



International Atlantic Salmon Research Board

SAG(16)8

Inventory of Research Relating to Salmon Mortality in the Sea

(Updated 27 October 2016)

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Summary

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1. The International Atlantic Salmon Research Board's inventory of research relating to salmon mortality in the sea was established in 2002 and has been updated annually since then. It is a valuable tool in the development of research priorities for potential funding and in better coordinating existing research efforts. It had previously been noted that greater use could be made of the inventory and in both 2009 (SAG(09)10) and 2013 (SAG(13)2) a Sub-Group established by the Board's Scientific Advisory Group (SAG) had reviewed the inventory. The Board had agreed that the inventory should continue to be reviewed every 3 or 4 years. If this schedule continues to be followed then the next review of the inventory would be due in 2016 or 2017. The SAG will be asked to consider appropriate timing and make its recommendation to the IASRB.
2. The updated inventory for 2016 is attached. The Board had agreed that the summary table of ongoing and completed projects should be made available in Excel format and the 2016 inventory has again been presented in this way. Table 1 provides details of expenditure on ongoing research by topic area for each Party. The total annual expenditure on the 43 ongoing projects (2 of which are uncosted) is approximately £5.7 million. Approximately half of the expenditure is associated with long-term monitoring programmes.
3. In Table 2, ongoing and completed projects are listed accordingly to the five research topic areas agreed by the Board on the basis of the main focus of the research, although some projects could have been allocated to a number of these research areas. Last year the Board adopted a Resolution, ICR(14)6 encouraging collaborative telemetry projects in order to partition marine mortality of Atlantic salmon along their migration routes. The current inventory includes 15 ongoing, and 19 completed projects related to the migratory behaviour of individual fish and these are listed under section 2(b) of Table 2.
4. In Table 3 the projects have been allocated to the relevant work package in the SALSEA Programme. The SAG may wish to consider if listing the inventory projects in the format of Table 3 is still informative. Table 4 provides summary information on both the ongoing (43) and completed (84) projects. Full details of these projects are contained in Annex 1.
5. Five new projects have been included in the inventory since its last update as follows:

Canada

Smolt monitoring on Middle River, Cape Breton, Nova Scotia, Canada

Objectives: estimate run size, age structure and phenology of Atlantic salmon smolts from the Middle River, Nova Scotia; estimate survival in the marine environment from smolt to adult life phases; collect smolts for other research projects and collaborations (e.g. behavioural tagging studies); contribute information to inform recovery planning and traditional ecological knowledge (it is hoped to acoustically tag up to 50 smolts in

2016).

European Union – Denmark

Strengthen the Danish Atlantic salmon populations (SDPAS)

Objectives: The vision of the project is to strengthen Danish Atlantic salmon populations towards a state where the populations are completely self-sustainable and can be exploited under a dynamic catch quota approach. The project comprises of six work packages including limiting factors for smolt and pre-smolt run and survival, limiting factors for kelt survival, improving quality and post-release survival of stocked salmon.

European Union – Ireland

Investigation of the early migration of salmon and brown trout from the Burrishoole National Index River using telemetry technology in freshwater, brackish and inshore marine areas.

Objectives: Track early migration of salmon and trout through the Burrishoole system and assess mortality on entry to marine milieu; experimentally compare early migration and migratory behaviours of local versus foreign Atlantic salmon smolts reared from the Burrishoole system; and link long-term biological data on Atlantic salmon and sea trout with climate time series to assess the effect of potential thermal mismatch between freshwater and marine environments on post-smolt survival.

Investigation of the causes of early migration mortality in salmon and sea trout from the Burrishoole National Index River using acoustic telemetry in estuarine, marine and coastal areas.

Objectives: Build national capacity in the use of telemetry to monitor movements of migratory fish species; evaluate and optimise methods for the tagging of wild and reared post-smolts; describe and map the migration routes taken by post-smolt Atlantic salmon and sea trout during their seaward migration from the Burrishoole catchment; and estimate survival of tagged post-smolts during their seaward migration from the Burrishoole catchment.

Estimate marine survival of wild Atlantic salmon in the North-east Atlantic from the National Salmonid Index Catchment in the west of Ireland

Objectives: Investigate the decline in North-East Atlantic Salmon stocks from a West coast of Ireland river using Passive Integrated Transponder (PIT) tag technology; provide data to support and for use in forecast models of abundance, size and life history strategies of the current stock; estimate pre-adult to adult marine survival rates; and provide information on results of survival rate of salmon smolts to Standing Scientific Committee.

Table 1: Approximate Annual Expenditure on Ongoing Research Projects in Relation to Salmon Mortality at Sea by Topic Area and Party

	Canada	Denmark (Faroe Islands and Greenland)	European Union	Norway	Russian Federation	United States of America	France (in respect of St Pierre and Miquelon)	Totals by Topic Area
Long-term monitoring	£613,300 2	-	£1,899,800 11	£134,000 1	£60,000 1	-		£2,707,100 15
Distribution/ Migration in the sea	£773,100 4	£105,000 1	£925,000 6 (1)	£468,000 2	-	£103,000 6	- 1(1)	£2,374,100 20(2)
Life history/ biological processes	-	-	£80,000 2	-	-	£70,000 1	-	£150,000 3
Development of methods	-	-	-	-	-	-	-	-
Specific natural and anthropogenic factors	-	-	£337,000 3	£75,000 1	-	£50,000 1	-	£462,000 5
Totals by Party	£1,386,400 6	£105,000 1	£3,241,800 22 (1)	£677,000 4	£60,000 1	£223,000 8	- 1(1)	£5,693,200 43(2)

The figures shown are in pounds sterling. The number of ongoing projects is shown below the expenditure figure, with the number of uncosted projects shown in parentheses. The costs have been allocated on the basis of the NASCO Party coordinating the research project. However, in many cases the projects involve collaboration with other Parties or with NGO partners who may have made financial contributions to the projects (some details of these contributions have been provided and are given in Annex 1).

Table 2: Allocation of ongoing and completed projects by topic area

Topic Area	Objective/Issue	Comments/examples	Ongoing Projects	Completed Projects	Potential for cooperation among Parties	Priority for access to 'Fund'
1. Long-term monitoring	a. Time-series of marine survival/growth estimates	Essential on-going tagging/monitoring programmes; require long-term national funding.	C17, C26, De3, Fi1, Fr2, Ir8, Ir15, Sw1, Ew11, Ni2, Sc3, N14, R2	U6	Medium	Low
	b. Time series of marine survival in relation to environmental parameters (e.g. SST)	Desk studies on time series.	Fi3, Sc4	E1, E3, Ir2, Ni1, N2, N6, U11	Medium	Medium
2. Distribution/migration in the sea	a. Distribution of salmon in the sea	Marine surveys of post-smolt distributions in NEAC and NAC areas; identification of fish caught (e.g. tagging, genetics).		C2, C6, C15, E2, N8, U7	High	High
	b. Migratory behaviour of individual fish	Active smolt tracking; automated data collection by DSTs.	C16, C18, C25, De4, De5, Ir12, Ir13, Ir14, Ni3, N18, U4, U5, U10, U13, U16	C1, C3, C4, C5, C10, C11, C12, C20, C22, C23, De1, De2, Ir5, Ir9, Ew1, N5, N12, N15, U3	High	High
	c. Origin of catches in directed fisheries	Catch sampling in distant water fisheries; genetic analysis and scale analysis, etc; changes over time.	C24, D1, N21, U9, F1	C9, C13, C14, C21, Fi2, Fr3, Ir6, Ew6, Ew10, Ew18, Sc5, Sc7, Sc8, N11, N17, N19, R3		Low
	d. Migration and bioenergetic models	Desk studies based on data obtained from other studies.		Ew4, U1	Medium	Medium
	e. By-catches in pelagic fisheries	Can be conducted as part of marine surveys of post-smolt distributions; sample commercial pelagic catches.		N3, R1	High	High
3. Life history/biological processes	a. Freshwater factors	Age, growth, migration timing, etc.		Fr1, Ew8, Ew13, Ew15	Low	Low
	b. Pre-fishery recruitment marine factors	Environment, food, predation, growth, parasites and diseases, etc.	Ir10, U14	Ew9, N7, U12	High	High
	c. Post-fishery recruitment marine factors	Environment, food, predation, maturation processes, growth, etc.	Sc6	C8, C19, Ew12, N1, U2	High	High
4. Development of methods	a. Post-smolt survey methods	Development of trawls with cameras, tag detection, etc.		Ir4, Sc1	Medium	Medium
	b. Electronic tag technology	Development of smaller/smarter/cheaper tags.			Medium	High
5. Specific natural and anthropogenic factors	a. Fish farms	Increased sea lice infestations.	Ir11, N13,	Ir1, Ir3, Ir7, Ew3, N4, N9, N10, N16, N20	Low	Low
	b. Predation	Predation by seals, birds, fish, etc. in estuaries/coastal areas.	U15	Sc2, U8	Low	Low
	c. Obstructions to fish movements	Barrages, etc.	Ew16	Ew5	Low	Low
	d. Pollutants	Acidification; freshwater contaminants.	Ew17	C7, Ew2, Ew7, Ew14	Low	Low

Note: The priorities of low, medium and high assigned to the topic areas in this table are those currently considered appropriate for international cooperation and funding. The Board will keep them under review. They are not intended to reflect overall importance of these topics.

Table 3: Ongoing and completed projects in the inventory of research allocated to SALSEA programme work packages

SALSEA Work Packages	Ongoing Projects	Completed Projects
<i>Work Package 1: Supporting Technologies</i>		
Task 1: Genetic tagging to determine stock origin	C24, D1, N21, U9, F1	C9, C13, C14, C21, Fi2, Fr3, Ir6, Ew6, Ew10, Ew18, Sc5, Sc7, Sc8, N11, N17, N19, R3
Task 2: Sampling equipment evolution	-	-
Task 3: Signals from scales	Sc4	C8, C19, Ew12, N1, U2
<i>Work Package 2: Early Migration through the Inshore Zone: fresh waters, estuaries and coastal waters</i>		
Task 1: Investigate the influence of biological characteristics of Atlantic salmon smolts on their marine mortality	C17, C26, De3, Fi1, Fr2, Ir8, Ir15, Sw1, Ew11, Ni2, Sc3, N14, R2	Ir2, U6
Task 3: The impacts of physical factors in fresh water on marine mortality of Atlantic salmon	Ew16	Fr1, Ew5, Ew8, Ew9, Ew13, Ew15
Task 3: Preparing to migrate – investigate the influence of freshwater contaminants on the marine survival of Atlantic salmon	Ew17	C7, Ew2, Ew7, Ew14
Task 4: The part played by key predators	U15	Sc2, U8, U12
Task 5: The impact of aquaculture on mortality of salmon	Ir11, N13	Ir1, Ir3, Ir7, Ew3, N4, N9, N10, N16, N20
<i>Work Package 3: Investigating the distribution and migration of salmon at sea</i>		
Task 1: Distribution and migration mechanisms – develop theoretical migration models	-	Ew4, N2, U1
Task 2: A common approach – refine the plans for a large-scale marine survey	-	-
Task 3: Salmon at sea – carry out a comprehensive survey	-	C2, C6, C15, E2, N7, N8, U7
- acoustic tagging surveys	C16, C18, C25, De4, De5, Ir12, Ir13, Ir14, Ni3, N18, U4, U5, U13, U16	C1, C3, C4, C5, C10, C11, C12, C20, C22, C23, De1, De2, Ir5, Ir9, Ew1, N5, N12, N15, U3
- data storage tags	U10	-
- others	Ir10, Sc6, U14	N3, N6, R1, U11
Task 4: Distribution and migration – analyse and collate data	-	-
<i>Appendix 1: Supporting technologies, further development of which will support the SALSEA programme</i>		
1. Novel trawl sampling technologies	-	Ir4, Sc1
2. Data storage tags	-	-
3. Coded wire tagging	-	-
4. Sonic tags and sonic detector arrays	-	-

Table 4: Summary of ongoing and completed research projects relating to salmon mortality in the sea

Jurisdiction	Project No	Title	Status	Summary of Objectives	Research Dates	Topic Area	Objective/Issue	Area of Research	Collaborating Countries	Coordinating Scientist	Annual Expenditure
Canada	C1	Marine migration and survival of post-smolt Atlantic salmon from Bay of Fundy rivers	Completed	Provide knowledge about marine habitat (migration routes and feeding grounds) used by salmon post-smolts from Bay of Fundy rivers. Determine the location, timing and extent of salmon post-smolt mortality at sea. Investigate the causes and mechanisms of marine mortality of salmon post-smolts. Provide information to fuel the recovery programme for inner Bay of Fundy salmon stocks.	2001 - 2003	Distribution/migration in the sea	Migratory behaviour of individual fish	Bay of Fundy and Gulf of Maine	USA	Gilles L Lacroix	
Canada	C2	Distribution, health and condition of Atlantic salmon from Bay of Fundy rivers while at sea	Completed	Provide knowledge about marine habitat and health of salmon post-smolts from Bay of Fundy rivers. Investigate the causes and mechanisms of marine mortality of salmon post-smolts. Provide information to fuel the recovery programme for inner Bay of Fundy salmon stocks.	2002 - 2004	Distribution/migration in the sea	Distribution of salmon in the sea	Bay of Fundy and Gulf of Maine	USA and Norway	Gilles L Lacroix	
Canada	C3	Marine migration and survival of post-smolt Atlantic salmon from the Saint-Jean River (Gaspé)	Completed	Provide knowledge of the marine habitat (migration routes and feeding grounds) used by salmon post-smolts from Bay of Gaspé rivers. Determine the location, timing and extent of salmon post-smolt mortality at sea. Investigate the causes and mechanisms of marine mortality of salmon post-smolts.	2005 - 2006	Distribution/migration in the sea	Migratory behaviour of individual fish	Saint-Jean River, Gaspé Peninsula, Quebec		Julian Dodson, François Caron	
Canada	C4	Marine migration and survival of kelt Atlantic salmon from the Saint-Jean River (Gaspé)	Completed	Provide knowledge of the marine habitat (migration routes and feeding grounds) used by salmon kelts from Bay of Gaspé rivers. Determine the location, timing and extent of kelt mortality at sea. Investigate the causes and mechanisms of marine mortality of salmon kelts.	2006 - 2007	Distribution/migration in the sea	Migratory behaviour of individual fish	Saint-Jean River, Gaspé Peninsula, Quebec		Julian Dodson, François Caron	
Canada	C5	Tracking experimentally 'escaped' farmed salmon	Completed	Determine the course tracks and fates of sonically tagged farmed salmon released in winter and spring.	2005	Distribution/migration in the sea	Migratory behaviour of individual fish	Cobscook Bay, Maine, USA; Quoddy region, NB, Canada		Fred Whoriskey	
Canada	C6	Atlantic salmon distribution and abundance at sea	Completed	Determine salmon distribution and abundance at sea, particularly post-smolts in the Labrador Sea and Northern Grand Banks; collect biological and other data; investigate the relationship between salmon and their prey; investigate the relationship between oceanographic parameters and salmon abundance; tag and release salmon.	2001 - 2005	Distribution/migration in the sea	Distribution of salmon in the sea	Labrador Sea and Northern Grand Banks		David Reddin	
Canada	C7	Integrated field and laboratory assessment of the effects of endocrine – disrupting substances on Atlantic salmon smolts	Completed	Laboratory tests of the effects of endocrine-active substances in municipal, and industrial effluents; field tests of the effects of endocrine-active substances in municipal and industrial effluents; field tests on caged smolts near sites with potential for significant agriculture run-off; ocean field tests of link between exposure of smolts to endocrine - disrupting substances and subsequent lower adult returns.	2003 - 2007	Specific natural and anthropogenic factors	Pollutants	Atlantic Canada and Co. Mayo, Ireland	Ireland	Wayne Fairchild	
Canada	C8	Use of stable isotopes to assess long-term changes in marine trophic ecology of Atlantic salmon (<i>Salmo salar</i>)	Completed	Assess trophic and dietary information through analysis of stable isotope signatures of carbon and nitrogen from previously compiled scale samples from various salmon stocks; compare isotopic signatures within and among stocks to infer differences in feeding ecology in time and space; examine evidence of environmental influences on trends in isotopic signatures; examine linkages of stable isotope signatures with trends in abundance.	2006 – 2007	Life history/biological processes	Post-fishery recruitment marine factors	Desk study examining archived material and samples from Newfoundland, the Maritime Provinces, the Quebec North Shore, and the Barents Sea (Tana River, Finland)	Finland	J Brian Dempson	
Canada	C9	Effective population size, gene flow and population structure of Atlantic salmon in Newfoundland and Labrador	Completed	Document population structure and connectivity (gene flow) among Newfoundland and Southern Labrador rivers. Test for temporal stability of the structure over the past 50 years.	2003 - 2008	Distribution/migration in the sea	Origin of catches in directed fisheries	Newfoundland and Labrador		Daniel Ruzzante, Friso Palstra	

Jurisdiction	Project No	Title	Status	Summary of Objectives	Research Dates	Topic Area	Objective/Issue	Area of Research	Collaborating Countries	Coordinating Scientist	Annual Expenditure
Canada	C10	River and extended estuary acoustic tracking of Atlantic salmon (<i>Salmo salar</i>) kelts and bright salmon	Completed	Track and document migratory behaviour of Atlantic salmon kelts as they leave the river for the open ocean and bright salmon as they return to rivers; identify possible critical habitat sites utilized by kelts and bright salmon during their migration; examine the mortality rates of kelts and bright salmon during migration.	2006 - 2008	Distribution/migration in the sea	Migratory behaviour of individual fish	LaHave River and estuary, Nova Scotia		Peter G. Amiro, A Jamie F. Gibson	
Canada	C11	Integrated modelling of juvenile Atlantic salmon movement and physical habitat in fluvial and estuarine environments	Completed	Develop an innovative geomatic approach capable of relating the behaviour of smolts during their migration to the characteristics of the physical habitat in rivers and estuaries; apply this approach to the analysis of the migration of smolts through the estuaries of the St. Jean, Dartmouth and York rivers and down the Baie de Gaspé; detect possible change in migration pattern of smolts in response to the presence of sea cages.	2005 - 2008	Distribution/migration in the sea	Migratory behaviour of individual fish	York River and Baie de Gaspé, Quebec	UK	Julian Dodson	
Canada	C12	Estuary acoustic tracking of Atlantic salmon (<i>Salmo salar</i>) smolts and kelts – Conne River, Little River, and Bay d’Espoir, Newfoundland	Completed	Tag and track migratory behaviour of Atlantic salmon smolts and kelts as they leave the Conne River, Newfoundland; determine the movements and migration patterns throughout the Bay d’Espoir fjord; provide insight into the initial survival and residency of smolts and kelts migrating through the fjord.	2006 - 2008	Distribution/migration in the sea	Migratory behaviour of individual fish	Conne River, Little River and Bay d’Espoir fjord, Newfoundland		J. Brian Dempson, Keith Clarke	
Canada	C13	Spatio-temporal distribution of Atlantic salmon stocks and the impact of the West Greenland fishery	Completed	Provide knowledge about the river origin of the salmon catch in the commercial fishery at West Greenland.	2006 - 2008	Distribution/migration in the sea	Origin of catches in directed fisheries	Samples from West Greenland		Louis Bernatchez, Tim King	
Canada	C14	Genetic population structure of Atlantic salmon in Eastern Canada and its implication for conservation	Completed	Elucidate the genetic population structure of Atlantic salmon from a small (river) to a large (Eastern Atlantic coast) spatial scale and propose conservation units for the Canadian distribution range.	2004 - 2008	Distribution/migration in the sea	Origin of catches in directed fisheries	Rivers in Quebec, Canada		Louis Bernatchez, Mélanie Dionne	
Canada	C15	Pelagic ecosystem survey of the Northwest Atlantic	Completed	Sample the upper pelagic ecosystem during the period corresponding to the early post-smolt phase. Determine distribution and relative abundance of post-smolts at selected locations and times along hypothesised ocean migration route. Obtain data on relative abundance of other species including macroplankton aggregations to provide information on the role of salmon in the pelagic ecosystem. Obtain oceanographic information.	2008 - 2011	Distribution/migration in the sea	Distribution of salmon in the sea	North West Atlantic (stations 49-58°N)	USA	Gerald Chaput, Dave Reddin, Tim Sheehan	
Canada	C16	Miramichi River and Restigouche River kelt movements and survival	Ongoing	Document the spring movements and survival of kelts from the Miramichi River and Restigouche River as they return to the sea and on their subsequent return as repeat spawners. Determine the locations and causes of kelt mortalities in the marine environment.	2008 – 2016	Distribution/migration in the sea	Migratory behaviour of individual fish	Miramichi River and estuary Restigouche River and estuary and Gulf of St Lawrence, Atlantic Ocean		Jon Carr	£108,000
Canada	C17	Marine survival of Canadian Atlantic salmon stocks: long-term monitoring	Ongoing	Long-term assessments of smolt production and adult return estimates from a number of rivers in Newfoundland region, Maritimes region, Gulf region and Quebec.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Canadian rivers in Newfoundland region, Maritimes region, Gulf region and Quebec		Gerald Chaput	£600,000
Canada	C18	Atlantic salmon smolt migration and survival within Canadian rivers, estuaries and during the marine life stage	Ongoing	Provide a time-series of stage specific estimates of mortality rates for smolts and post-smolts at various points of their at-sea migration, including for their transitions through freshwater, the estuary and to various points in the ocean; examine the relation between biological characteristics of the fish and survival rates to attempt to isolate mortality causes; document the migration pathways and speeds of smolts from different rivers.	2003 -	Distribution/migration in the sea	Migratory behaviour of individual fish	Miramichi River and estuary; Restigouche River and Baie des Chaleurs; Cascapedia River and estuary; St-Jean (Côte-Nord) River and estuary; Strait of Belle Isle, Cabot Strait, Labrador.	USA	Jon Carr, Fred Whoriskey	£435,000

Jurisdiction	Project No	Title	Status	Summary of Objectives	Research Dates	Topic Area	Objective/Issue	Area of Research	Collaborating Countries	Coordinating Scientist	Annual Expenditure
Canada	C19	Stable isotope ratios to infer trophic structure and condition of Atlantic salmon during their life at sea	Completed	Improve understanding of marine ecology of salmon through studies of trophic state and condition. Questions to be addressed include: are trophic states of 1SW non-maturing fish similar between NAC and NEAC origin salmon?; Are trophic states of 1SW non-maturing fish different from those of maturing 1SW fish of the same cohort? Can this tell us anything about when these different maturity groups separate in the North Atlantic?; Has there been a trophic state change between West Greenland and return to home rivers as 2SW salmon? How do current measures of trophic status compare with measures from archival scales and do differences indicate significant changes?	2008 – 2014	Life history/ biological processes	Post-fishery recruitment marine factors	West Greenland and from salmon returning to the index rivers of Eastern Canada.	Greenland	Heather Dixon, Mike Power, J. Brian Dempson, Gerald Chaput, Tim Sheehan	
Canada	C20	Identification of essential habitat for repeat spawning Atlantic salmon of Inner Bay of Fundy origin	Completed	Identify the freshwater and marine habitats used by post-spawning Atlantic salmon of inner Bay of Fundy (iBoF) origin for reconditioning and identify the sites and times of mortality.	2008 - 2013	Distribution/ migration in the sea	Migratory behaviour of individual fish	Big Salmon, Gaspereau and Hammond Rivers		Gilles L Lacroix, Ross Jones	
Canada	C21	Genomic basis of adaptive divergence and marine survival among Atlantic salmon populations	Completed	Elucidate the genetic basis of adaptive divergence and marine survival in Atlantic salmon populations from eastern Canada. Contribute to the identification of management units.	2010 - 2014	Distribution/ migration in the sea	Origin of catches in directed fisheries	Québec, Maritimes, Newfoundland and Labrador	Norway, USA	Louis Bernatchez, Mélanie Dionne, Patrick O'Reilly, Vincent Bourret	
Canada	C22	River and extended estuary acoustic tracking of Atlantic salmon (<i>Salmo salar</i>) smolts in Southern Uplands rivers	Completed	Estimate mortality rates, assess the spatio-temporal dynamics of natural mortality and examine migratory behaviour during the fresh to saltwater transition of wild Atlantic salmon <i>Salmo salar</i> smolts from four river systems in an area of Nova Scotia, Canada known as the Southern Upland.	2008 - 2010	Distribution/ migration in the sea	Migratory behaviour of individual fish	LaHave River, St. Mary's River, Gold River, and West River (Sheet Harbour)		E Halfyard, A Jamie F Gibson	
Canada	C23	Effects of early captive exposure on measures of fitness later in life for Inner Bay of Fundy (IBoF) Atlantic Salmon	Completed	Assess the effects of standard and novel conservation rearing strategies on measures of fitness for the recovery of IBoF salmon. Part of the research involved acoustic tagging to assess return migration ability.	2010 - 2015	Distribution/ migration in the sea	Migratory behaviour of individual fish	Upper Salmon River		Corey Clarke	
Canada	C24	Genomic stock identification techniques provide distribution information of regional groups of Atlantic salmon from eastern North America and estimates of exploitation in mixed stock marine fisheries	Ongoing	Identify to regional groups the origin of salmon from mixed stock fisheries of Labrador (Canada), Saint-Pierre & Miquelon, and at West Greenland; estimate total catch by regional group and examine region specific variations in distribution at sea and availability of Atlantic salmon in marine fisheries.	2013 - 2017	Distribution/ migration in the sea	Origin of catches in directed fisheries	Eastern North America, West Greenland	France, NASCO West Greenland sampling Programme (see D1)	Ian Bradbury	£130,100
Canada	C25	Rearing wild-origin IBoF salmon smolts in marine netpens for release as adults to supplement stocking of Fundy National Park (FNP) Rivers	Ongoing	Experimentally supplement FNP spawning adult salmon populations to effective population size for one salmon generation (4-5years) and produce cohorts of naturally spawned and captive-free migrating smolts.	2014 – 2019	Distribution/ migration in the sea	Migratory behaviour of individual fish	Upper Salmon River, Point Wolfe River (Fundy National Park) *Petitcodiac		Corey Clarke	£100,000
Canada	C26	Smolt monitoring on Middle River, Cape Breton, Nova Scotia, Canada	New Entry	The objectives are to: estimate run size, age structure and phenology of Atlantic Salmon smolts from the Middle River, Nova Scotia; allow estimation of survival in the marine environment from smolt to adult life phases; allow collection of smolts for other research projects and collaborations (e.g. behavioural tagging studies); and contribute information to inform recovery planning and traditional ecological knowledge.	2011 - 2016	Long-term monitoring	Time-series of marine survival/growth estimates	Middle River, Cape Breton, Nova Scotia		Shelley Denny	£13,300
Denmark - Greenland	D1	West Greenland Salmon Fishery Sampling Programme	Ongoing	Continue time series of data on the continent of origin and biological characteristics of salmon in the fishery; provide data on mean weight and length and continent of origin for input to models; collect information on the recovery of internal and external tags; collect other additional biological samples as required.	Annual	Distribution/ migration in the sea	Origin of catches in directed fisheries	Sisimiut, Maniitsoq, Paamiut and Qaqortoq, Greenland	USA, UK, Ireland, Canada	Helle Siegstad	£105,000

Jurisdiction	Project No	Title	Status	Summary of Objectives	Research Dates	Topic Area	Objective/Issue	Area of Research	Collaborating Countries	Coordinating Scientist	Annual Expenditure
European Union	E1	SALMODEL Concerted Action – A co-ordinated approach towards the development of a scientific basis for management of wild Atlantic salmon in the North-East Atlantic	Completed	Improve ability to set conservation limits and examine methods of estimating pre-fishery abundance (PFA) and determine how these PFA estimates can be used to provide catch advice.	2000 - 2002	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Desk study	France, Ireland, Finland, Norway, Iceland, Sweden, Canada, UK	Walter Crozier	
European Union	E2	SALSEA-Merge: Advancing understanding of Atlantic salmon at sea: Merging genetics and ecology to resolve stock – specific migration and distribution patterns	Completed	Merge genetic and ecological investigations to advance understanding of stock specific migration and distribution patterns and overall ecology of the marine life of Atlantic salmon and gain an insight into the factors resulting in recent significant increases in marine mortality.	2008 - 2011	Distribution/migration in the sea	Distribution of salmon in the sea	North-East Atlantic with marine surveys off coast of Ireland and UK, around the Faroes and in the Northern Norwegian Sea and Barents Sea	Denmark, Finland, France, Faroes, Iceland, Ireland, Norway, Spain, UK	Jens Christian Holst	
European Union	E3	ECOKNOWS (Effective Use of Ecosystem and Biological Knowledge in Fisheries): Improving fisheries assessment methods by integrating new sources of biological knowledge	Completed	The objectives include improving ways to find generic and understandable biological reference points. An age and stage-based life-cycle population dynamic model which explicitly separates the freshwater and marine phases and incorporates the variability of life histories (river and sea ages) is one output from the project.	2010 - 2014	Long-term monitoring	Time series of marine survival in relation to environmental parameters	North Atlantic	ECOKNOWS Consortium: Finland, Denmark, Philippines, Greece, Spain, Ireland, UK, Canada, Sweden, France	One Coordinating Scientist for each of the Seven Work Packages	
European Union - Denmark	De1	Estuarine migration of smolts in the River Skjern Å (North Sea) and River Guden Å	Completed	Assess the effect of restoration of habitat in the River Skjern Å on the smolt runs of salmon and sea trout, in particular with regard to predation by piscivorous birds. To investigate the migration of salmon smolts in the River Guden Å.	2002 - 2003	Distribution/migration in the sea	Migratory behaviour of individual fish			Gorm Rasmussen	
European Union - Denmark	De2	Mortality of Atlantic salmon smolts during estuary migration	Completed	Estimate mortality of salmon smolts during migration through estuaries and compare the return ratio of wild, stocked ½- and one-yearlings.	2000 - 2008	Distribution/migration in the sea	Migratory behaviour of individual fish	River Skjern Å and River Stor Å (North Sea) and River Guden Å (Kattegat) and their estuaries		Anders Koed, Kim Aarestrup	
European Union - Denmark	De3	Salmon Rehabilitation Plan: monitoring numbers of spawners, spawning and nursery areas in four Atlantic salmon rivers and the achievement of the objective of self-reproduction	Ongoing	The Danish national salmon rehabilitation plan describes four rivers with natural wild salmon populations. This project monitors the effect of the rehabilitation plan and the development of the populations (the goal is at least 1,000 spawners in each river to fulfil the plan). This study will allow estimates of marine mortality of salmon to be made.	Annually	Long-term monitoring	Time series of marine survival /growth estimates	River Skjern Å, River Ribe Å, River Storå and Varde Å. The rivers flow into the North Sea		Anders Koed, Einar Eg Nielsen, Niels Jepsen	£110,300
European Union - Denmark	De4	Marine behaviour of Atlantic salmon	Ongoing	Obtain more knowledge about the salmon's distribution and migration at sea using DSTs and PSAT tags and isotopes.	2010 - 2016	Distribution/migration in the sea	Migratory behaviour of individual fish	River Skjern Å and River Storå		Kim Aarestrup	£35,000
European Union - Denmark	De5	Strengthen the Danish Atlantic salmon populations (SDPAS)	New Entry	The vision of the project is to strengthen Danish Atlantic salmon populations towards a state where the populations are completely self-sustainable and can be exploited under a dynamic catch quota approach. The project comprises six work packages including limiting factors for smolt and pre-smolt run and survival, limiting factors for kelt survival and improving quality and post-release survival of stocked salmon.	2016 – 2020	Distribution/migration in the sea	Migratory behaviour of individual fish	River Skjern	Denmark	Anders Koed	£630,000
European Union - Finland	Fi1	Long-term variation in population dynamics, life history characteristics, sea growth and origin (wild/reared) of salmon in the rivers Teno (Tana) and Näätämöjoki (Neidenelva)	Ongoing	Collect long-term data on variation in the stock components, life histories, sea growth and abundance of escaped farmed salmon in the salmon stocks of the rivers Teno and Näätämöjoki. Relate the population dynamics of the juvenile salmon and returning adult salmon in preceding and subsequent generations.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Northern Finland and Norway	Norway	Jaakko Erkinaro	£275,000
European Union - Finland	Fi2	Joint use of high-throughput SNP assay infrastructure in Atlantic salmon	Completed	The key aims of the project include: I) A concerted effort to identify genomic regions that affect ecologically and economically important phenotypic traits in domesticated and wild Atlantic salmon; II) efficient joint utilization of a state-of-the-art Nordic genomics infrastructure to generate large-scale salmon SNP datasets;	2009 - 2010	Distribution/migration in the sea	Origin of catches in directed fisheries	Norway and Finland	Norway	Craig Primmer	

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European Union - Finland	Fi3	Integrative science for adaptive co-management in the Arctic: Teno Atlantic salmon as a model system (ISAMA)	Ongoing	The aims of the project are to: 1) characterise the ecological and genetic changes in the Teno salmon stock over the past 40 years; 2) identify the key human-mediated/climatic factors that have contributed to these changes; 3) determine the relationships between these changes and the co-occurring societal and political changes 4) better understand the genetic basis of life-history traits important for maintaining stock diversity and stability and thus salmon-related livelihoods 5) use local knowledge and management of Teno salmon as a case study to examine the links between scientific research, local resource users, and adaptive co-management and policy.	2015 -2018	Long-term monitoring	Desk studies on time series	Finland and Norway	Norway	Craig Primmer, Jaakko Erkinaro	£400,000
European Union - France	Fr1	Evolution of biological characteristics in Atlantic salmon from all the Armorican massif rivers (Brittany and Low-Normandy, France)	Completed	Examine relationships between the cumulative effects of climate warming and other anthropogenic stresses and changes in biological features in populations in the southern part of the European distribution range of the species.	1972 - 2005	Life history/ biological processes	Freshwater factors	Salmon rivers in the Armorican Massif (about 25 – 30 rivers)		Jean-Luc Baglinière	
European Union - France	Fr2	The sea survival of Atlantic salmon from the River Scorff, Brittany	Ongoing	Estimation and long-term monitoring of survival at sea in the southern part of the European distribution range of the species.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	River Scorff (Southern Brittany)		Etienne Prévost	£143,000
European Union – France	Fr3	Atlantic salmon metapopulation investigation in Normandy rivers	Completed	Estimate exchanges between rivers flowing into the Mont Saint-Michel Bay and the impact on management of salmon populations.	2007 - 2010	Distribution/ migration in the sea	Origin of catches in directed fisheries	Rivers flowing into Mont Saint-Michel Bay, Normandy		Jean-Luc Baglinière	
European Union - Ireland	Ir1	Assessment of the levels of the parasite <i>Lepeophtheirus salmonis</i> on Atlantic salmon post-smolts in salmon aquaculture bays along Ireland's western seaboard	Completed	Determine whether sea lice from marine salmon farms are a contributory factor in increased marine mortality of salmon post-smolts migrating from bays with salmon aquaculture. Gather information on salmon post-smolt migration patterns.	2002	Specific natural and anthropogenic factors	Fish farms	South-West Coast (Kenmare Bay), West Coast (Killary Harbour, Bertraghboy Bay, Clew Bay), North-West Coast (Inver Bay).		Paddy Gargan	
European Union - Ireland	Ir2	Oceanic factors influencing marine survival of Irish salmon stocks	Completed	Provide information on marine survival at various stages of ocean migration.	2001 - 2005	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Desk study utilising oceanic data from around North Atlantic	USA	Niall Ó Maoiléidigh, Kevin Friedland	
European Union - Ireland	Ir3	Sustainable management of interactions between aquaculture and wild salmonid fish	Completed	Assess efficacy of prophylactic treatments for salmon smolts migrating through aquaculture bays.	2003 – 2006	Specific natural and anthropogenic factors	Fish farms	Kilkerrin Bay, Bertraghboy Bay, Connemara	UK, Norway	Paddy Gargan,	
European Union - Ireland	Ir4	Early distribution and migration of Atlantic salmon smolts off the west of Ireland	Completed	Test new pelagic trawl in open waters off Irish coast; train and familiarise staff on the operation and development of the trawl for further surveys in 2008 and 2009; obtain samples of post-smolts for biological and genetic analyses; relate run-timing, timing of migration, swimming speed, growth, etc to oceanographic parameters.	2007	Development of methods	Post-smolt survey methods	North-west coast of Ireland	UK	Niall Ó Maoiléidigh	
European Union - Ireland	Ir5	Migration of salmon in estuarine and coastal waters	Completed	Investigate the timing, route of migration and aspects of the biology of migrating ranched salmon smolts in comparison to the native wild smolt migration.	2005 - 2008	Distribution/ migration in the sea	Migratory behaviour of individual fish	Burrishoole catchment, Newport and Clew Bay, Co. Mayo	UK	Russell Poole, Deirdre Cotter, Niall Ó Maoiléidigh	
European Union – Ireland	Ir6	National Development Plan - National Genetic Stock Identification Project	Completed	Identify and map discrete spawning areas within tributaries of Irish salmon rivers and collect juveniles for establishment of genetic baseline for mixed sample analysis. Undertake molecular genetic analysis of juvenile salmon tissue and adult scales to determine relative contributions of different baseline river populations within mixed samples.	2006 - 2008	Distribution/ migration in the sea	Origin of catches in directed fisheries	All Irish rivers	UK, Spain	Tom Cross, Paddy Gargan, Philip McGinnity	
European Union – Ireland	Ir7	Interactions between aquaculture and wild salmonid fish	Completed	Assess efficacy of prophylactic treatments for salmon smolts migrating through aquaculture bays.	2003 - 2009	Specific natural and anthropogenic factors	Fish farms	Burrishoole, Shannon, Lee and Screebe rivers, and drift net fisheries around Irish coast		D Jackson	

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European Union - Ireland	Ir8	Marine survival of wild and hatchery reared salmon: National coded wire tagging and tag recovery programme and Burrishoole wild salmon census	Ongoing	Provide information on marine survival and exploitation rates by commercial fisheries; estimate the contribution of individual river stocks to catches; examine the performance of selected experimental groups; and evaluate potential for salmon ranching.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Tag recovery from around North Atlantic. Salmon census facility, Newport, Co Mayo	Norway, UK, Faroes, France, Spain, Germany, Denmark	Niall Ó Maoiléidigh Russell Poole	£472,000
European Union - Ireland	Ir9	Kelt survival	Completed	Tag salmon kelts from four rivers in southern Ireland and monitor marine migration, depth and temperature preferences.	2010 - 2012	Distribution/migration in the sea	Migratory behaviour of individual fish	Southern Ireland		Audun H. Rikardsen	
European Union - Ireland	Ir10	The ecology of salmon (<i>Salmo salar</i> L.) at sea – environmental factors affecting marine growth, survival and migration of Atlantic salmon	Ongoing	Investigate the decline in North Atlantic salmon stocks in the past two decades in an ecosystem context and provide new information for use in forecast models of abundance and size of current stocks.	2012 - 2016	Life history/biological processes	Pre-fishery recruitment marine factors	Ireland, Norway	Norway, UK	Dr. D. Brophy	£50,000
European Union - Ireland	Ir11	Experiment to determine the potential impact of sea lice from marine salmon farms on out-migrating salmon smolts in western Ireland	Ongoing	Assess the efficacy of prophylactic treatments for salmon smolts migrating through aquaculture bays	2014 - 2017	Specific natural and anthropogenic factors	Fish farms	River Erriff and Killary Harbour, River Corrib and Galway Bay		Paddy Gargan	£69,000
European Union - Ireland	Ir12	Salmonid West Programme 2014-2019	Ongoing	Investigate migration, distribution, habitat usage and survival of sea trout and salmon smolts in the marine environment on the west coast. Determine factors that may influence salmonid migration and survival and identify key marine habitats. Investigate ecology of smolts/kelts in freshwater / marine interface and marine zone. Improve understanding of salmonid ecology at sea and allow assessment of impacts of development on wild salmonids. Enable quality environmental impact assessment and optimised spatial planning.	2014 - 2019	Distribution/migration in the sea	Migratory behaviour of individual fish	Killary Harbour and River Erriff, Corrib River and Galway Bay		William Roche, Patrick Gargan	£50,000
European Union - Ireland	Ir13	Investigation of the early migration of salmon and brown trout from the Burrishoole National Index River using telemetry technology in freshwater, brackish and inshore marine areas	New Entry	Apply tracking technology to track early migration of salmon and trout through the Burrishoole system and assess mortality on entry to marine milieu; experimentally compare early migration and migratory behaviours of local versus foreign Atlantic salmon smolts ranched from the Burrishoole system; and link long-term biological data on Atlantic salmon and sea trout with climate time series to assess the effect of potential thermal mismatch between freshwater and marine environments on post-smolt survival.	2016 - 2019	Distribution/migration in the sea	Migratory behaviour of individual fish	Burrishoole and environs. Newport, Co. Mayo		Niall Ó Maoiléidigh T Reed	£105,000
European Union - Ireland	Ir14	Investigation of the causes of early migration mortality in salmon and sea trout from the Burrishoole National Index River using acoustic telemetry in estuarine, marine and coastal areas	New Entry	Objectives include: building national capacity in the use of telemetry to monitor movements of migratory fish species; evaluating and optimising methods for the tagging of wild and reared post-smolts; describing and mapping the migration routes taken by post-smolts of Atlantic salmon and sea trout during their seaward migration from the Burrishoole catchment; and estimating survival of tagged post-smolts during their seaward migration from the Burrishoole catchment.	2016 - 2019	Distribution/migration in the sea	Migratory behaviour of individual fish	Burrishoole River, Clew Bay and environs, Co. Mayo	-	Niall Ó Maoiléidigh, Deirdre Brophy	£105,000
European Union - Ireland	Ir15	Estimate marine survival of wild Atlantic salmon in the North-East Atlantic from the National Salmonid Index Catchment in the west of Ireland	New Entry	Investigate the decline in North-East Atlantic Salmon stocks from a West coast of Ireland river using Passive Integrated Transponder (PIT) tag technology. Provide data to support and for use in forecast models of abundance, size and life history strategies of the current stock. Estimate pre-adult to adult marine survival rates. Provide information on results of survival rate of smolts to Standing Scientific Committee.	2015 – 2021	Long-term monitoring	Time series of marine survival/growth estimates	River Erriff, West of Ireland	-	Paddy Gargan	£5,000
European Union - Sweden	Sw1	Long-term variation in population dynamics, life-history and exploitation of salmon stock in the index River Åtran	Ongoing	Estimate long-term variation of survival in different life-stages, life-history characteristics, stock recruitment and growth of wild salmon in the River Åtran and its major tributary Högvadsån.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Sweden (west coast; Kattegatt)		Erik Degerman	£43,000

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European Union - UK (England and Wales)	Ew1	Salmonid migration and climate change	Completed	Describe and model the environmental factors affecting the migration of salmonids and predict the effects of climate change on salmonid migration and survival in the sea.	1999 - 2004	Distribution/migration in the sea	Migratory behaviour of individual fish	Coastal waters around the UK and extending to salmon feeding grounds in Faoes and Greenland Seas		Andy Moore	
European Union - UK (England and Wales)	Ew2	Impacts of agricultural contaminants on wild salmonids	Completed	Describe the nature and extent of the impacts of aquatic contaminants derived from agriculture on migration and marine survival of salmonid smolts and post-smolts.	1999 - 2004	Specific natural and anthropogenic factors	Pollutants	England and Wales	Sweden and Canada	Andy Moore	
European Union - UK (England and Wales)	Ew3	Impact of intensive in-river aquaculture on wild salmonids	Completed	Describe the nature and extent of the impact of aquatic contaminants derived from intensive freshwater aquaculture (effluents, pesticides, antibiotics and hormones) on reproduction and migration of wild salmonids.	2001 - 2005	Specific natural and anthropogenic factors	Fish farms	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew4	Modelling the bioenergetics of salmon migration	Completed	Model the energetic requirements of salmon during their marine migrations and predict the effects of environmental and oceanographic changes on smolt growth and survival.	2002 - 2005	Distribution/migration in the sea	Migration and bioenergetic models	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew5	Cardiff Bay Fisheries Monitoring Programme	Completed	Assess the impact of Cardiff Bay barrage on salmon stocks of the rivers Taff and Ely.	1990 - 2006	Specific natural and anthropogenic factors	Obstructions to fish movements	Cardiff Bay at mouth of rivers Taff and Ely, South Wales, UK		Peter Gough	
European Union - UK (England and Wales)	Ew6	Atlantic Salmon Arc Project, ASAP	Completed	Define exploitation at sea on a regional basis using genetic tools. Create a long-term database for these studies and create an international management tool to inform decision-making.	2004 - 2008	Distribution/migration in the sea	Origin of catches in directed fisheries	Europe, North Atlantic	Spain, France, Ireland, Scotland, USA, Iceland	Dylan Bright	
European Union - UK (England and Wales)	Ew7	Diffuse pollution and freshwater fish populations	Completed	Investigate the role of diffuse aquatic contaminants in regulating populations of freshwater fish with particular reference to salmonid stocks and fisheries.	2005 - 2010	Specific natural and anthropogenic factors	Pollutants	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew8	The influence of the freshwater environment on salmonid populations	Completed	Examine the impact of environment change on juvenile salmon production and ecology. One aspect of the research directly related to marine survival is the potential role of assessment techniques (trapping, anaesthetisation tagging) in influencing marine survival.	2005 - 2010	Life history/biological processes	Freshwater factors	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew9	Factors affecting the distribution and behaviour of salmonid populations	Completed	Investigate the habitat requirements of adult salmonids within the estuarine and freshwater environments. One key element of the research is to investigate how changes in prey availability within the marine environment may influence recruitment of stocks between years.	2005 - 2010	Life history/biological processes	Pre-fishery recruitment marine factors	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew10	Genetic sampling to type British salmon stocks	Completed	Coordinate and support the establishment of baseline information on the genetic character of breeding populations within and among rivers in Britain.	2008 – 2010	Distribution/migration in the sea	Origin of catches in directed fisheries	England, Wales, Northern Ireland and Scotland	Northern Ireland and Scotland	Miran Aprahamian	
European Union - UK (England and Wales)	Ew11	Deriving estimates of marine survival for monitored river stocks in England and Wales	Ongoing	Establish 'monitored' rivers where estimates of marine survival can be derived and compared with other North Atlantic stocks.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	River Dee (North Wales), River Tamar (SW England) River Frome (S England)		Ian Davidson, Rob Hillman, Ian Russell, Rasmus Lauridsen	£150,000
European Union - UK (England and Wales)	Ew12	The marine life of Atlantic salmon: evidence from the microchemistry of scales	Completed	Measure the stable isotope and trace element compositions from salmon scales in relation to variations in the marine environment and develop a model to predict impacts of changes in the marine environment on return rates of salmon.	2007 – 2010	Life history/biological processes	Post-fishery recruitment marine factors	England and Wales		Clive Trueman	
European Union - UK (England and Wales)	Ew13	Development and application of salmonid life cycle models	Completed	Review available models to assess suitability and build on existing models or develop new models to <i>inter alia</i> compare marine and freshwater factors affecting stocks.	2009 – 2013	Life history/biological processes	Freshwater factors	England and Wales		Ted Potter	

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European Union - UK (England and Wales)	Ew14	The impacts of contaminants and temperature on freshwater fish populations	Completed	Study the impacts of contaminants derived from intensive agriculture and aquaculture facilities on wild salmonids and investigate the implications of predicted climate change scenarios on the impacts of different sources of diffuse and point source pollution on wild fish populations.	2009 – 2014	Specific natural and anthropogenic factors	Pollutants	England and Wales		Andy Moore	
European Union - UK (England and Wales)	Ew15	Impacts on juvenile salmonid populations from a changing freshwater environment	Completed	Investigate how predicted changes in the freshwater environment might impact on juvenile salmonid populations and how changing conditions during the early life history stages may influence their behaviour and subsequent survival within the marine environment.	2009 – 2015	Life history/ biological processes	Freshwater factors	England and Wales		Bill Riley	
European Union - UK (England and Wales)	Ew16	Impacts of in-river hydropower production on migratory fish	Ongoing	Examine the cumulative effects of freshwater hydropower schemes on habitat connectivity within river basins and on the migratory behavior and survival of Atlantic salmon and European eels, and assess potential effects at the fish population level. Examine how delays to seaward migration of smolts as a result of in-river renewable energy schemes may compromise the fish once they enter the sea.	2012 - 2017	Specific natural and anthropogenic factors	Obstructions to fish movements	Rivers in Southern England (e.g. Frome and Ribble)		Andy Moore	£168,000
European Union - UK (England and Wales)	Ew17	Estuarine habitat requirements and distribution of diadromous fish	Ongoing	Examine the residency and habitat preferences of migratory fish within estuaries and assess the impact of construction and operation of man-made structures on the migratory behavior and survival of key diadromous fish species as they move between the marine and freshwater environments.	2012 - 2016	Specific natural and anthropogenic factors	Pollutants	Estuaries and coastal waters in England and Wales		Andy Moore	£100,000
European Union - UK (England and Wales)	Ew18	Genetic stock identification of salmon caught in the Faroes fishery	Completed	Catalogue scale samples collected from 1984 to 2000; identify a selection of scales that will best represent the stock composition during a baseline period(s); use GRAASP to provide country/region of origin assignments; report on how the results can be used in the provision of catch advice.	2012 - 2015	Distribution/ migration in the sea	Origin of catches in directed fisheries	Laboratory based study in Norway and UK; samples from Faroese fishery	UK, Norway, Faroes	Ted Potter	
European Union – UK (Northern Ireland)	Ni1	Development of conservation limits, pre-fishery abundance and management of the Foyle salmon fishery	Completed	Build upon the existing Foyle salmon management system, develop it into a precautionary catch advice framework that fully takes account of biological data on stock abundance and which fulfils all the main requirements of the Precautionary Approach.	2005 - 2008	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Foyle area, Ireland	Ireland, France, Scotland	Patrick Boylan	
European Union – UK (Northern Ireland)	Ni2	The marine survival of Atlantic salmon from the River Bush, Northern Ireland	Ongoing	Investigate factors influencing the survival at sea of salmon smolts migrating from the River Bush until their return as adults.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	River Bush, N. Irish/Irish coastal waters and distant-water fisheries	Ireland (tag recovery programme)	Dennis Ensing	£241,500
European Union – UK (Northern Ireland)	Ni3	Investigating the movement and mortality of Atlantic salmon in the Foyle from river to sea	Ongoing	To establish movement and potential for loss of smolts in their riverine migration and early marine phase	2013 - 2016	Distribution/ migration in the sea	Migratory behaviour of individual fish	Foyle catchment and L Foyle to where it entered the North Atlantic	Scotland	Patrick Boylan	-
European Union – UK (Scotland)	Sc1	Testing and development of Institute of Marine Research (IMR), Bergen, Norway, salmon trawl gear	Completed	Test a prototype trawl developed by IMR, Bergen, Norway, which, rather than capturing post-smolts, records, by use of CCTV, their passage as they pass through an open-ended trawl net. A supplementary objective, dependent on the success of the gear trials, was to conduct a post-smolt survey at the shelf edge.	2006	Development of methods	Post-smolt survey methods	Scalloway Deepes (Shetland), the Minches	Norway	Julian MacLean, Jens Christian Holst, Dick Shelton	
European Union – UK (Scotland)	Sc2	Protecting salmonid fisheries from seal damage	Completed	Develop and apply new molecular tools for discriminating among species of fish in the diets of seals from their remains in scats. Test the possibility of using molecular tools to quantify the occurrence of diet components. Develop and deploy cetacean-friendly seal-scarer. Identify factors influencing in-shore migration routes of salmon. Characterise behavioural interactions between salmon and their predators and seals and their prey. Investigate the digestion of otoliths during passage through a seal's gut.	2003 - 2008	Specific natural and anthropogenic factors	Predation	Principally North West (Shieldaig), North-East Scotland (Cromarty Firth). Possible work in other estuaries as required.		John Armstrong	

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European Union – UK (Scotland)	Sc3	Post-smolt mortality of Atlantic salmon	Ongoing	Assess post-smolt mortality rates of Atlantic salmon from three Scottish rivers, and the contribution of these salmon to fisheries that exploit them.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	North Esk, Aberdeenshire Dee (two tributaries), River Conon		Gordon Smith, Iain Malcolm, John Armstrong	£50,000
European Union – UK (Scotland)	Sc4	Analysis of post-smolt life history by scale reading	Ongoing	Investigate the relationship between growth and mortality, particularly during the marine phase, by analysis of scale growth patterns. Identify periods crucial to survival.	Annual	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Samples from around Scotland and from North Esk and Gironck Burn in particular	USA and Canada	Gordon Smith	£10,000
European Union – UK (Scotland)	Sc5	Fisheries-induced evolution	Completed	Analyse the prevalence and consequence of fisheries-induced adaptive changes in exploited salmon stocks.	2007 - 2010	Distribution/migration in the sea	Origin of catches in directed fisheries	Scotland and Ireland and across European species' distribution, including marine migration routes.	Austria, Norway, France, Denmark, Belgium, UK, Netherlands, Finland, Germany, Spain	Ulf Dieckman, John Gilbey, Philip McGinnity	
European Union – UK (Scotland)	Sc6	Size and condition of returning grilse (ISW) and MSW salmon	Ongoing	Investigate decadal trends in the size and condition of adult salmon returning to Scotland.	Annual	Life history/biological processes	Post-fishery recruitment marine factors	Six locations in Scotland, in particular North Esk.		Philip Bacon	£30,000
European Union – UK (Scotland)	Sc7	Development of a General Spatial Model of within river population structuring in Scottish Atlantic salmon (POPMOD)	Completed	Improve the scientific basis for <i>inter alia</i> setting biologically appropriate conservation limits, providing advice on conservation and restoration initiatives, accurately and cost-effectively monitoring the status of salmon stocks.	2008 - 2011	Distribution/migration in the sea	Origin of catches in directed fisheries	River systems across Scotland		Eric Verspoor	
European Union – UK (Scotland)	Sc8	Focusing Atlantic salmon management on Atlantic salmon (FASMOP)	Completed	Establish the number and spatial boundaries of breeding populations of salmon within any Scottish river system; establish the ancestral relationships and functional biological differences between wild salmon stock components across Scottish rivers; improve local management practice and increase the focus of management on local breeding populations.	2009 – 2013	Distribution/migration in the sea	Origin of catches in directed fisheries	River systems across Scotland		Stuart Middelmas, Calum Sinclair	
Norway	N1	Identification of salmon by geochemical signatures; further development and testing of methods	Completed	Test if geochemical signatures are stable from year to year; test if geochemical signatures of salmon scale samples can be used to discriminate among fish from different rivers; develop analytical procedures (otolith core sampling, chemical and statistical analyses) for application of this method in ecological studies on Atlantic salmon.	2002	Life history/biological processes	Post-fishery recruitment marine factors	Laboratory study		Peder Fiske	
Norway	N2	Development of models to predict marine survival and return of salmon to Norway	Completed	Identify and examine the feasibility of applying time series of marine environmental data, zooplankton productivity, productivity of pelagic fish and salmon life-history information for model development. Develop appropriate models.	2002 - 2005	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Desk study of existing data	USA, Canada, EU	Lars Petter Hansen	
Norway	N3	By-catch in pelagic fisheries as a population-regulating factor in wild salmon stocks	Completed	Investigate the extent of by-catch of salmon post-smolts and develop management advice to reduce by-catch while maintaining catch rates in the mackerel fishery.	2001 - 2005	Distribution/migration in the sea	By-catches in pelagic fisheries	Norwegian Sea	Russia, Scotland	Jens Christian Holst	
Norway	N4	Sea lice as a population-regulating factor in Norwegian salmon: status, effects of measures taken and future management	Completed	Further clarify the effects of sea lice on wild salmon populations and propose measures to reduce sea lice infections in wild salmon and develop alternative measures in critically affected stocks.	2002 - 2005	Specific natural and anthropogenic factors	Fish farms	Sognefjord and Altafjord		Jens Christian Holst	
Norway	N5	Distribution of salmon in relation to environmental parameters and origin in the North Atlantic – capture, tagging and release of salmon with data storage tags (DSTs)	Completed	Investigate the temporal and spatial distribution of DST-tagged salmon in the Norwegian Sea and adjacent areas, with emphasis on spatial distribution and temperature preferences; growth in relation to environmental parameters; and diurnal vertical distribution.	2003 - 2006	Distribution/migration in the sea	Migratory behaviour of individual fish	Northern North Sea, Norwegian Sea, Iceland Sea, Greenland Sea	Faroe Islands, Iceland	Marianne Holm	
Norway	N6	Temporal variation in abundance of the northernmost populations of Atlantic salmon with emphasis on the River Tana	Completed	Examine the influence of ocean climate, predation, marine fisheries and smolt production on the abundance of salmon with emphasis on the River Tana	2002 - 2006	Long-term monitoring	Time series of marine survival in relation to environmental parameters	River Tana	Finland, Russia, Canada	Martin Svenning	

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Norway	N7	The importance of early marine feeding on the growth and survival of Atlantic salmon post-smolts in Norwegian fjords	Completed	Analyse spatial variation in early marine post-smolt feeding and growth along a north-south geographical scale; investigate how post-smolt feeding and growth is associated with timing of smolt descent, marine prey availability, parasite infection, fjord migration, and abiotic factors.	2002 - 2007	Life history/ biological processes	Pre-fishery recruitment marine factors	Central and Northern Norway	Canada	Bengt Finstad	
Norway	N8	Distribution and ecology of post-smolts and salmon at sea	Completed	Analyse age, growth and migratory paths in relation to environmental conditions and competitors so as to expand understanding of salmon marine life-history in order to explain observed variations in salmon survival.	2002 - 2007	Distribution/ migration in the sea	Distribution of salmon in the sea	West of Ireland – Faroes, northern North Sea, Norwegian Sea	Faroe Islands	Marianne Holm	
Norway	N9	Dispersal of salmon lice in Norwegian fjords	Completed	Estimate and describe to what extent free-living salmon lice larvae disperse from wild and farmed sources within and between areas.	2007	Specific natural and anthropogenic factors	Fish farms	Hardangerfjord, Norway		Karin Kroon Boxaspen	
Norway	N10	Experimental tagging programme for investigating the behaviour of escaped farmed salmon: pilot study	Completed	Examine the migration of escaped large farmed salmon and test if they are transported with the currents and appear in Norwegian waters.	2006 - 2007	Specific natural and anthropogenic factors	Fish farms			Lars Petter Hansen	
Norway	N11	Individual assignment of salmon caught in the ocean to region of origin	Completed	Investigate genetic variation in Norwegian Atlantic salmon populations on different spatial scales. Provide calibrated data from micro-satellite markers for a database. Analyse samples caught in the ocean and assign to country/region of origin.	2006 - 2009	Distribution/ migration in the sea	Origin of catches in directed fisheries	Norway	Finland	Oystein Skaala, Vidar Wennevik	
Norway	N12	Migratory behaviour of smolts and post-smolts of cultured Atlantic salmon	Completed	Study the change in migratory behaviour from smolts during the post-smolt stages in cultured Atlantic salmon.	2008 - 2009	Distribution/ migration in the sea	Migratory behaviour of individual fish	Masfjorden, western Norway		Ove Skilbrei	
Norway	N13	Significance of salmon lice for growth and survival of salmon in the sea	Ongoing	Estimate the effects of salmon lice on post-smolt growth and survival, dependent on release site and time and year of release.	2006 -	Specific natural and anthropogenic factors	Fish farms	Western Norway; River Dale and nearby coast.		Ove Skilbrei	£75,000
Norway	N14	Marine survival, growth and exploitation of salmon from the Rivers Figgjo, Imsa, Drammenselv and Halselv	Ongoing	Estimate marine survival, marine growth and marine exploitation of salmon from four rivers in Norway. Develop predictive models.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Rivers Figgjo, Imsa, Drammenselv and Halselv with tag recovery programme in fisheries along Norwegian coast and elsewhere		Lars Petter Hansen, Nina Jonsson, Arne Johan Jensen	£134,000
Norway	N15	Population-limiting mechanisms for Atlantic salmon during early estuarine and coastal migration (SALPoP)	Completed	Map migratory behaviour and quantify where, when and why mortalities occur; correlate data on migration and mortalities with health status and major population-limiting factors; develop improved mitigating actions and management strategies to contribute to sustainability of salmon populations.	2008 - 2012	Distribution/ migration in the sea	Migratory behaviour of individual fish	Eresfjord in Møre and Romsdal, mid Norway	Sweden, UK, Canada	Bengt Finstad	
Norway	N16	The Hardangerfjord salmon lice project	Completed	Improve sea lice monitoring and management; evaluate success of sea lice management strategies; quantify the abundance and distribution of salmon lice in the Hardangerfjord area; analyse data sets for possible risk factors associated with varying lice infection pressure.	2007 - 2010	Specific natural and anthropogenic factors	Fish farms	Hardangerfjord on the Norwegian west coast	Canada, UK	Bengt Finstad	
Norway	N17	Origin of Atlantic salmon off Svalbard	Completed	Identify the origin of Atlantic salmon occurring in gill net fisheries at Isfjorden, Spitsbergen, by life history (age, growth) and genetic analyses.	2008 - 2012	Distribution/ migration in the sea	Origin of catches in directed fisheries	Isfjorden, Spitsbergen		Arne Johan Jensen	
Norway	N18	SALMOTRACK - Electronic tracking of northern anadromous salmonids	Ongoing	Track different life-stages of northern Atlantic salmon and other anadromous species in river, fjord and open ocean.	2006 – 2012 2013 - 2016	Distribution/ migration in the sea	Migratory behaviour of individual fish	Northern Norway (Alta, Neiden, Tana, Skibotn); Mid Norway (Orkla); Western Norway (Hardangerfjord)	Denmark, UK, Finland, USA, Japan, Ireland, Canada	Audun H. Rikardsen	£250,000

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Norway	N19	Trilateral cooperation on our common resource; the Atlantic salmon in the Barents region (Kolarctic salmon 2011 - 2013)	Completed	Develop an integrated, long-term management of Atlantic salmon in the sea and in rivers in the northernmost distribution areas of the Atlantic salmon; provide data to implement customized, sustainable, knowledge-based harvesting regimes, and to preserve the rich traditions of fishing and coastal culture; unite empirical knowledge (local and traditional) with scientific knowledge; provide synthesized and new knowledge about Atlantic salmon, its adaptation to climate change and its migration along the coast.	2011 - 2013	Distribution/migration in the sea	Origin of catches in directed fisheries	Barents region; Northern Norway, Finland and Russia	Finland, Russian Federation	Tiia Kalske	
Norway	N20	Effects of salmon lice on wild salmonid populations; filling in knowledge gaps (LicePop)	Completed	To assess: to what extent lice from farms occur on wild fish; how many lice a wild fish can tolerate under natural conditions before its viability is compromised; to what extent wild fish are able to combat lice infection through adaptations aimed at reducing infestations; and to what extent sea lice can reduce or regulate wild populations of salmonids.	2013 – 2015	Specific natural and anthropogenic factors	Fish farms	Hardangerfjord, Norway	New Zealand, UK (Scotland)	Bengt Finstad	
Norway	N21	Salmon migrating through a maze in a changing world: building a dynamic management regime for a multi-stock system affected by extensive mixed-stock fisheries	Ongoing	Analyze and explain the historical variation and recent decline in the abundance of Atlantic salmon from different sub-populations of the Tana complex.	2015 - 2017	Distribution/migration in the sea	Origin of catches in directed fisheries	Barents Sea and Tana river	Norway, Finland	Martin A.Svenning	£218,000
Russian Federation	R1	Assessment of by-catch of post-smolts of Atlantic salmon in pelagic fisheries in the Norwegian Sea	Completed	Assess the occurrence of post-smolts in catches by Russian vessels engaged in the pelagic fisheries for mackerel, blue whiting and herring.	2002 - 2007	Distribution/migration in the sea	By-catches in pelagic fisheries	Norwegian Sea		Boris Prischepa, Alexander Zubchenko	
Russian Federation	R2	Monitoring of the stock status, abundance assessment and provision of advice on the allowable level of harvest of Atlantic salmon	Ongoing	Estimate survival of juveniles and adult return rates, estimate natural and fishing mortality, study population dynamics; assess population sizes and spawning escapement; and estimate allowable catch.	Annual	Long-term monitoring	Time series of marine survival/growth estimates	Atlantic salmon rivers of the Murmansk Region, Archangel Region, Nenets Autonomous Okrug, Republic of Komi, and Karelian Republic		Sergey Prusov, Igor Studenov	£60,000
Russian Federation	R3	Establishing a genetic baseline of northern salmon populations across the Russian – Norwegian border for management purposes	Completed	Establish a genetic baseline of sufficient resolution for the purposes of partitioning bag net catches between Russian and Norwegian regions.	2009 - 2010	Distribution/migration in the sea	Origin of catches in directed fisheries	Northern Norway, North West of the Russian Federation	Norway	Vidar Wennevik (IMR), Sergey Prusov (PINRO)	
United States of America	U1	Forecasts of Atlantic salmon transoceanic migration: climate change scenarios and anadromy in the North Atlantic	Completed	Develop and evaluate marine migration models for Atlantic salmon from North America and Europe; evaluate the potential effects of climate change on migration patterns of Atlantic salmon.	2002 - 2004	Distribution/migration in the sea	Migration and bioenergetic models	Desk study	Canada	Kevin Friedland	
United States of America	U2	Stable isotope composition of Atlantic salmon scales	Completed	Develop a retrospective time series of stable isotope ratios for the DPS in Maine and the mixed-stock samples from the continental stock complex to evaluate feeding patterns of the stocks over time.	2001 - 2002	Life history/biological processes	Post-fishery recruitment marine factors	Desk study. Analysis of scale samples collected at West Greenland and from US returns.	International collaboration in obtaining samples	Kevin Friedland	
United States of America	U3	Ultrasonic telemetry of smolts and post-smolts in the Narraguagus River and Narraguagus Bay	Completed	Evaluate migration timing and pathways in the lower Narraguagus River and Narraguagus Bay and estimate survival of migrating smolts and post-smolts.	2002 - 2009	Distribution/migration in the sea	Migratory behaviour of individual fish	Narraguagus River, Narraguagus Bay and Gulf of Maine	Canada	James Hawkes	
United States of America	U4	Penobscot hatchery versus wild smolt telemetry	Ongoing	Evaluate migration timing and pathways in the Penobscot Estuary and Bay and estimate survival of migrating smolts and post-smolts.	2005 - 2016	Distribution/migration in the sea	Migratory behaviour of individual fish	Penobscot Estuary, Penobscot Bay	Canada	James Hawkes	£10,000
United States of America	U5	Comprehensive evaluation of marine survival of hatchery-stocked smolts: migration behaviour and success of Dennys River smolts	Ongoing	Evaluate migration speed and behaviour from lower river release sites through estuarine habitat; estimate survival of migrating smolts and identify areas where mortality may be occurring.	2001 - 2016	Distribution/migration in the sea	Migratory behaviour of individual fish	Dennys River, Cobscook Bay, Gulf of Maine	Canada	James Hawkes	£10,000

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United States of America	U6	Comprehensive evaluation of marine survival of hatchery-stocked smolts: Dennys River smolt stocking assessment	Completed	Evaluate smolt-to-adult survival rates based on temporal and spatial patterns of release; determine optimal stocking levels to achieve stock rebuilding objectives.	2001 - 2012	Long-term monitoring	Time series of marine survival/growth estimates	Dennys River, Cobscook Bay, Gulf of Maine	Recovery of marked fish through NASCO West Greenland sampling programme	Joan Trial	
United States of America	U7	Evaluation of estuary and nearshore marine distributions of Atlantic salmon post-smolts in Penobscot Bay and the Gulf of Maine	Completed	Evaluate nearshore distribution and migration pathways of smolts and post-smolts; estimate the relative contribution of stocked hatchery smolts to overall post-smolt populations; evaluate the relative contribution of spatially and temporally distinct smolt releases on post-smolt populations; evaluate the physiological condition of post-smolts in marine environments.	2001 - 2011	Distribution/migration in the sea	Distribution of salmon in the sea	Penobscot Bay, Gulf of Maine		Tim Sheehan	
United States of America	U8	Cormorant harassment in the Narraguagus River/Narraguagus Bay	Completed	Reduce predation on migrating salmon smolts by excluding double-crested cormorants from the Lower Narraguagus River and Bay, and assess the efficacy of non-lethal predator exclusion as a means of reducing predation on migrating Atlantic salmon smolts.	2005 - 2012	Specific natural and anthropogenic factors	Predation	Lower Narraguagus River, Estuary and Narraguagus Bay, Maine		James Hawkes	
United States of America	U9	SALSEA Greenland	Ongoing	Advance understanding of the ecology of the Atlantic salmon West Greenland stock complex and to gain insights into the factors resulting in recent significant increases in marine mortality across the North Atlantic. (The baseline sampling programme at West Greenland is described in project D1)	2009 - 2016	Distribution/migration in the sea	Origin of catches in directed fisheries	Ilulissat, Sisimiut, Nuuk and Qaqortoq, Greenland	Collaborative project with countries detailed in project D1 and scientists from SALSEA-Merge	Tim Sheehan	£10,000
United States of America	U10	Using Pop-up Satellite Tags (PSATs) to track adult Atlantic salmon in the Northwest Atlantic	Ongoing	Provide information on localized movement patterns of Atlantic salmon off the coast of West Greenland, large scale movement and migration patterns en route to natal rivers in North America and Europe, locations of overwinter residences and depths and temperatures experienced during the second or third winter at sea in the North Atlantic. These data will be used to evaluate if conditions experienced from September through April are favourable for survival and subsequent spawning escapement.	2010 - 2016	Distribution / migration in the sea	Migratory behaviour of individual fish	Coastal waters off West Greenland	Norway, Greenland and UK	Mark Renkawitz	£10,000
United States of America	U11	Impact of oceanographic changes on Atlantic salmon survival in the Northwest Atlantic	Completed	Determine mechanisms controlling the ecosystem-salmon connections and hypothesize on their implications for salmon populations in the future.	2010 -2014	Long-term monitoring	Time series of marine survival in relation to environmental parameters	Desk study		Tim Sheehan	
United States of America	U12	Evaluation of the importance of predator and prey fields and ocean circulation on Atlantic salmon growth and survival in the Gulf of Maine	Completed	Evaluate the consequences for Atlantic salmon post-smolt growth and survival of the match or mismatch of spawning runs of diadromous fishes, aggregations of other marine forage fishes, and thermal/circulation patterns in the Gulf of Maine (GoM) with the timing of Atlantic salmon out-migration.	2010 - 2014	Life history/biological processes	Pre-fishery recruitment marine factors	Desk study		John Kocik	
United States of America	U13	Migration timing of Atlantic salmon smolts from Penobscot Bay to the Scotian Shelf	Ongoing	Evaluate the migration timing and likely spatial extent of Gulf of Maine Atlantic salmon post-smolts along migration to the Ocean Tracking Network's Halifax Array and other distant water telemetry assets in the OTN network.	2013 - 2016	Distribution / migration in the sea	Migratory behaviour of individual fish	Desk study	Canada	John Kocik	£10,000
United States of America	U14	Impact of oceanographic changes on Atlantic salmon survival in the Northwest Atlantic	Ongoing	Investigate the hypothesis that ecosystem changes have influenced the energy needed by and available to Atlantic salmon and thereby have affected salmon growth, survival, and productivity during their marine phase	2014 - 2019	Life history/biological processes	Pre-fishery recruitment marine factors	Desk Study		Tim Sheehan	£70,000
United States of America	U15	Species interactions in the Penobscot Estuary	Ongoing	Merge datasets from acoustic telemetry smolt tagging studies and hydro-acoustic data collected within the Penobscot Estuary; describe overlap of timing and location (along river and within the water column) data of Atlantic salmon smolts and hydro-acoustic data targets (river herring); and describe and compare these data and how it relates to survival.	2013 - 2017	Specific natural and anthropogenic factors	Predation	Penobscot Estuary, Maine		James Hawkes	£50,000

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United States of America	U16	Acoustic telemetry evaluation of migration performance in the Kennebec Estuary	Ongoing	Evaluate smolt emigration dynamics and timing in the Lower Kennebec River and Estuary and Merrymeeting Bay; and estimate survival of migrating smolts and post-smolts	2014 - 2017	Distribution / migration in the sea	Migratory behaviour of individual fish	Kennebec Estuary, Maine		Graham Goulette	£53,000
France – St Pierre and Miquelon	F1	St Pierre and Miquelon Salmon Fishery Sampling Programme	Ongoing	Improve understanding of the biological characteristics and origin of salmon harvested in the fishery at St Pierre and Miquelon.	Annual	Distribution/ migration in the sea	Origin of catches in directed fisheries	Around the islands of St Pierre and Miquelon	Canada	Herlé Goragner	-