



IP(19)25rev

NASCO Implementation Plan for the period 2019-2024

***United States
(Revised version submitted 30 October 2019)***

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The main purpose of this Implementation Plan is to demonstrate what actions are being taken by the Parties / jurisdictions to implement NASCO's Resolutions, Agreements and Guidelines.

*In completing this Implementation Plan please refer to the **Guidelines for the Preparation and Evaluation of NASCO Implementation Plans and for Reporting on Progress**, CNL(18)49.*

Questions in the Implementation Plan are drawn from the following documents:

- *NASCO Guidelines for Management of Salmon Fisheries, CNL(09)43 (referred to as the 'Fisheries Guidelines');*
- *Report of the Working Group on Stock Classification, CNL(16)11;*
- *Minimum Standard for Catch Statistics, CNL(93)51 (referred to as the 'Minimum Standard');*
- *Revised matrix for the application of the six tenets for effective management of an Atlantic salmon fishery, WGCST(16)16¹;*
- *NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat, CNL(01)51;*
- *NASCO Guidelines for Protection, Restoration and Enhancement of Atlantic Salmon Habitat, CNL(10)51 (referred to as the 'Habitat Guidelines');*
- *Williamsburg Resolution, CNL(06)48;*
- *Guidance on Best Management Practices to address impacts of sea lice and escaped farmed salmon on wild salmon stocks (SLG(09)5) (referred to as the 'BMP Guidance');*
- *Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach (CNL(04)57); and*
- *Road Map' to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of G. salaris and eradicate it if introduced', NEA(18)08.*

Party:	United States of America
Jurisdiction / Region:	

¹ This document can be obtained from the NASCO Secretariat; email hq@nasco.int

1. Introduction		
1.1 What are the objectives for the management of wild salmon? (Max 200 words)		
<p>The primary objective for the management of wild salmon in the United States is to recover the Gulf of Maine Distinct Population Segment of Atlantic salmon (and the ecosystems upon which they depend) to a point where the protections of the Endangered Species Act are no longer required. The Gulf of Maine Distinct Population Segment is comprised of all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Recovery of these populations will be accomplished once specific recovery criteria (see section 1.2) are met.</p> <p>There are currently no specific objectives for the management of wild salmon in rivers south of the Androscoggin River, as these rivers lost their native populations by the early to mid-1800s. There are, however, small salmon conservation programs on the Saco River (in the state of Maine), the Merrimack River (in the state of Massachusetts), and in the State of Connecticut. These programs seek to maintain small populations of salmon in targeted watersheds for the purposes of perpetuating the ecological and cultural presence of salmon in the region. The objectives also include supporting biodiversity, public education and awareness about salmon, and scientific research on Atlantic salmon.</p>		
1.2 What reference points (e.g. conservation limits, management targets or other measures of abundance) are used to assess the status of stocks? (Max 200 words) (Reference: Sections 2.4 and 2.5 of the Fisheries Guidelines)		
<p>The Endangered Species Act compels the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to develop measurable criteria that must be met in order to remove an endangered species from the endangered species list. These recovery criteria have been developed for the Gulf of Maine Distinct Population Segment of Atlantic salmon and are summarized as follows: at least 6,000 wild adult returns per year; 90,000 fully accessible habitat units (1 unit = 100m² of rearing habitat); and threats that were identified at the time of listing (in 2009) are reduced. These recovery criteria informed the development of the rebuilding objectives adopted within the North American Commission and the West Greenland Commission (see NAC(13)4).</p> <p>While conservation limits for the entire United States have previously been published, they are no longer relevant in many areas. As noted in section 1.1, there are currently no specific objectives for the management of wild salmon in rivers south of the Androscoggin River. The recovery criteria described above remain more relevant reference points from 2019 to 2023.</p>		
1.3 What is the current status of stocks under the new classification system outlined in CNL(16)11?		
Stock Classification Score	Salmon Classification Category	No. rivers
0	Not at Risk	
1	Low Risk	
2	Moderate Risk	
3	High Risk	1
N/A	Artificially Sustained	15
N/A	Lost	30
N/A	Unknown	
Additional comments:		
1.4 How is stock diversity (e.g. genetics, age composition, run-timing, etc.) taken into account in the management of salmon stocks? (Max 200 words)		
Low marine survival and the reduction in productivity of freshwater habitats have led to drastic		

population declines in recent years. Decreased population sizes could result in the loss of genetic, phenotypic, and life-history diversity. Long-term reliance on hatchery supplementation could also lead to artificial selection. Thus, diversity considerations are key tenets of salmon management in the United States in many ways; two are summarized below.

Genetic Diversity – The U.S. Fish and Wildlife Service oversees a rigorous genetic monitoring and management program for endangered populations. The first major milestone of this program was the development of a broodstock management plan in 2006. This plan set forth a rigorous broodstock genetic management program that provides screening, mating guidance, and assessment information for hatchery activities. To monitor if genetic diversity is being maintained over time, metrics such as allelic variability and heterozygosity are assessed annually, using a suite of variable molecular markers.

Spatial Diversity – Recovery criteria for endangered populations require that sufficient suitable freshwater habitat is accessible for attainment of abundance and productivity goals in three separate geographic areas, referred to as Salmon Habitat Recovery Units or “SHRUs.” Each of the three SHRUs is comprised of a suite of large and small rivers, further reducing extinction risks if recovery were to occur in only one or a few rivers.

1.5 To provide a baseline for future comparison, what is the current and potential quantity of salmon habitat? (Max 200 words)
(Reference: Section 3.1 of the Habitat Guidelines)

Quantitative estimates are available only for endangered populations in Maine. The following table summarizes the current and potential quantity of salmon habitat (expressed in “units” where 100m² of rearing habitat equals one unit), as well as the recovery criteria (i.e., accessibility goal) in each Salmon Habitat Recovery Unit.

Recovery Unit	Currently Accessible Habitat	Potential Habitat	Recovery Criteria
<i>Penobscot Bay</i>	18,600	397,092	30,000
<i>Merrymeeting Bay</i>	9,800	356,066	30,000
<i>Downeast Coastal</i>	28,500	60,063	30,000
Total	56,900	813,521	90,000

1.6 What is the current extent of freshwater and marine salmonid aquaculture?

Number of marine farms	27
Marine production (tonnes)	Commercial production estimated at 5,020t
Number of freshwater facilities	In Maine, there are 15 Total -- Private (commercial) = 4; State (Recreational fisheries) = 4; Federal conservation hatcheries = 2; NGOs conservation hatcheries = 3; Research hatcheries = 2. In addition, each state in New England has a recreational stocking program. There are six facilities in New Hampshire, four in Massachusetts, three in Connecticut, five in Vermont, and four in Rhode Island. There are also three federal facilities in southern New England, but they have recently phased out production of Atlantic salmon.
Freshwater production (tonnes)	Hatcheries supporting recreational fisheries - The Maine Department of Inland Fisheries and Wildlife hatcheries that support recreational fisheries stocked

	<p>160 t of salmonids into the state waters of Maine. Recent production estimates for other states are not available.</p> <p>Commercial hatcheries – Roughly 1.5 to 3 million individual smolts are stocked annually to support Atlantic salmon grow out in marine net pens; weight estimates are not available.</p> <p>Conservation hatcheries - U.S. Fish and Wildlife Service stocks roughly 55 t of Atlantic salmon annually to support recovery efforts in Maine.</p>
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Append one or more maps showing the location of aquaculture facilities and aquaculture free zones in rivers and the sea.

A map is appended.

1.7 Please describe the process used to consult NGOs and other stakeholders and industries in the development of this Implementation Plan. (Max 200 words)

The National Marine Fisheries Service (NMFS) sought input from the NGO community in Maine, U.S. Fish and Wildlife Service, Maine Department of Marine Resources, and Tribal representatives via a series of face-to-face meetings as well as through electronic means in late 2018 and early 2019. Following those meetings and the partial shutdown of the U.S. government, NMFS presented a draft Implementation Plan in early April 2019. Comments from a broad suite of stakeholders were received in April 2019 with further face to face meetings and conference calls to consider input. NMFS carefully considered all comments before finalizing and submitting the Implementation Plan to the NASCO Secretariat in late April 2019.

2. Management of Salmon Fisheries:
In this section please review the management approach to each of the fisheries in your jurisdiction (i.e. commercial, recreational and other fisheries) in line with the relevant NASCO Resolutions, Agreements and Guidelines. For Parties / jurisdictions that prosecute mixed-stock fisheries, there should at least one action related to their management.

2.1 What are the objectives for the management of the fisheries for wild salmon? (Max. 200 words)

The objective is to facilitate recovery of endangered populations of Atlantic salmon and their ecosystems to a level where: 1) Native Americans can once again exercise their rights to ceremonial and sustenance harvest; and 2) recreational fisheries can once again be considered. This can only occur after the endangered populations are either “downlisted” to threatened or “de-listed” because they are recovered (meeting the downlisting and/or delisting recovery criteria outlined in section 1.2).

2.2 What is the decision-making process for the management of salmon fisheries, including predetermined decisions taken under different stock conditions (e.g. the stock levels at which regulations are triggered)? (Max. 200 words)
(This can be answered by providing a flow diagram if this is available.)
(Reference: Sections 2.1 and 2.7 of the Fisheries Guidelines)

All fisheries for sea-run Atlantic salmon in the United States remain closed. As an endangered species under the U.S. Endangered Species Act, it is illegal for any individual to fish for Atlantic salmon or to retain any incidentally caught Atlantic salmon. A fishery could be considered if the populations were listed as threatened (a less protective category than endangered under the U.S. Endangered Species Act) if the fishery was determined to have a net conservation benefit to the species. Such benefits could include things such as:

- using proceeds from license sales to fund habitat restoration work; and/or
- increasing public awareness regarding the state of Atlantic salmon and ongoing threats to

<p>salmon populations.</p> <p>Management of wild salmon south of the freshwater range of the Gulf of Maine populations is not a management goal at this time; thus, there are no set reference points for them. In some years, there may be small fisheries for broodstock in these rivers when there are sufficient numbers to support such a fishery.</p>
<p>2.3 (a) Are any fisheries permitted to operate on salmon stocks that are below their reference point (e.g. Conservation Limits)? If so, (b) how many such fisheries are there and (c) what approach is taken to managing them that still promotes stock rebuilding? <i>(Max 200 words)</i> <i>(Reference: Section 2.7 of the Fisheries Guidelines)</i></p>
<p>(a) Not domestically, but U.S. salmon stocks below their reference points are (or have been known to be) harvested in mixed-stock fisheries in Greenland, St. Pierre et Miquelon, and Canada (Labrador).</p>
<p>(b) Not applicable.</p>
<p>(c) Not applicable.</p>
<p>2.4 (a) Are there any mixed-stock salmon fisheries? If so (b) how are these defined, (c) what was the mean catch in these fisheries in the last five years and (d) how are they managed to ensure that all the contributing stocks are meeting their conservation objectives? <i>(Max. 300 words in total)</i> <i>(Reference: Section 2.8 of the Fisheries Guidelines)</i></p>
<p>(a) No. As noted above, however, U.S. stocks are (or have been known to be) harvested in mixed-stock fisheries in Greenland, St. Pierre et Miquelon, and Canada (Labrador).</p>
<p>(b) We concur with NASCO’s definition of mixed-stock fisheries as those fisheries that exploit a significant number of salmon from two or more river stocks.</p>
<p>(c) Not applicable to this Implementation Plan.</p>
<p>(d) Not applicable to this Implementation Plan. However, scientists from the United States continue to work with Canadian scientists to improve representation of U.S. stocks within the North American genetics baseline. In addition, the United States fully supports the sampling of all three mixed-stock fisheries to provide the most accurate estimates of harvest of U.S.-origin salmon. As a member of the West Greenland Commission, the United States actively participates in discussions to develop regulatory measures for the West Greenland fishery. The United States also remains very interested in continuing and expanding genetic testing of the salmon intercepted in the St. Pierre et Miquelon fishery to improve our collective understanding of the composition of the mixed stock so that informed management decisions can be made regarding this fishery. Finally, regarding Canada’s Labrador fishery, Canada and the United States are members of the North American Commission where research on that fishery is discussed and where management measures to address possible interceptions of U.S.-origin salmon can be considered to address such harvests, as necessary and appropriate.</p>
<p>2.5 How are socio-economic factors taken into account in making decisions on management of salmon fisheries? <i>(Max. 200 words)</i> <i>(Reference: Section 2.9 of the Fisheries Guidelines)</i></p>

When Atlantic salmon were listed as an endangered species in 2009, it was the policy of the United States to not take socio-economic factors into account when deciding whether or not to place a species on the endangered list. The U.S. Endangered Species Act requires that listing decisions be based solely on the best scientific and commercial information available regarding the species status. The listing and critical habitat designations made in 2009 remain in place; the “take” prohibitions of Section 9 of the Endangered Species Act prevents a directed fishery from being executed anywhere within the freshwater range of endangered salmon populations in Maine.

2.6 What is the current level of unreported catch and what measures are being taken to reduce this? (Max. 200 words)
(Reference: Section 2.2 of the Fisheries Guidelines and the Minimum Standard)

The unreported catch in the United States is zero tons.

Commercial fishers are required to report any bycatch of Atlantic salmon, and observers are also placed on a subset of vessels to document catch. We query databases from these observer programs as well as from fish dealers each year to ensure that bycatch of Atlantic salmon remains low. It is rare to observe more than five salmon (individuals) in either database on an annual basis. For recreational fisheries that may encounter Atlantic salmon as bycatch (e.g., brook trout fisheries), law enforcement officers operate surveillance programs to ensure that salmon bycatch is limited. In addition, angler education is emphasized to ensure that anglers can differentiate between juvenile brook trout and salmon parr.

2.7 Has an assessment under the Six Tenets for Effective Management of an Atlantic Salmon Fishery been conducted? If so, (a) has the assessment been made available to the Secretariat and (b) what actions are planned to improve the monitoring and control of the fishery? (c) If the six tenets have not been applied, what is the timescale for doing so? (Max. 200 words)
(Reference: Six Tenets for Effective Management of an Atlantic Salmon Fishery, WGCST(16)16)

(a) Yes.

(b) No further actions are planned as all salmon fisheries within the United States remain closed.

(c) Not applicable.

2.8 Identify the threats to wild salmon and challenges for management associated with their exploitation in fisheries, including bycatch of salmon in fisheries targeting other species.

Threat / challenge F1	Interception of U.S.-origin salmon in West Greenland, St. Pierre et Miquelon, and Canada (Labrador)
Threat / challenge F2	Bycatch of salmon parr in brook trout fisheries
Threat / challenge F3	Poaching of adult salmon
Threat / challenge F4	Bycatch of salmon in commercial fisheries

Copy and paste lines to add further challenges which should be labelled F5, F6, etc.

2.9 What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 2.8 to implement NASCO’s Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for the management of salmon fisheries?		
Action F1:	Description of action:	Reduce mortality of U.S.-origin salmon in mixed-stock fisheries by remaining active in the West Greenland Commission and the North American Commission
	Planned timescale (include milestones where appropriate):	<ul style="list-style-type: none"> a) 2019-2024– Review adherence to West Greenland regulatory measures b) 2021 – Engage in discussions to develop a new regulatory measure for the fishery at West Greenland c) 2019-2024 – Review reports and other scientific findings related to the mixed-stock fishery in Labrador; consider regulatory measures in the North American Commission as necessary and appropriate
	Expected outcome:	<ul style="list-style-type: none"> a) Maintenance of existing mortality attributable to the West Greenland fishery as measured by the quota currently set at 30mt through 2020 (note: specific outcomes beyond 2020 cannot be determined at this time as the existing regulatory measure applies only for 2018, 2019, and 2020) b) Agreement on a regulatory measure in 2021 c) Maintenance of low levels (previously estimated at 30 to 40 U.S.-origin salmon per year) of interception of U.S.-origin salmon in the mixed-stock fishery in Labrador
	Approach for monitoring effectiveness & enforcement:	<ul style="list-style-type: none"> a) Continue to facilitate the sampling program for the West Greenland fishery; review fishery data and reports from Denmark (in respect of the Faroe Islands and Greenland) to ensure the key provisions of the existing regulatory measure are effectively implemented. b) Annual review of reports and other scientific findings related to the mixed-stock fishery in Labrador.
	Funding secured for both action and monitoring programme?	Expected
Action F2:	Description of action:	Reduce bycatch of Atlantic salmon in recreational fisheries for other species, such as brook trout, to the maximum extent possible.
	Planned timescale (include milestones where appropriate):	2019 – 2024
	Expected outcome:	Closures of certain areas of rivers, gear restrictions, bag limit reductions, publication of species identification guides in fishing law books, prosecution of poachers when necessary, among others.

		Note: this action (and therefore expected outcome) does not lend itself to quantitative measures because specific estimates of bycatch are not available. Thus, developing quantitative targets is not possible. Reporting on progress under this action will therefore focus on qualitative aspects (using specific examples where possible) with the assumption that activities under this action will correlate with reductions in mortality of Atlantic salmon attributable to bycatch.
	Approach for monitoring effectiveness & enforcement:	This action does not lend itself to a strictly quantitative approach to monitoring as specific levels of bycatch are currently unknown. Thus, the focus will be on ensuring the risks to productive capacity are minimized (as opposed to developing quantitative estimates) by publication of new laws when necessary, description of law enforcement activities, and an aggressive outreach and education campaign ensuring that anglers can differentiate salmon parr from brook trout.
	Funding secured for both action and monitoring programme?	Expected
Action F3:	Description of action:	Reduce poaching of Atlantic salmon to the maximum extent possible.
	Planned timescale (include milestones where appropriate):	2019 – 2024
	Expected outcome:	Deterrence of illegal activity and prosecutions of poachers when necessary. Note: this action (and therefore expected outcome) does not lend itself to quantitative measures because specific estimates of mortality attributable to poaching are not available. Thus, developing quantitative targets is not possible. Reporting on progress under this action will therefore focus on qualitative aspects (using specific examples where possible) with the assumption that activities under this action will correlate with reductions in mortality of Atlantic salmon attributable to poaching.
	Approach for monitoring effectiveness & enforcement:	This action does not lend itself to a strictly quantitative approach to monitoring as specific levels of poaching are currently unknown (though thought to be very low). Thus, reporting will focus on ensuring the risks to productive capacity are minimized largely through descriptions of law enforcement activities (including deterrence).
	Funding secured for both action and monitoring programme?	Expected
Action F4:	Description of action:	Reduce mortality of Atlantic salmon by (1) maintaining closures for all directed fisheries for Atlantic salmon consistent with the existing Fishery Management Plan under the Magnuson-Stevens Fisheries Conservation and Management Act and (2) reducing bycatch of Atlantic salmon in fisheries for other species to the

		maximum extent possible.
	Planned timescale (include milestones where appropriate):	2019-2024
	Expected outcome:	Zero mortality of Atlantic salmon attributable to (1) directed salmon fisheries and (2) bycatch of Atlantic salmon in other commercial fisheries.
	Approach for monitoring effectiveness & enforcement:	Query vessel landings database, dealer purchases database, and the fisheries observer database to ensure that bycatch of Atlantic salmon in other commercial fisheries remains insignificant.
	Funding secured for both action and monitoring programme?	Expected

Copy and paste lines to add further actions which should be labelled F5, F6, etc.

<p>3. Protection and Restoration of Salmon Habitat: <i>In this section please review the management approach to the protection and restoration of habitat in your jurisdiction in line with the relevant NASCO Resolutions, Agreements and Guidelines.</i></p>
<p>3.1 How are risks to productive capacity identified and options for restoring degraded or lost salmon habitat prioritised, taking into account the principle of ‘no net loss’ and the need for inventories to provide baseline data? (Max. 200 words) <i>(Reference: Section 3 of the Habitat Guidelines)</i></p>
<p>Risks to reproductive capacity were explicitly examined by a team of local experts whose findings were published in 2006 in a “Status Review for anadromous Atlantic salmon in the United States.” The Final Rule that listed Atlantic salmon as an endangered species in 2009 is largely based off these findings. The risks to productive capacity identified then, are now referred to as “threats to the species” in the context of recovery planning. Addressing these threats to the species is the primary focus of the recovery program. In addition to ensuring that population growth criteria (see section 1.2 of this IP) and spatial diversity criteria (see section 1.4 of this IP) are met, there are also “threat abatement criteria” that are addressed through the recovery program. In short, the threats to the species that were identified at the time of listing Atlantic salmon as endangered (in 2009) must be reduced before the species can be “downlisted” to threatened or removed from the Endangered Species List.</p> <p>The concept of “no net loss” is further reflected in the recovery criteria (i.e., the spatial diversity goals outlined in section 1.4 of this IP). The recovery of Atlantic salmon can only be accomplished once 90,000 units of suitable habitat are accessible. Thus, opening more suitable habitat remains a focus of the salmon recovery program. Lastly, under the “no net loss” principle, the United States has designated critical habitat for Atlantic salmon pursuant to the Endangered Species Act. Some of the protections are explained in section 3.2 below.</p>
<p>3.2 How are socio-economic factors taken into account in making decisions on salmon habitat management? (Max. 200 words) <i>(Reference: Section 3.9 of the Habitat Guidelines)</i></p>
<p>The two primary processes of relevance are (1) section 4 of the Endangered Species Act (listing and critical habitat designation) and (2) section 7 of the Endangered Species Act (interagency consultation).</p>
<p>Section 4 – The implementing regulations of the U.S. Endangered Species Act require that a listing</p>

determination be based solely on the basis of the best available scientific and commercial information regarding a species status. The regulations do not allow consideration of socio-economic factors to influence a listing. However, the ESA does require that economic impacts, impacts on national security, and other relevant impacts of specifying any particular area as critical habitat be considered. When designating critical habitat, some areas may be excluded when the cost of designating are high, and the conservation value is low. The final critical habitat designation for Atlantic salmon includes 19,571 km of perennial river, stream, and estuary habitat and 799 square km of lake habitat. Approximately 1,256 km of river, stream, and estuary habitat and 100 square km of lake habitat were excluded from critical habitat pursuant to section 4(b)(2) of the ESA due to economic considerations.

Section 7 - Because Atlantic salmon is listed as an endangered species, federal agencies must consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to determine whether any proposed action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat. If an action is likely to negatively impact the survival or recovery of the species or destroy or adversely modify critical habitat, NMFS and/or USFWS must develop one or more alternatives for the action to move forward in a way that substantially reduces the impacts to the species and its critical habitat. In developing these alternatives, NMFS and USFWS must only propose alternatives that are economically and technically feasible and are consistent with the purpose of the proposed action. An exemption from the prohibitions on incidental take can only be provided if the action meets the “no jeopardy” standard. Any exemption from the incidental take prohibitions includes mandatory reasonable and prudent measures and implementing terms and conditions to minimize the impacts of incidental take. These measures must comply with the “minor change rule” which requires that the reasonable and prudent measures do not alter the basic design, location, scope, duration, or timing of the action, and that involve only minor changes.

3.3 What management measures are planned to protect wild Atlantic salmon and its habitats from (a) climate change and (b) invasive aquatic species? (Max. 200 words each)
(Reference: Section 3.2 of the Habitat Guidelines)

(a) The National Marine Fisheries Service recently conducted a scenario planning exercise to explore what we can do to improve resilience of Atlantic salmon in the face of climate change across its current range in the United States, including riverine and marine environments. The report is in draft phase and is expected to be made available to the public in late 2019. The report will assist decision makers in prioritizing the allocation of limited resources toward those recovery actions with the greatest potential benefits for salmon. It will also identify other areas of emphasis for other partners (state agencies, NGOs, etc.) to assist in the recovery process. Progress has already been made in identifying and moving forward with several projects that were recommended as a result of the scenario planning exercise.

The following action is included in the Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon: “Establish and implement a water temperature monitoring protocol in all salmon habitat recovery units to support efforts to identify climate vulnerable and climate resilient habitats.” Initial efforts have been spearheaded by numerous state, federal and NGO partners and are part of a broader effort in the Northeast United States referred to as the SHEDS Stream Temperature Database (<http://db.ecosheds.org/>).

(b) The following actions are included in the Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon: (1) Assess the impact of non-native species on juvenile salmon, including emigrating smolts and sites where predation occurs most frequently; (2) Implement fish management activities and regulations that minimize the spread of invasive species without compromising the recovery of Atlantic salmon and the co-evolved suite of diadromous fish; (3) Conduct outreach on the impacts of invasive species; (4) Implement fish management activities and regulations that help minimize the effects of predation and competition by introduced species; (5) Implement activities that encourage healthy populations

of native fish communities and discourage introduced species.

3.4 Identify the main threats to wild salmon and challenges for management in relation to estuarine and freshwater habitat.

Threat / challenge H1	Lack of accessibility at small dams and road-stream crossings
Threat / challenge H2	Lack of accessibility at hydroelectric dams
Threat / challenge H3	Diminished productive capacity (from climate change, invasive species, reduced water quality, and degraded physical habitat structure)
Threat / challenge H4	

Copy and paste lines to add further threats/challenges which should be labelled H5, H6, etc.

3.5 What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 3.4 to implement NASCO’s Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for the Protection, Restoration and Enhancement of Atlantic Salmon Habitat?

Action H1:	Description of action:	Improve fish passage by removing dams, installing fishways, removing culverts, decommissioning roads, and upgrading road-stream crossings
	Planned timescale (include milestones where appropriate):	2019-2024
	Expected outcome:	By 2024, restore connectivity to 5,000 units of suitable Atlantic salmon habitat (as defined in the Atlantic salmon Recovery Plan).
	Approach for monitoring effectiveness & enforcement:	Enumerate the number of habitat units made accessible each year (2019 – 2024).
	Funding secured for both action and monitoring programme?	Expected
Action H2:	Description of action:	Improve fish passage at hydroelectric dams through dam removal or construction of effective fishways and the implementation of adaptive management strategies to achieve passage efficiency and survival targets for dams that cannot be removed.
	Planned timescale (include milestones where appropriate):	2019-2024
	Expected outcome:	By 2024, restore connectivity to 10,000 units of suitable Atlantic salmon habitat and reduce mortality and injury of smolts and kelts at hydroelectric dams.
	Approach for monitoring	Enumerate the number of habitat units made accessible each year (2019 – 2024).

	effectiveness & enforcement:	Ensure attainment of passage efficiency and survival targets through adherence to the requirements of regulatory processes (Federal Power Act, Endangered Species Act, Clean Water Act, Magnuson-Stevens Fisheries Conservation and Management Act).
	Funding secured for both action and monitoring programme?	Expected
Action H3:	Description of action:	Develop and implement a freshwater protection, restoration, and enhancement strategy by 2024 for each of the three salmon habitat recovery units (actions PBS6.4, MBS7.4 and DES5.4 in the current recovery plan).
	Planned timescale (include milestones where appropriate):	2019-2024
	Expected outcome:	Geographically explicit freshwater protection, restoration, and enhancement strategy for each of the three recovery units. These strategies will explicitly consider protection of climate-resilient spawning and rearing habitats for each recovery unit in the face of climate change.
	Approach for monitoring effectiveness & enforcement:	The strategies will use adaptive management to ensure that management actions have a measurable effect on recovery criteria. Progress reports on the development of the strategies will occur for each recovery unit separately to enhance our ability to demonstrate progress toward the overall goal of completing each strategy by 2024.
	Funding secured for both action and monitoring programme?	Expected
Action H4:	Description of action:	
	Planned timescale (include milestones where appropriate):	
	Expected outcome:	
	Approach for monitoring effectiveness & enforcement:	
	Funding secured for both action and monitoring programme?	Choose an item.

Copy and paste lines to add further actions which should be labelled H5, H6, etc

4. Management of Aquaculture, Introductions and Transfers, and Transgenics:
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<p><i>Council has requested that for Parties / jurisdictions with salmon farms, there should be a greater focus on actions to minimise impacts of salmon farming on wild salmonid stocks. Each Party / jurisdiction with salmon farming should therefore include at least one action relating to sea lice management and at least one action relating to containment, providing quantitative data in Annual Progress Reports to demonstrate progress towards the international goals agreed by NASCO and the International Salmon Farmers Association (ISFA):</i></p> <ul style="list-style-type: none"> • <i>100% of farms to have effective sea lice management such that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms;</i> • <i>100% farmed fish to be retained in all production facilities.</i> <p><i>In this section please provide information on all types of aquaculture, introductions and transfers, and transgenics (including freshwater hatcheries, smolt-rearing etc.</i></p>
<p>4.1 (a) Is the current policy concerning the protection of wild salmonids consistent with the international goals on sea lice and containment agreed by NASCO and ISFA? (b) If the current policy is not consistent with these international goals, when will current policy be adapted to ensure consistency with the international goals and what management measures are planned to ensure achievement of these goals and in what timescale? (Max. 200 words for each) <i>(Reference: BMP Guidance)</i></p>
<p>(a) Yes. The current policies and management measures are consistent with international goals for sea lice and containment.</p>
<p>(b) Not applicable.</p>
<p>4.2 (a) What quantifiable progress can be demonstrated towards the achievement of the international goals for 100% of farms to have effective sea lice management such that there is no increase in sea lice loads, or lice-induced mortality of wild salmonids attributable to sea lice? (b) How is this progress monitored, including monitoring of wild fish? (c) If progress cannot be demonstrated, what additional measures are proposed and in what timescale? (Max. 200 words each) <i>(Reference: BMP Guidance)</i> <i>The measures by which these goals may be achieved, and against which the Review Group will be measuring the effectiveness of the Implementation Plan, are set out in the BMP Guidance SLG(09)5 (Best management practice; reporting and tracking; factors facilitating implementation) as agreed by NASCO and ISFA.</i></p>
<p>(a) Since 2001, enhanced oversight of fish health regulations for all commercial Atlantic salmon farming in Maine (i.e., 100% of farms) has been in place and administered by the State of Maine Department of Marine Resources with federal oversight from the U.S. Department of Agriculture, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. The emphasis of the program includes maintenance of the current fish health protocols and expansion of an ongoing epidemiological monitoring program to determine the type, incidence, and geographic distribution of salmonid pathogens in Maine. The major components of the fish health regulations in place are: vaccination of farmed fish prior to stocking in sea cages; protocols for harvesting and stocking of farmed salmon; mandatory fallowing and single year class stocking and; vessel traffic protocols, and gear and vessel disinfection protocols. In addition, an Integrated Pest Management plan is in place for all marine net pen sites in Maine. These protocols include monitoring of sea lice levels and evaluating treatment efficacy at all (100%) farms. The guidelines include best management practices that seek to reduce the need for use of chemicals or medications. Mandatory monitoring of sea lice levels occur at least bi-weekly when water temperatures are greater than 8°C, and monthly when water temperatures are between 6°C and 8°C. A maximum treatment threshold for sea lice counts is presently one gravid female and five pre-adults, on average, with a minimum of two samples. All farms (100%) comply with these treatment thresholds annually.</p>

<p>Providing quantitative results of monitoring programs (e.g., lice counts) is not possible as U.S. law prohibits the government from making public any data that can be linked to individual people or businesses. Because there is only one aquaculture company operating in Maine, there is presently no way to share that information without violating this regulation (which can be found in the code of Maine rules tit. 13-188 Ch. 5,, § 5.30).</p>
<p>(b) The monitoring described in section 4.2(a) is the main monitoring program. Unfortunately, monitoring of fish in the wild (e.g., using sentinel cages) is not routinely conducted in the United States due to constraints on existing resource levels and the considerable progress demonstrated in section 4.2(a).</p> <p>Wild fish monitoring has been conducted in the past at specific sites (fish traps) or during research cruises collecting smolts or other diadromous fish. Some data have been published in peer-reviewed journals, while other data are collected opportunistically. For example, in 2017, 840 Atlantic salmon captured at the Milford fish lift (Penobscot River, Maine) were checked for the presence of sea lice with sea lice observed on 155 of these salmon. In addition, Jensen et al. (2015) surveyed sea lice infestation rates of the wild fish community of Cobscook Bay (an area with active salmon farming operations). They sampled over 6,000 fish in 2012 (though no Atlantic salmon were captured). They observed sea lice on 10 fish species, but only <i>Caligus elongatus</i> was found with no individuals being identified as <i>Lepeophtheirus salmonis</i>. (Jensen AJ, GB Zydlewski, S Barker, and M Pietrak. 2015. Sea lice infestations of a wild fish assemblage in the Northwest Atlantic Ocean, Transactions of the American Fisheries Society, 145:1, 7-16, DOI: 10.1080/00028487.2015.1091381)</p>
<p>(c) We consider the answer to 4.2(a) and 4.2(b) to be considerable progress over the last 20 years. As explained above, it is not possible to provide this information due to U.S. confidentiality requirements. Given the continued progress in reducing sea lice infestations at marine net pens, no additional measures are planned at this time. The existing fish health regulations described in section 4.2 (a) will continue throughout the time period of this Implementation Plan. As resource levels allow, we will consider augmenting monitoring levels with sentinel cages.</p>
<p>4.3 (a) What quantifiable progress can be demonstrated towards the achievement of the international goals for achieving 100% containment in all (i) freshwater and (ii) marine aquaculture production facilities? (b) How is this progress monitored, including monitoring of wild fish (genetic introgression) and proportion of escaped farmed salmon in the spawning populations? (c) If progress cannot be demonstrated, what additional measures (e.g. use of sterile salmon in fish farming) are proposed and in what timescale? (Max. 200 words each) <i>(Reference: BMP Guidance)</i> <i>The measures by which these goals may be achieved, and against which the Review Group will be measuring the effectiveness of the Implementation Plan, are set out in the BMP Guidance SLG(09)5 (Best management practice; reporting and tracking; factors facilitating implementation) as agreed by NASCO and ISFA.</i></p>
<p>(a)(i) Since 2005, annual third party audits validate that all mandatory requirements of each facilities' containment management plans are in place. These audits are also reviewed by state and federal agencies ensuring 100% compliance with all protective measures for each facility. The results from these audits have shown full compliance with containment requirements and only minor infractions have been documented which did not decrease the effectiveness of the plans in reducing escapes. The audit verification process is in place to validate the special conditions implemented in state and federal permits to reduce impacts to wild Atlantic salmon from commercial aquaculture operations in Maine.</p>
<p>(a)(ii) Since 2003, the salmon farming industry in the United States has been required to have containment management plans in place. Since fully implementing these plans in 2005, no reportable escape events have occurred, although less severe potential escape opportunities (holes in nets, etc.)</p>

were recorded annually. Similar to freshwater sites described above, since 2005, annual third party audits validate that all mandatory requirements of each facilities' containment management plans are in place and implemented properly. These audits are also reviewed by state and federal agencies ensuring 100% compliance with all protective measures for each facility. The results from these audits have shown full compliance with containment requirements and only minor infractions documented. The audit verification process is in place to validate the special conditions implemented in state and federal permits to reduce impact to wild Atlantic salmon from commercial aquaculture operations in Maine. Since the implementation of the suite of management measures beginning in 2003, the number of suspected aquaculture escapees (from U.S. sites) captured in salmon rivers in the United States has declined substantially and has become a rare event. The salmon farming industry in Maine has developed a site-specific (genetic) marking strategy for all salmon stocked annually. Since implementing this approach, very few aquaculture-origin salmon (of U.S. origin) have been documented in salmon rivers in Maine; four salmon captured in 2012 and three salmon in 2016 were positively identified as coming from a commercial site in Maine. These fish were removed from the river and not allowed to reproduce.

(b) Progress is monitored by (1) third party audits including oversight from state and federal officials; (2) monitoring of adult salmon at traps on five rivers to screen for the potential presence of aquaculture escapees; and (3) annual genetic monitoring at conservation hatcheries to ensure that any potential introgression of farm-origin salmon is not propagated by the conservation hatcheries.

Below, we present the number of aquaculture-origin escapees captured in Maine rivers in recent years. It is important to understand that the number of rivers monitored over this time period has changed. Most notably, there is no longer a weir in the Dennys River, a salmon river close to many commercial salmon farms in Cobscook Bay (see appendix 1).

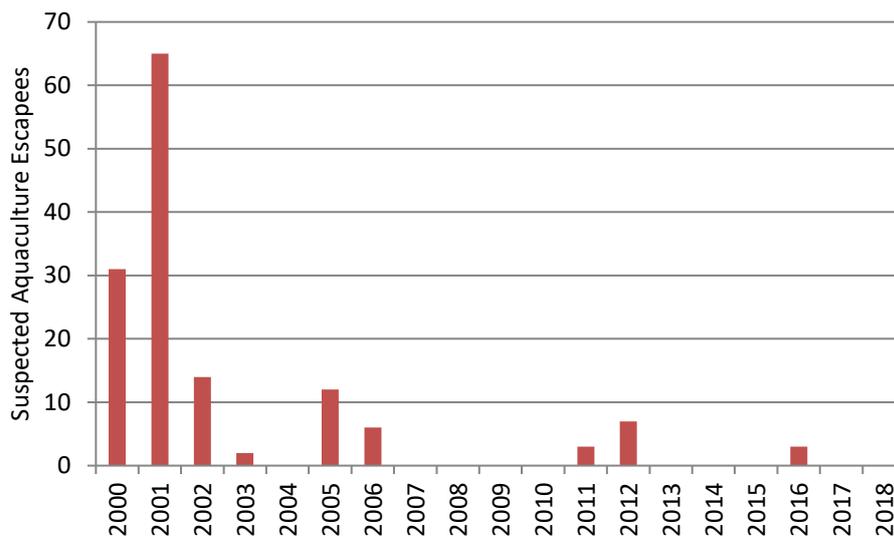


Figure 4.3. Number of suspected aquaculture-origin escapees captured in Maine rivers from 2000 to 2018.

(b) Not applicable.

4.4 What adaptive management and / or scientific research is underway that could facilitate better achievement of NASCO’s international goals for sea lice and containment such that the environmental impact on wild salmonids can be minimised? (Max 200 words)
(Reference: BMP Guidance and Article 11 of the Williamsburg Resolution)

A new initiative funded through NOAA and Maine Sea Grant is now underway. It is entitled: ‘An integrated approach to addressing sea lice control in the commercial culture of Atlantic salmon.’ One of the main goals of the project is to bring together industry, research, and regulatory partners to develop a “gap analysis” and a formal needs assessment in order to advance acceptance of integrated pest management practices for salmon aquaculture. The effort specifically recognizes that new pest

management schemes are of little value if they are not accepted by commercial producers. As such, initial work at the first workshop in September of 2019 was geared toward identifying barriers to stakeholder acceptance of new pest management practices and develop methods to foster implementation of new strategies.

In addition, considerable research efforts are currently underway to:

- (a) eliminate the use of chemicals for removing sea lice;
- (b) and evaluate the efficacy of other environmentally friendly chemical treatment methods for the removal of sea lice such as hydrogen peroxide.

4.5 What is the approach for determining the location of aquaculture facilities in (a) freshwater and (b) marine environments to minimise the risks to wild salmonid stocks? (Max. 200 words for each)

(a) Private companies seek out locations for a fish culture facility based on suitable natural resources (i.e., sufficient water quality and quantity) which can provide optimal growing conditions for the species they are rearing. A formal application includes information on the species being cultured and an environmental characterization and baseline including a description of the anticipated physical and environmental impacts as a result of the operation of the facility. The baseline serves as a benchmark for monitoring the effects of fish culture operations on the receiving body of water and subsequent water quality. Active salmon hatcheries require a variety of state and federal permits to conduct their activities, these include measures required to minimize impacts to wild Atlantic salmon. While there is no requirement that freshwater hatcheries be a specific distance from a salmon river, the potential ecological and environmental impacts are considered during the federal consultation and permit review process.

(b) As with freshwater siting, private companies seek out locations for marine lease sites based on suitable environmental characteristics which can provide optimal growing conditions for the species they are farming. A formal application includes information on the species being cultured and an environmental characterization and baseline including a description of the anticipated physical and environmental impacts as a result of the operation of the farm. The baseline serves as a benchmark for monitoring the effects of farm operations on sediments, marine organisms, and water quality. Active salmon farms require a variety of state and federal permits to conduct their activities including protective measures to minimize impacts to wild Atlantic salmon. While there is no requirement that a lease site be a specific distance from a salmon river, the potential ecological and environmental impacts are considered during the federal consultation and permit review process for authorizing new and existing lease sites.

4.6 What progress has been made to implement NASCO’s guidance on introductions, transfers and stocking? (Max. 200 words)
(Reference: Articles 5 and 6 and Annex 4 of the Williamsburg Resolution)

Article 5 (Aquaculture) -- In 2003, the National Marine Fisheries Service (NMFS) analysed the effects from continued operations of commercial Atlantic salmon aquaculture facilities in Maine. To minimize these effects, NMFS recommended specific protective measures be incorporated into state and federal permits including: 1) use only local North American salmon stocks for production in marine pens; 2) implementation of containment measures to reduce escapes; 3) audits and reporting requirements; 4) prohibitions on stocking transgenic salmon, and; 5) marking all farmed salmon placed in marine pens within the United States.

Article 6 (State stocking programs) – A series of recent agreements among state authorities curtails stocking of non-native salmonids in areas that are actively managed for Atlantic salmon. The one exception is the Sandy River, a major tributary of the Kennebec River, where brown trout are still stocked (as of 2018) in areas inhabited by Atlantic salmon.

Annex 4 (Stocking Atlantic salmon) –As referenced in other parts of this implementation plan, the

<p>United States has developed a rigorous broodstock management plan for federal hatcheries involved with salmon recovery efforts for the endangered populations in Maine. This broodstock management plan is closely aligned with stocking plans developed by the State of Maine.</p> <p>Programs to restore runs of wild salmon were conducted on rivers south of the freshwater range of the endangered populations for many years but have now nearly ceased. These were government-run programs that were supported by large-scale hatchery stocking programs. These stocking programs had genetic management and broodstock management plans similar to the ones in place in Maine and consistent with NASCO guidelines. The remaining “Legacy Program” in the State of Connecticut is also consistent with NASCO’s guidance on transfers and stocking.</p>	
<p>4.7 Is there (a) a requirement to evaluate thoroughly risks and benefits before undertaking any stocking programme and (b) a presumption against stocking for purely socio-political / economic reasons? (Max. 200 words each) <i>(Reference: Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach and Annex 4 of the Williamsburg Resolution)</i></p>	
<p>(a) No, this is not a requirement. However, when new proposals for stocking are considered, NASCO guidance documents are considered by federal agencies such as the National Marine Fisheries Service.</p>	
<p>(b) This presumption is not specified in any domestic law or policy, but stocking salmon for socio-political or economic reasons no longer occurs given the necessary focus on recovering endangered populations. Further, if a new stocking program involving endangered salmon were considered, it would require endorsement from the relevant state and federal agencies ensuring that the goals of the program would be consistent with recovery criteria (described earlier in this Implementation Plan) and the recovery program broadly (even if part of the goal were socio-political or socio economic).</p>	
<p>4.8 What is the policy / strategy on use of transgenic salmon? (Max. 200 words) <i>(Reference: Article 7 and Annex 5 of the Williamsburg Resolution)</i></p>	
<p>Federal and State of Maine permits prohibit rearing transgenic salmon for commercial aquaculture at existing lease sites in the marine environment. In addition, the U.S. Department of Commerce (DOC) and the National Atmospheric and Atmospheric Administration (NOAA) policies reflect broad goals including: (1) encouraging and fostering sustainable aquaculture within the context of the National Ocean Policy; (2) protecting wild species and ocean ecosystems; (3) working internationally to learn from aquaculture best practices around the world and encourage the adoption of science-based sustainable practices; among others.</p>	
<p>4.9 For Members of the North-East Atlantic Commission only: What measures are in place, or are planned, to implement the eleven recommendations contained in the ‘Road Map’ to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of <i>Gyrodactylus salaris</i> and eradicate it if introduced, including the development and testing of contingency plans? (Max. 200 words) <i>(Reference ‘Road Map’ to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of G. salaris and eradicate it if introduced, NEA(18)08)</i></p>	
<p>Not applicable.</p>	
<p>4.10 Identify the main threats to wild salmon and challenges for management in relation to aquaculture, introductions and transfers, and transgenics.</p>	
Threat / Challenge A1	Sea lice attributable to marine net pens
Threat / challenge A2	Containment of aquaculture-origin salmon

Threat / challenge A3	Further loss of diversity of salmon populations from small effective population size, genetic introgression of aquaculture escapees, or domestication
Threat / challenge A4	Potential stocking of non-native salmonids in the freshwater range of endangered salmon

Copy and paste lines to add further threats/challenges which should be labelled A5, A6, etc.

4.11 What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 4.10 to implement NASCO’s Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for aquaculture, introductions and transfers, and transgenics?		
Action A1:	Description of action:	Sea Lice - Minimize sea lice loads on commercial aquaculture fish being reared in marine net pens to reduce risks to salmon in the wild each year. This will be accomplished by mandatory fallowing, monitoring of lice levels (monthly when temperatures range from 6 – 8°C and bimonthly when temperatures exceed 8°C), and mandatory treatments when thresholds for sea lice counts are exceeded (1 gravid female and 5 pre-adult lice).
	Planned timescale (include milestones where appropriate):	2019 – 2024
	Expected outcome:	a) Lice loads in marine net pens maintained at a level below the pre-determined thresholds and b) Treatment when necessary (monitoring reveals sea lice levels above threshold levels) to ensure that risks to salmon in the wild remain low.
	Approach for monitoring effectiveness & enforcement:	Monthly surveillance conducted by a third party for pathogens and sea lice required under the State of Maine Fish Health regulations.
	Funding secured for both action and monitoring programme?	Expected
Action A2:	Description of action:	Containment --- Minimize effects to wild salmon from genetic introgression from escaped aquaculture-origin salmon by ensuring that containment measures are maintained at 100% of all salmon farms each year
	Planned timescale (include milestones where appropriate):	2019 - 2024
	Expected outcome:	No escapees of U.S origin spawning in the rivers containing endangered salmon.
	Approach for monitoring effectiveness & enforcement:	Annual audits of containment management plans and records; timely reporting requirements for escape events; surveillance of five salmon rivers for the presence of aquaculture-origin salmon
	Funding secured for both action and monitoring programme?	Expected

Action A3:	Description of action:	Implement broodstock management protocols at conservation hatcheries on an annual basis
	Planned timescale (include milestones where appropriate):	2019 – 2024 – Implement protocols each year
	Expected outcome:	Reduce or eliminate the loss in diversity from endangered populations
	Approach for monitoring effectiveness & enforcement:	Estimates of genetic diversity, such as allelic variability (i.e. number of alleles per locus, allelic diversity), and heterozygosity are obtained through the use of a comparable suite of molecular markers that are consistently used to monitor diversity over time. We will conduct these assessments and report the results annually.
	Funding secured for both action and monitoring programme?	Expected
Action A4:	Description of action:	Reduce stocking of non-native salmonids in the freshwater range of endangered salmon to ensure that predatory and competitive effects are minimized.
	Planned timescale (include milestones where appropriate):	2019 – 2024
	Expected outcome:	Minimally, the current locations for stocking non-native salmonids will be maintained where only the Sandy River is routinely stocked with brown trout.
	Approach for monitoring effectiveness & enforcement:	Coordination with state programs that stock salmonids to support recreational fisheries; Review of stocking reports and consultation with state authorities. Note: this action (and therefore expected outcome and approach for monitoring) does not lend itself to truly quantitative measures. Instead, reporting will rely on qualitative descriptions of progress in reducing stocking of non-native salmonids from 2019 to 2024 using specific examples (e.g., changes to stocking strategies) whenever possible.
	Funding secured for both action and monitoring programme?	Expected

Copy and paste lines to add further actions which should be labelled A5, A6, etc

Appendix 1. Location of relevant aquaculture facilities.

