological effects. Because EOS no longer has in-house capabilities in these research areas, and has a limited funding program delivered through the National Contaminants Advisory Group, there is a risk that DFO may be not be able to meet its SAIP commitments or the growing needs of its clients for research into these two fields.

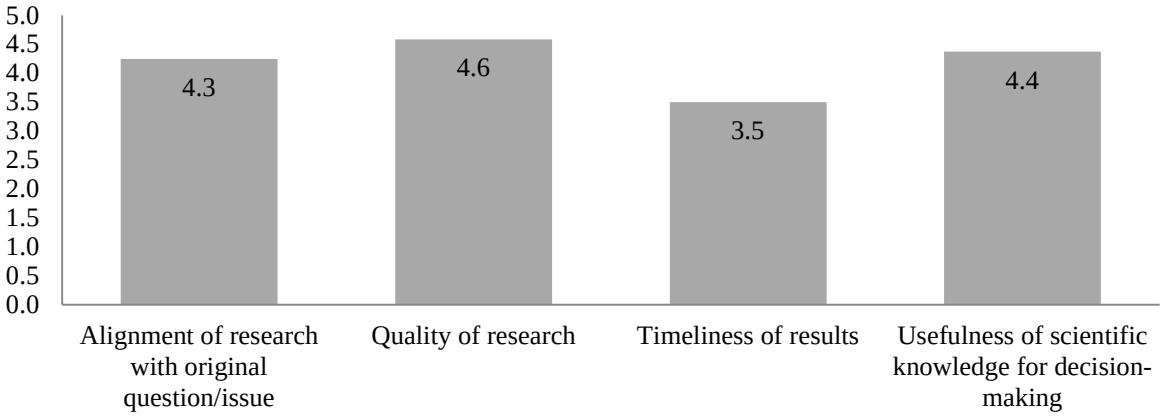
6.2 Effectiveness – Ecosystems and Oceans Science

Key Finding: EOS delivered scientific knowledge and advice in support of decision- and policy-making. There is evidence that science knowledge and advice is strongly valued and used by AMD management.

From 2013 to 2016, EOS held 17 peer review CSAS processes and funded 47 PARR projects, which were valued at approximately $12.5M, including leveraged funding. In addition to the ongoing interactions between EOS and AMD for the communication of science advice at the national and regional levels, a total of 126 scientific articles were published in peer-reviewed journals during this time period.[23]

The evidence suggests that DFO management and other regulators at the federal and provincial levels are strongly satisfied with the science advice produced by EOS (See Figure 1).

Figure 1: User Satisfaction with DFO Aquaculture Regulatory Science, (n=18)[24]



Evaluators examined PARR project reports, CSAS advisory reports and undertook two case studies in the Maritimes and Gulf regions to determine how science advice and knowledge

[23] Please note that these results do not reflect all the output of the science investments made as part of SAP II as many projects were underway when the evaluation was being conducted. More outputs are expected to occur in the future years as the projects are completed and the results are published.

[24] Respondents were asked to rate their level of satisfaction using a scale of 1 to 5, where 1 was the lowest level of satisfaction and 5 was the highest level of satisfaction.

provided by EOS was used to support decision- and policy making. Evidence of the use of science advice to support decision-making includes:

- **Production carrying capacity in Foxley River, PEI (Gulf region):** In response to industry applications to convert bottom oyster leases to suspended culture leases, the DFO PEI office requested science advice to better understand the potential impacts of conversions on existing oyster leases. Scientific advice was provided by DFO scientists to the PEI Leasing Board; the board advised the DFO PEI office to grant the conversion of 55 acres of bottom leases to suspended culture. The DFO PEI office is currently in the process of approving these conversions.
- **Spread of disease from site-to-site (Maritimes):** As early as 2006, the province of NB used DFO oceanographic current modelling research to develop and implement a Bay Management Area system to manage spread of disease among finfish aquaculture sites.
- **Sea-lice transmission from farmed to wild salmon (Pacific):** Research into salmon physiology determined that juvenile salmon are most susceptible to sea lice infection, and most likely to die from infection. License conditions were adapted in BC to ensure that aquaculture sites near salmon rivers exert more control over sea lice during juvenile migration periods.
- **Genetic interactions between wild and farmed Atlantic salmon (NL):** Research demonstrated that hybridization and introgression between escaped farmed salmon and wild salmon is occurring in NL. The results have helped decision-makers to better understand the ecological risks of escapees.
- **Toxicity of contaminants on non-target organisms (Maritimes)**: Several PARR projects were initiated to investigate the fate and biological effects of various legal and illegal pesticides on non-target organisms (primarily lobsters and shrimp). The information was used in the following manner by regulators:
    - PMRA used data from these projects in its risk assessment framework and regulatory decision-making. It has also used DFO science advice for its label instructions on Salmosan®.
    - The industry and province in NB chose to not seek another emergency registration for AlphaMax®, once its toxicity to non-target organisms was known.
    - ECCC used these results in its litigation against a Cooke Aquaculture Inc. in response to a lobster kill.

While EOS provided science advice and knowledge to support decision-making and policy development, in some cases, other factors were more influential in final decisions. The evaluation found that although science advice supported the development of the AAR and the Monitoring Standard, key elements were not determined by science evidence, such as the timing for sample testing and the threshold for hard bottom benthic environments. The timing for the sample testing was reported to be a temporary measure until the results of a peer review CSAS process to standardize this requirement across the country are available. Evaluators also learned that a new technique to stabilize samples over time has been developed in Saint Andrews, NB, which could provide a solution to the degradation of samples over time and affect the content of the Monitoring Standard. With respect to the threshold for hard bottom benthic environment, three projects are currently underway in the NL region.

A few interviewees also noted that the AAR does not reflect current knowledge of the impact of pesticides on non-target organisms like lobsters, because the AAR does not include any post-deposit monitoring provisions. Such provisions would be necessary to assess whether the use of pesticides is resulting in unintended ecological impacts beyond the area where the product is directly applied and deposited (i.e., the net-pen cage). A few interviewees noted that the need to deliver a zero-cost regulation for the industry may explain why such a provision was not included in the AAR. The research that will be initiated in response to the Science Advice Implementation Plan (SAIP) could result in changes to the AAR and/or its Monitoring Standard.

6.3 Economy and Efficiency – Ecosystems and Oceans Science

6.3.1 Efficiencies of program operations

Key Finding: EOS operates in an efficient manner, although B-base funding (PARR) is creating minor inefficiencies.

Overall, the science component of SAP was delivered in an efficient manner. EOS was successful at conducting PARR projects and coordinating peer review CSAS processes that generated advice that is valued by decision- and policy-makers. The breadth of expertise (staff and state-of-the-art facilities), the presence of established and efficient consultation mechanisms, the ability to make linkages with expertise in other programs, and the delivery of peer-reviewed science advice explain the success of EOS.

The fact that the PARR funding is B-based was not found to be a significant barrier to the efficient operation of the Program. Nonetheless, EOS experienced challenges with staff recruitment and retention as only determinate positions could be offered. Some interviewees also noted that the workloads associated with funding renewal and delays in the release of funds when new cycles are initiated had created inefficiencies.

6.3.2 Resource Limitations

Key Finding: The AAR and the anticipated growth of the industry have created a need for additional resources in order to maintain an equivalent level of service to policy- and decision-makers.

Section 8 (1) of the AAR requires that the industry provide a depositional model to DFO as part of any site application process. This process ensures that the depositional contour of any new aquaculture site or any amendment to a site is defined and that no sensitive fish habitat or CRA fisheries are negatively affected. This new regulatory requirement is expected to put pressure on the resources available to EOS, as EOS will be required to provide advice on these models in a relatively short timeframe to DFO management then on to the province. The collection and reporting of data on the quantities of pesticides, drugs and chemicals used by the industry, which is now required by the AAR, has also created additional work for EOS. In fact, EOS is now required to analyse the data in order to add value to the information and also to avoid any misinterpretation of publicly available information by interested parties.

According to EOS interviewees, the additional workload stemming from the need to provide science advice to support the siting decision process and the AAR, in a context of industry growth, has created a need for additional resources in order to maintain an equivalent level of service to policy- and decision-makers. EOS estimates that it would need six additional FTE biologists ($750,000K annually) and O&M estimated at $100,000 per year in order to meet these current and future needs in a timely manner. Other sources of information indicated that one FTE per region would be required to realize these tasks. It was not possible to assert with a strong level of confidence what a sufficient level of resources would be, to undertake these new responsibilities.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

Aquaculture Management Directorate

The *Fisheries Act* provides the authority under which DFO develops new regulations and administers the operational requirements associated with its regulatory framework. The evidence collected suggests that there is a need for AMD to address DFO-specific regulatory incongruences that are negatively affecting industry operations. Most of the regulatory incongruences identified as part of the evaluation could be addressed by amending the current regulations.

Overall, AMD was not successful at streamlining the regulatory environment. This is because AMD focused its efforts on the development and implementation of the AAR, thus delaying the amendment of certain longstanding regulatory incongruences, which have negatively impacted the industry over the years. Additionally, the adoption of the AAR has resulted in unintended outcomes that did not contribute to a streamlined regulatory framework. In terms of increased transparency through public reporting, it was found that software issues and communication challenges with the industry regarding reporting requirements, have delayed this expected result.

With respect to the efficiency and economy of the Program, the evaluation identified only minor inefficiencies in the delivery of the Canadian Shellfish Sanitation Program and opportunities for improvement in DFO's involvement in provincial siting decision processes. Aquaculture Management at both headquarters and in the regions appears to have the right resources to deliver the Program; although some regional offices have reported operating at full capacity.

Conservation and Protection

While there is evidence that C&P has made progress regarding the enforcement of the AAR and s. 36, many activities will have to be realized before a nationally-consistent enforcement regime is delivered in each of the DFO Regions where aquaculture activities take place. Furthermore, the lack of resources could have an impact on C&P's ability to dedicate enforcement efforts to match the level of risk of non-compliance with the aquaculture regulations by the aquaculture industry. According to the new Departmental Results Framework (DRF), the enforcement of the AAR is critical to SAP's performance regarding environmental sustainability.

Ecosystems and Oceans Science

All federal and provincial decision- and policy-makers that were consulted as part of the evaluation confirmed the importance of science knowledge and advice to support the decision- and policy-making process. These same interviewees also noted knowledge gaps concerning the impacts of the industry upon aquatic organisms and the environment. The evaluation identified a capacity gap that may have an impact upon EOS`s ability to address emerging information needs regarding research into the biological effects and fate of drugs and pesticides used by the aquaculture industry, which the Department will be responsible to provide, according to the AAR and a Science Advice Implementation Plan and MOU between DFO, Health Canada and

ECCC. Further to previous decisions, research into biological effects is being sourced externally through the by the National Contaminants Advisory Group, while EOS does not currently have the resources and expertise to produce science advice concerning the fate of drugs and pesticides in the environment.

Overall, decision- and policy-makers consulted as part of the evaluation expressed a strong level of satisfaction with the knowledge and advice produced by EOS. Case studies and interviews revealed evidence that the knowledge and advice provided by EOS is used by policy- and decision-makers. EOS operates in an efficient manner, although the nature of the B-base funding of the Program for Aquaculture Regulatory Research has created minor inefficiencies.

7.2 Recommendations

Based on the findings of the evaluation, the following recommendations are being made:

Recommendation 1: It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, as part of the upcoming program funding renewal process, clarifies and better articulates the program objectives to ensure that these objectives align with its core responsibilities.

Rationale: SAP supports DFO's departmental responsibilities related to s. 35 and s. 36 of the *Fisheries Act*. Currently, the Program's objectives place emphasis on streamlining the regulatory framework; however, the evaluation found that only a fraction of AMD-NCR staff (20%) are working on activities that are aligned with this program objective. The remaining staff, including those located in the regional offices, are supporting operational requirements associated with DFO's core responsibilities (section 35 and 36 of the Fisheries Act). Evidence suggests that there is a need for AMD to address a limited number of minor longstanding DFO-specific regulatory incongruences that are negatively affecting the industry. Although there is a need for AMD to address these minor incongruences, the evaluation found that other barriers have acted as greater impediments to the growth of the sector. This finding challenges the industry's position, which is articulated in its advocacy documents, that federal regulations are key impediments to the growth of the sector.

Recommendation 2: It is recommended that the Assistant Deputy Minister, Ecosystems and Oceans Science develop, or secure access to, research in the fields of fate and biological effects of contaminants. This research should allow EOS to:

- support DFO's commitments identified in the Science Advice Implementation Plan in a timely manner; and,
- meet, to the extent possible, the other knowledge and advice needs of DFO regarding the fate and biological effects of contaminants used by the aquaculture industry.

Rationale: AMD management and other federal/provincial regulators have a pressing need for science advice related to the fate and biological effects of contaminants used by the aquaculture industry. The Science Advice Implementation Plan, which stems from an MOU between DFO, HC and ECCC also requires DFO to lead research and provide advice into the fate and biological effects of drugs and pesticides. As of July 2017, EOS does not have the research expertise or the

core resources to deliver on the SAIP commitment or to meet the other needs identified in the report. It is particularly important that the Department be able to secure expertise in these areas and provide timely advice to management and regulators, given the current context of ECCC's investigation.

Recommendation 3: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management assess the risk of non-compliance with the aquaculture regulations by the aquaculture industry; and, use this assessment to develop a proposal for enhanced enforcement of aquaculture regulations by C&P detachments across Canada to inform the renewal of the Sustainable Aquaculture Program.

Rationale: Interviews with C&P management show that the level of risk associated with non-compliance by the aquaculture industry has not been formally assessed. A risk assessment is essential in order to determine the level of effort needed to enforce the AAR and to meet its new responsibilities associated with the enforcement of s. 36 of the *Fisheries Act*. There is also a need for C&P to formalize its activities as part of enforcement plans. In this regard, only one region formally identified aquaculture as part of its enforcement plans. Additionally, these plans provided a high-level mention of aquaculture, but did not include what specific enforcement activities will be conducted and the level of effort required. Interviews with C&P representatives have shown that regions have different interpretations of what enforcement actions are required under the AAR. There is a need for C&P to implement equivalent risk-based enforcement to ensure that a nationally-consistent enforcement regime is delivered in each of the DFO Regions where aquaculture activities take place.

Recommendation 4: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management establish Regional Working Agreements with the relevant federal and provincial partners in the Atlantic regions to ensure that C&P has access to key information and expertise, and that a coordinated enforcement regime is put in place.

Rationale: The evaluation identified several information and expertise gaps that could hamper C&P's ability to conduct coordinated and efficient enforcement activities. Some information held by provinces, such as sea lice levels and the presence of pathogens, is critical to ensure that C&P's operations are conducted at the right time and that biological contamination is avoided. As of July 2017, C&P does not have access to the required expertise to test fish samples for the detection of illegal pesticides. It is expected that the testing of fish samples will be outsourced to either PMRA or ECCC's regional labs. Formal agreements with partners will be essential for C&P to ensure that Fisheries Officers have access to the right expertise at the right time to conduct successful investigations. There is also a need to coordinate C&P's enforcement activities with other federal and provincial agencies to ensure that a coordinated and harmonized enforcement regime is in place in Canada.

Recommendation 5: It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, in collaboration with the Assistant Deputy Minister, Ecosystems and Oceans Science, review the siting decision process to:

- clarify the roles and responsibilities between the Fisheries Protection Program and the Regional Aquaculture Management Division in the provincial siting decision process;
- define the roles and responsibilities and expected level of involvement of EOS in the provincial siting decision process;
- define clear criteria for decision-making that are harmonized and applied consistently across the regions; and
- establish service standards to ensure timely delivery of advice to the provinces.

Rationale: The process for making provincial aquaculture siting decisions varies across regions, and there are no established service standards. The roles, responsibilities and level of involvement of both the Fisheries Protection Program and EOS in support of the provincial siting decision process varies across the regions. Likewise, the criteria to support the decision-making process are unclear and inconsistent across the regions. There is a need to provide clear and harmonized decision-making criteria in order to ensure the transparency of the process and to provide certainty of outcomes for the provinces and the industry. The role of EOS also needs to be clarified to ensure that the decision-making process is supported by science advice. Finally, service standards should be established, to ensure that DFO provides advice in a timely manner and does not negatively affect the length of the lease/license approval process, which is led by the province.

ANNEX A: EVALUATION MATRIX

Evaluation Questions	Indicators	Document Review	Review of Administrative & Performance Data	Key Informant Interviews	Case Studies	Costing Analysis
Relevance						
1. Is there a continued and demonstrable need for the Sustainable Aquaculture Program?	1.1 Evidence from documents / program stakeholders' views re: the importance of the aquaculture sector for the Canadian economy.	X		X		
	1.2 Comparative analysis of the socio-economic impacts of the industry in other countries (based on secondary sources of data)	X				
	1.3 Evidence from documents / program stakeholders' views of current and on-going knowledge gaps and/or information needs of policy- / decision-makers.	X		X	X	
	1.4 Evidence of legislative / regulatory barriers and/or incongruences that affect the growth of the aquaculture sector.	X		X	X	
2. To what extent is the Sustainable Aquaculture Program (SAP) consistent with federal roles and responsibilities? ▪ Is there a specific need for a legislative reform (e.g., Aquaculture Act) to regulate aquaculture activities in Canada?	2.1 Evidence from documentation / program stakeholders' views re: the appropriateness of federal roles and responsibilities.	X		X		
	2.2 Evidence from documents / program stakeholders' views that Memorandum of Understanding (MOU) between the federal and provincial governments contribute to clarifying the roles and responsibilities of the different levels of government.	X		X		
	2.3 Evidence from the documentation / program stakeholders' views re: the need for a legislative reform to regulate aquaculture activities in Canada.					
Effectiveness						
3. To what extent has the SAP achieved its expected outcomes: ▪ Canada's aquaculture sector operates within a streamlined and	3.1 Evidence of the regulatory changes made by the Department of Fisheries and Oceans (DFO) and its federal/provincial partners to streamline the regulatory framework of the aquaculture industry in Canada.	X		X		

Evaluation Questions	Indicators	Document Review	Review of Administrative & Performance Data	Key Informant Interviews	Case Studies	Costing Analysis
transparent regulatory regime that protects the environment; ▪ New scientific knowledge has been developed and this knowledge supports policy- and decision-makers; and ▪ Timely and predictable reporting on the environmental and economic performance of the aquaculture sector is available to the public.	3.2 Evidence of enhanced regulatory cooperation with regulators in other countries.	X		X		
	3.3 Industry and stakeholders' views re: the extent to which the changes made to the regulatory framework reduced the regulatory burden or complexities associated with their operations.	X		X		
	3.4 Evidence from documents / program stakeholders' views re: factors that have hindered or facilitated SAP's ability to streamline the regulatory framework (e.g., presence/absence of up to date MOU with provinces).	X		X		
	3.5 Evidence that SAP-funded science activities have been performed and outputs have been generated over the last four years.	X	X	X	X	
	3.6 Key Performance Indicators include: ▪ Number and value of Program for Aquaculture Regulatory Research (PARR)-funded projects, by research theme and region; ▪ Number of aquaculture-related journal publications; and ▪ Number of Canadian Scientific Advisory Secretariat (CSAS) peer review processes.		X			
	3.7 Evidence of formal processes between Aquaculture Management Directorate (AMD) and Science to align SAP-funded scientific research with AMD regulatory needs.	X		X	X	
	3.8 Policy- / decision-makers' level of satisfaction with the quality, relevance and timeliness of scientific knowledge and advice produced by SAP.			X		
	3.9 Evidence of the use of SAP-funded scientific knowledge and advice by policy- and/or decision-makers.	X		X	X	
	3.10 Evidence from documents / program stakeholders' views re: the factors that hindered and/or facilitated the use of SAP-funded scientific	X		X	X	

Evaluation Questions	Indicators	Document Review	Review of Administrative & Performance Data	Key Informant Interviews	Case Studies	Costing Analysis
	knowledge by policy-and/or decision makers.					
	3.11 Evidence re: progress made toward the publication by DFO of information pertaining to the environmental performance of the aquaculture industry.	X	X	X		
	3.12 External stakeholders' views re: the minimal information requirements that would need to be in place to ensure public confidence in the environmental sustainability of the aquaculture sector.			X		
	3.13 Evidence that mechanisms are in place to ensure that the information provided by the industry to DFO is accurate.	X		X		
4. To what extent is the aquaculture industry compliant with DFO's aquaculture legislations and regulations?	4.1 Evidence from documents / program stakeholders' views re: the industry's level of compliance with aquaculture regulations.	X	X	X		
	4.2 Key Performance indicators for C&P enforcement: ▪ Total number of hours of patrols and number of sites checked, by region; ▪ Total number of hours dedicated to aquaculture, by type of activities and by region; ▪ Proportion of sites covered by patrols by region; ▪ Number of violations, by type, region and Fiscal Year; ▪ Total number of occurrences by type, by region and by Fiscal Year; and ▪ Other CSSP program data.		X			
	4.3 Evidence that aquaculture component is included in enforcement plans in all regions in which C&P management deems them necessary.	X		X		
	4.4 Evidence from documents / program stakeholders' views re: factors that facilitate and/or hinder DFO's ability to enforce the AAR and other aquaculture regulations.	X		X		

Evaluation Questions	Indicators	Document Review	Review of Administrative & Performance Data	Key Informant Interviews	Case Studies	Costing Analysis
Efficiency and Economy						
5. To what extent is the program operating in an efficient manner?	5.1 Evidence from documents / program stakeholders' views re: program's efficiency.	X	X	X	X	X
	5.2 Evidence from documents / program stakeholders' views re: factors that facilitate and/or hinder DFO's ability to operate in an efficient manner.	X	X	X	X	X
6. What operational and financial impacts have the AAR and the transfer of authority of Section 36 of the *Fisheries Act* had on DFO? ▪ To what extent does DFO have the right resources to address the additional requirements of the AAR and changes to Section 36 of the *Fisheries Act*?	6.1 Impacts of the AAR and the transfer of authority of Section 36 of the *Fisheries Act* from ECCC to DFO.	X	X	X		X
	6.2 Comparative analysis of costing study results with the resources currently available to SAP.	X	X	X		X
	6.3 Program' views re: extent to which DFO has the appropriate resources to administer and enforce aquaculture-related activities.	X	X	X		X

ANNEX B: BARRIERS TO INDUSTRY GROWTH IN CANADA

Barriers	Evidence
Access to space for new sites	▪ Moratorium in British Columbia (BC represents 62% of the finfish production volume in 2015).[25] ▪ Availability of suitable space in NB and Gulf region for finfish activities. ▪ Prohibition of net-pen aquaculture in Québec. ▪ Moratorium on new shellfish leases across PEI.
Negative public perception of the finfish industry	▪ Uncertainties around the environmental risks associated with aquaculture and distortions of these risks by interested parties. ▪ Violations of the *Fisheries Act* confirmed in two provinces, including the use of illegal pesticide and the unapproved introduction of fish. ▪ Perceived lack of publicly available information around the use of pesticides and other environmental impacts. ▪ Perception that Canada's regulatory framework is not as stringent as other jurisdictions. ▪ Litigation in BC and NL.
Complexity of the federal regulatory framework	▪ Overlapping responsibilities at the federal level regarding the release of pesticides, combined with polarized views on how different laws, regulations and international agreements are interpreted across federal departments. ▪ Shared responsibilities across federal departments for increasingly complex issues (e.g., Fish Health and Food Safety) that fall under the mandate of more than one federal department (i.e., NAAHP and CSSP). ▪ Uncertainties around the development of an Aquaculture Act delayed the approval of new leases in one Atlantic province.
CSSP	▪ Budget constraints at ECCC and inefficient coordination among the partners are resulting in slow progress on the reclassification of water for aquaculture leases. ▪ Closing of areas by ECCC based on inadequate weather information (location of weather station).

[25] Statistics Canada, Aquaculture, production and value, by province and Canada – 2015. Site consulted on August 30, 2017: WWW.STATCAN.GC.CA/PUB/23-222-X/2015000/T053-ENG.HTM

ANNEX C: MANAGEMENT ACTION PLAN

RECOMMENDATION 1
Recommendation 1 It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, as part of the upcoming program funding renewal process, clarifies and better articulates the program objectives to ensure that these objectives align with its core responsibilities. **Rationale:** SAP supports DFO's departmental responsibilities related to s. 35 and s. 36 of the *Fisheries Act*. Currently, The Program's current objectives place emphasis on streamlining the regulatory framework; however, the evaluation found that only a fraction of AMD-NCR staff (20%) are working on activities that are aligned with this program objective. The remaining staff, including those located in the regional offices, are supporting operational requirements associated with DFO's core responsibilities (section 35 and 36 of the Fisheries Act). Evidence suggests that there is a need for AMD to address a limited number of minor longstanding DFO-specific regulatory incongruences that are negatively affecting the industry. Although there is a need for AMD to address these minor incongruences, the evaluation found that other barriers have acted as greater impediments to the growth of the sector. This finding challenges the industry's position, which is articulated in its advocacy documents, that federal regulations are key impediments to the growth of the sector.
STRATEGY
The Aquaculture Activities Regulations (AARs) are the mechanism to implement DFO responsibilities for s. 35 and s.36 of the Fisheries Act and were created as a key part of the Sustainable Aquaculture Program. As AMD continues to implement the AARs, there is an opportunity to re-examine the objectives of SAP. AMD will undertake a review of the SAP components to re-align resources and clarify objectives of the program. A re-designed SAP program will endeavour to better align with the core responsibilities under s. 35 and s. 36 of the Fisheries Act as well as address emerging areas of importance for the aquaculture industry.

MANAGEMENT ACTIONS	DUE DATE (BY END OF MONTH)	STATUS UPDATE: COMPLETED / ON TARGET / REASON FOR CHANGE IN DUE DATE	OUTPUT
Conduct internal analysis on the current SAP components on how to better align with core responsibilities an emerging areas of focus.	April 2018		Policy paper that clarifies and articulates the intended objective of a re-designed SAP program and how it aligns with core responsibilities.

Develop a policy proposal to propose a re-designed SAP program that aligns with core responsibilities.	June 2019		A new sustainable aquaculture program that addresses the recommendations from both the internal evaluation and the audit conducted by the Office of the Auditor General, Commissioner of the Environment and Sustainable Development.

RECOMMENDATION 2

Recommendation 2: It is recommended that the Assistant Deputy Minister, Ecosystems and Oceans Science develop, or secure access to, research in the fields of fate and biological effects of contaminants. This research should allow EOS to:

- support DFO's commitments identified in the Science Advice Implementation Plan in a timely manner; and,
- meet, to the extent possible, the other knowledge and advice needs of DFO regarding the fate and biological effects of contaminants used by the aquaculture industry.

Rationale: AMD management and other federal/provincial regulators have a pressing need for science advice related to the fate and biological effects of contaminants used by the aquaculture industry. The Science Advice Implementation Plan, which stems from an MOU between DFO, HC and ECCC also requires DFO to lead research and provide advice into the fate and biological effects of drugs and pesticides. As of July 2017, EOS does not have the research expertise or the core resources to deliver on the SAIP commitment or the meet the other needs identified in the report. It is particularly important that the Department be able to secure expertise in these areas and provide timely advice to management and regulators, given the current context of ECCC's investigation.

STRATEGY

The ADM, EOS will ensure that a work plan is developed to address the sampling needs for 2017-2018, a plan for research for 2018-2019 and a plan to provide advice required under the Science Advice Implementation Plan. The ADM, EOS will endeavour to identify key infrastructure, resources and expertise needs and optimal approaches to addressing fate and biological effects of aquaculture-related contaminants.

MANAGEMENT ACTIONS	DUE DATE (BY END OF MONTH)	STATUS UPDATE: COMPLETED / ON TARGET / REASON FOR CHANGE IN DUE DATE	OUTPUT
Plan to address sampling needs and analysis for 2017-2018	November 2017		Sampling plan
Plan to address research needs for 2018-2019	April 2018		Research plan
Plan to address provision of advice in support of the Science Advice Implementation Plan	March 2019		Advice delivery plan

RECOMMENDATION 3

Recommendation 3: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management assess the risk of non-compliance with the aquaculture regulations by the aquaculture industry; and, use this assessment to develop a proposal for enhanced enforcement of aquaculture regulations by C&P detachments across Canada to inform the renewal of the Sustainable Aquaculture Program.

Rationale: Interviews with C&P management show that the level of risk associated with non-compliance by the aquaculture industry has not been formally assessed. A risk assessment is essential in order to determine the level of effort needed to enforce the AAR and to meet its new responsibilities associated with the enforcement of s. 36 of the *Fisheries Act*. There is also a need for C&P to formalize its activities as part of enforcement plans. In this regard, only one region formally identified aquaculture as part of its enforcement plans. Additionally, these plans provided a high-level mention of aquaculture, but did not include what specific enforcement activities will be conducted and the level of effort required. Interviews with C&P representatives have shown that regions have different interpretations of what enforcement actions are required under the AAR. There is a need for C&P to implement equivalent risk-based enforcement to ensure that a nationally-consistent enforcement regime is delivered in each of the DFO Regions where aquaculture activities take place.

STRATEGY

Enacted in February 2014, the Order designating the Minister of the Environment as the Minister Responsible for the Administration and Enforcement of Subsections 36(3) to (6) of the Fisheries Act (Designation Order) transferred responsibility for enforcing these subsections to the Minister of the Environment, with the exception of aquaculture, aquatic invasive species and pests (which remain the responsibility of the Minister of Fisheries and Oceans). As a result of this order, the responsibility for aquaculture enforcement now rests with Conservation & Protection (C&P), rather than Environment and Climate Change Canada (ECCC). This includes all deleterious substances/pollution events which are linked to aquaculture operations. Traditionally, siltation was the only event of this nature that fishery officers were directly involved in.

Fisheries and Oceans Canada also developed the Aquaculture Activities Regulations (AAR) under the Fisheries Act. Receiving Royal Assent in June 2015, the AARs clarified rules on the deposit of pesticides and drugs in water for the purposes of aquaculture, as well as imposed new reporting requirements to make industry practices more transparent to Canadians. Despite the lack of new enforcement resources, the regulations included provisions for fishery officers to respond to aquaculture occurrences where illegal and/or unauthorized chemicals have been used.

Conservation & Protection allocates enforcement resources based on perceived and/or assessed risks to the environment and the communities that depend on the environment. Enforcement activities are prioritized based on fishery officer experience and a traditional understanding of vulnerabilities in commercial, recreational and Aboriginal capture fisheries. At this time, no formal compliance risk assessment of the aquaculture industry has been undertaken, despite awareness of the potential use of illegal pesticides and the presence of other chemical contaminants.

A comprehensive national, proactive aquaculture inspection regime by the Department will require a commitment of new, dedicated aquaculture enforcement resources. In the meantime, fishery officers will remain in a reactionary position. Officers in select detachments with higher-density aquaculture activities will selectively receive training funded by re-allocated resources, and will only able to respond to reported occurrences of potential violations at the expense of other fisheries enforcement activities.

In the interim, C&P recognizes that determining current vulnerabilities via a formalized compliance risk assessment is a necessary precursor to the establishment of dedicated aquaculture enforcement capacity.

MANAGEMENT ACTIONS	**DUE DATE (BY END OF MONTH)**	**STATUS UPDATE: COMPLETED / ON TARGET / REASON FOR CHANGE IN DUE DATE**	**OUTPUT**
The Conservation & Protection Directorate will conduct an assessment of the risks of non-compliance by the Canadian aquaculture industry.	December 2018		Internal DFO Aquaculture Industry Non-compliance Risk Assessment
Conservation & Protection NHQ will disseminate and promote the aquaculture industry risk assessment for use in detailed regional and detachment-specific enforcement plans.	Spring 2019		Regional and detachment-specific enforcement plans

RECOMMENDATION 4
Recommendation 4: It is recommended that the Assistant Deputy Minister, Fisheries and Harbour Management establish Regional Working Agreements with the relevant federal and provincial partners in the Atlantic regions to ensure that C&P has access to key information and expertise, and that a coordinated enforcement regime is put in place. **Rationale:** The evaluation identified several information and expertise gaps that could hamper C&P's ability to conduct coordinated and efficient enforcement activities. Some information held by provinces, such as sea lice levels and the presence of pathogens, is critical to ensure that C&P's operations are conducted at the right time and that biological contamination is avoided. As of July 2017, C&P does not have access to the required expertise to test fish samples for the detection of illegal pesticides. It is expected that the testing of fish samples will be outsourced to either PMRA or ECCC's regional labs. Formal agreements with partners will be essential for C&P to ensure that Fisheries Officers have access to the right expertise at the right time to conduct successful investigations. There is also a need to coordinate C&P's enforcement activities with other federal and provincial agencies to ensure that a coordinated and harmonized enforcement regime is in place in Canada.
STRATEGY
Until such time as new, dedicated aquaculture enforcement resources are realized, the Department is unable to put in place a national, proactive aquaculture inspection regime. With stop-gap training in select detachments with higher-density aquaculture activities, fishery officers will remain in a reactionary position, only able to respond to reported occurrences of potential violations at the expense of other fisheries enforcement activities. As part of this reactionary position, C&P is working with national and regional DFO aquaculture staff as well as regional enforcement personnel, ECCC and other federal and provincial partners to determine how to risk-manage and develop interim operational capacity in this new role. Part of this strategy is to leverage existing federal forensic laboratory capacity and to formally establish the operational responsibilities for all implicated federal and provincial agencies via Regional Working Agreements.

MANAGEMENT ACTIONS	DUE DATE (BY END OF MONTH)	STATUS UPDATE: COMPLETED / ON TARGET / REASON FOR CHANGE IN DUE DATE	OUTPUT
Where necessary, Conservation & Protection Branch will establish operational agreements with other federal partners with specialized laboratory facilities for testing aquaculture	May 2018		Service Level Agreement(s) for laboratory testing.

samples for the presence of illegal pesticides.			
Where appropriate, Conservation & Protection Branch will finalize Regional Working Agreements (RWAs) that include operational details relevant to aquaculture enforcement operations (including contact information for all federal & provincial agencies, laboratory information, etc.)	May 2018		RWAs as required.

RECOMMENDATION 5

Recommendation 5: It is recommended that the Assistant Deputy Minister, Aquatic Ecosystems Sector, in collaboration with the Assistant Deputy Minister, Ecosystems and Oceans Science, review the siting decision process to:

- clarify the roles and responsibilities between the Fisheries Protection Program and the Regional Aquaculture Management Division in the provincial siting decision process;
- define the roles and responsibilities and expected level of involvement of EOS in the provincial siting decision process;
- define clear criteria for decision-making that are harmonized and applied consistently across the regions; and
- establish service standards to ensure timely delivery of advice to the provinces.

Rationale: The process for making aquaculture siting decisions varies across regions, and there are no established service standards. The roles, responsibilities and level of involvement of both the Fisheries Protection Program and EOS in support of the provincial siting decision process varies across the regions. Likewise, the criteria to support the decision-making process are unclear and inconsistent across the regions. There is a need to provide clear and harmonized decision-making criteria in order to ensure the transparency of the process and to provide certainty of outcomes for the provinces and the industry. The role of EOS also needs to be clarified to ensure that the decision-making process is supported by science advice. Finally, service standards should be established, to ensure that DFO provides advice in a timely manner and does not negatively affect the length of the lease/license approval process, which is led by the province.

STRATEGY

Aquaculture Management Directorate, in collaboration with the Fisheries Protection Program and Ecosystems and Oceans Science, will establish national protocols to clarify the roles and responsibilities of all contributors to the siting decision process. The protocols will include clear criteria for decision-making and service standards for delivery of advice to provinces in accordance with the Treasury Board Secretariat Guideline on Service Standards.

MANAGEMENT ACTIONS	DUE DATE (BY END OF MONTH)	STATUS UPDATE: COMPLETED / ON TARGET / REASON FOR CHANGE IN DUE DATE	OUTPUT
Finalize and implement revised protocols with clear roles and responsibilities and establish service standards for delivery of advice to the provinces.	June 2018		Documented and agreed upon roles and responsibilities for the siting decision process.
Review protocols to ensure that they are	March 2019		Revised protocols that

harmonized and applied consistently across regions and revised as required.			address all aspects of the recommendation.
Formalize and implement final protocols, including a commitment to review every five years.	June 2019		A revised, harmonized siting decision process, formalized in signed protocols.