

**marinescotland**  
**science**

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Marine Scotland Communications

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HEAD OF SCIENCE:  
Prof. Colin Moffat

# INTRODUCTION

## VISION

To provide robust research and advice underpinning the management of Scotland's marine and freshwater resources.

## KEY MESSAGE

Marine Scotland Science will enhance its reputation by providing reliable advice and high quality science, ensuring that all staff are valued and that they contribute fully to Scotland's future.



Marine Scotland Science (MSS) allows Marine Scotland as a whole to deliver and go on to demonstrate how specific pieces of work mean the framework for Government and other SG priorities are facilitated and supported by good public sector science.

As I write what is my final introduction to a Marine Scotland Science Annual Review, I am struck by the significant delivery that has characterised previous Reviews and is also evident in this Annual Review which covers the period 2017/18. Furthermore, I am pleased to be able to say that marine science and policy is now main stream. What do I mean by this? Every day there is a news article somewhere highlighting the importance of our seas and oceans. Public awareness has been heightened, not least by the BBC Production Blue Planet II, of the impact that we are having on our seas and oceans. However, we at MSS are providing some of that critical evidence that reinforces these popular productions, but more crucially is providing the evidence which allows decisions to be made with an improved level of confidence. It is the human activities which we can manage, not the environment itself. This means that we must be able to link the pressures on marine ecosystems with the state of marine ecosystems. Whether it is sea fisheries, aquaculture, freshwater fisheries, marine protected areas, development of renewable energy, oil and gas, marine litter, hydrophobic contaminants, marine noise, seabirds, cetaceans, the temperature of the sea surface, the aging of fish, the instrument needed to help us 'see' under the sea surface, the saltiness of the water, the planktonic life, fish disease, river water temperature, parasites of fish and shellfish, the biodiversity of the shelf, the slope or indeed the deep waters, there is someone at MSS who has critical knowledge.

Today, we link the understanding of our seas, brought about through studying the natural sciences, with the wider benefits of our seas – health and wellbeing and blue carbon being just two. We gather the data which we transpose into information that we then communicate through our publications, talks and posters. Supported by our communications experts, we now tweet and blog; this means that the information is widely accessible. The transformation

of the data often requires considerable computing power, reliable IT systems, strong quality assurance and reliable data archiving, while our day to day operations would not happen without those that ensure our environment is safe, chemicals are available, there is plenty of gas, our ships are fully operational, our orders are processed and the documents are ready. The many cogs that make the machine that is MSS function are each critical and I am grateful to each and every one of the staff and students at MSS who have contributed to our delivery in 2017/18.

MSS has made an impact in all areas that it covers, be it marine fisheries, aquaculture, freshwater, energy generation, environmental assessment, protecting marine biodiversity, engineering development and innovative IT solutions; please take a few minutes to find out about the specific impact made by each Programme during 2017/18 as presented in the Key Highlights and Impact section for the individual Programmes. However, I am keen to stress the importance of the data and information that MSS has produced in respect of ensuring that the legislation that is introduced is appropriate and that we are able to assess the impact of such legislation. MSS provides the high grade fuel on which the Marine Scotland engine runs – we are integral to the process, but also fundamental to the operation. A further example of our output is the just over 100 peer-reviewed papers published, all carefully collated by the MSS Library. Finally, our two research vessels, MRV *Scotia* and MRV *Alba na Mara*, have again covered an impressive combined total of 534 days at sea and we have effectively handled a number of Freedom of Information requests.

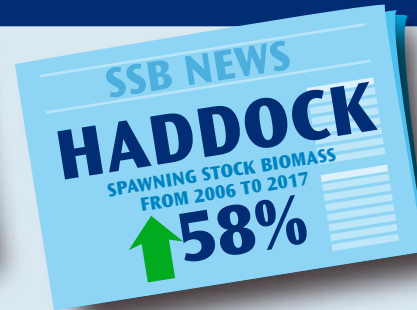
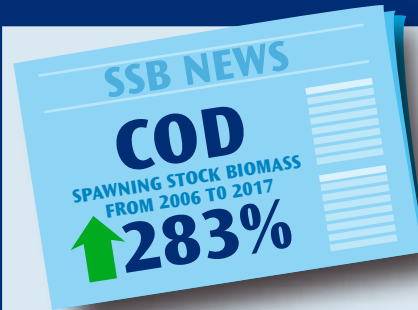
In closing, I would like say that I am very much looking forward, in my role as Chief Scientific Advisor Marine, to working closely with Tim McDonnell, the new Head of Marine Laboratories. I would also like to reiterate my considerable thanks to the staff and students who, no matter what their role or area of interest, have dedicated themselves to delivering for Marine Scotland Science and thus Scotland, not only in 2017/18, but throughout my time as Head of Science.

Thank you

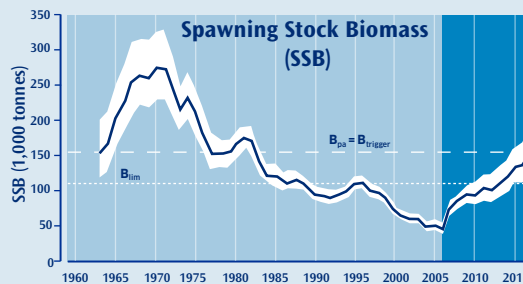
Colin Moffat Head of Science (Until 31 March 2018)

# HEADLINE STORY : EFFECTIVE FISHERIES MANAGEMENT

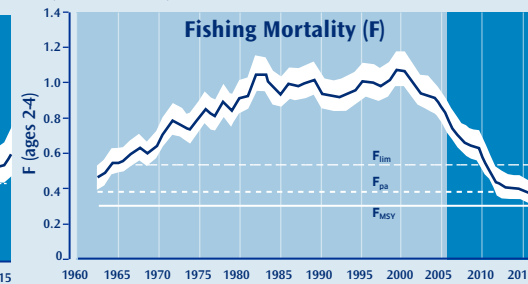
Through the annual data collection, collation, assessment and advice cycle, staff contribute significantly to the provision of scientific fisheries management advice from the International Council for the Exploration of the Sea (ICES) to the European Commission (EC), the North-East Atlantic Fisheries Council (NEAFC), and others. In recent years, this work has helped to facilitate the considerably improved status of many of the key commercial fish stocks in the North Sea and wider areas, on which the livelihoods of Scottish fishermen and coastal communities depend.



NORTH SEA COD ASSESSMENT SUMMARY: (ICES 2017)



Spawning stock biomass (1,000 tonnes) with 95% confidence interval and agreed reference points.

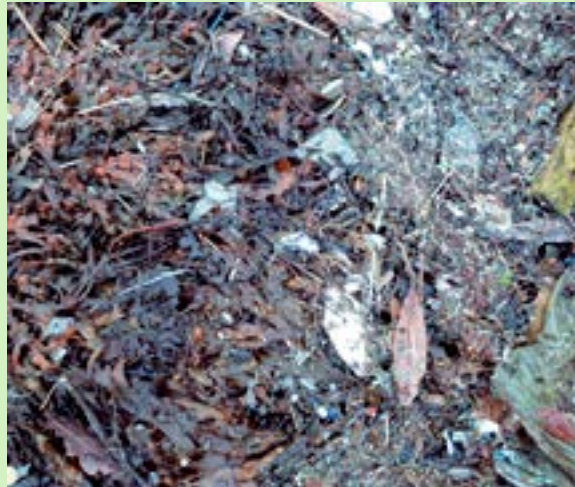
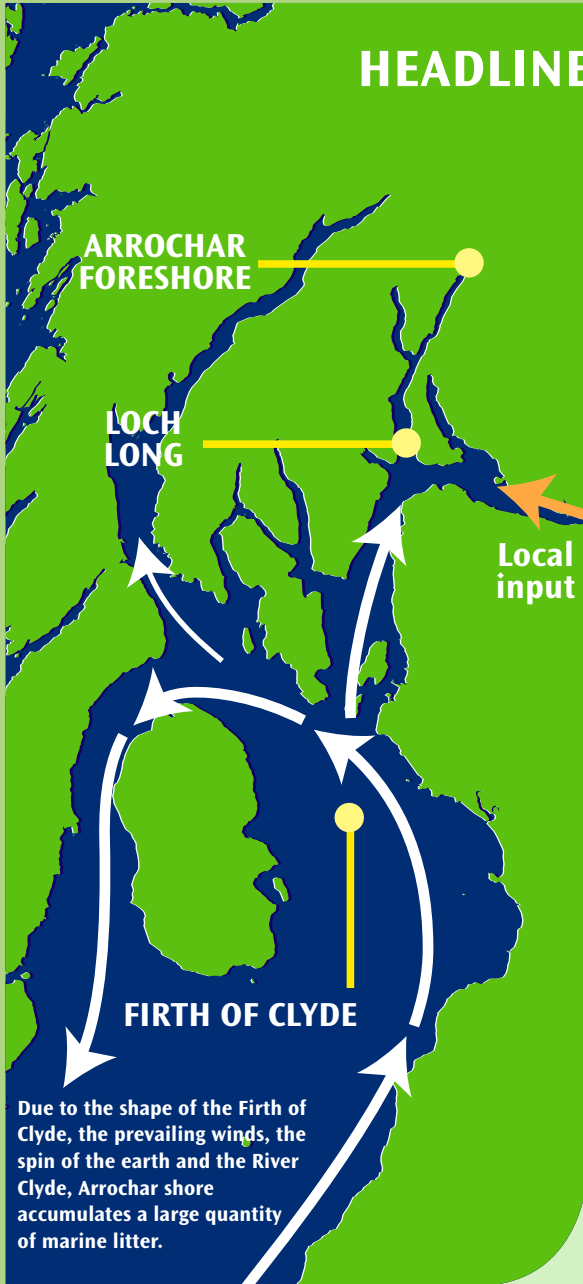


Fishing mortality rate for ages 2-4 with 95% confidence interval and agreed reference points.

Change in spawning stock biomass estimates from 2006 to 2017 (abundance given for *Nephrops*)

SPECIES	AREA	2006	2017	DIFFERENCE
Cod	North Sea	43,739 t	167,711 t	+283%
Haddock	Northern Shelf	157,195 t	248,592 t	+58%
Hake	Northern	32,475 t	265,666 t	+718%
Herring	North Sea	1,641,301 t	2,033,511 t	+23%
Mackerel	NE Atlantic	2,181,467 t	3,443,926 t	+58%
Monkfish	Northern	40,985 t	87,896 t	+114%
<i>Nephrops</i>	Fladen	4,862 million	7,036 million	+45%
Norway pout	North Sea	53,572 t	152,162 t	+184%
Plaice	North Sea	280,355 t	936,773 t	+234%
Saithe	Northern	275,577 t	257,329 t	-7%
Sandeel	North Sea	48,487 t	194,120 t	+300%
Sole	North Sea	24,799 t	67,961 t	+174%
Whiting	North Sea	180,314 t	305,405 t	+69%

# HEADLINE STORY : MARINE LITTER IN LOCH LONG



The foreshore at Arrochar lies at the head of Loch Long, a sea loch off from the Firth of Clyde. During the winter months especially, large volumes of dead seaweed (sometimes called ‘wrack’ or ‘ware’) accumulate on the foreshore. In the past this was viewed as a bonus for the area as the seaweed was removed and used on fields and gardens as fertiliser. This was a wide spread practice in Scotland, and some coastal villages have a ‘Ware Road’ to this day.

However since the 1950s, plastic has started to become used daily around the globe and it is estimated that we make over 400 million tonnes each year. Of this, about 2% to 5% enters the sea, through bad management of our waste. The presence of this plastic waste in our seas means that the ‘ware’ on Arrochar foreshore is now

completely mixed with pieces of plastic, from large items like buckets and shoes to almost invisibly small pieces, broken down from larger items such as plastic bags and bottles. This mix is now a problem to the local community, not a resource because it cannot be used as fertiliser any longer, and to date there is no known way of separating out the seaweed from the litter.

## WHERE DOES THE LITTER COME FROM ?

MSS undertook a review of the oceanography of the area, and developed a simple model of litter deposition. This showed that the plastics on the foreshore came from two sources: locally, from the River Clyde, and further afield, from the Irish Sea (white arrows). This is more than a local pollution problem - litter on the foreshore in Loch Long is a regional issue and requires a regional scale response to solve it.

This underlines the Scottish Government’s message that marine litter is everybody’s problem. We can all do our bit to help tackle it, and the first steps are to reduce the amount of waste we produce by remembering to: ‘Reduce, Reuse and Recycle’ and to always dispose of any waste responsibly.

Further information can be found on the arrochar ‘litter sink’ topic sheet.



**PROGRAMME MANAGER:**  
**Dr. Rob Raynard**

## **AQUACULTURE AND FISH HEALTH (AFH)**

### **PROGRAMME OBJECTIVE:**

The Aquaculture and Fish Health (AFH) Programme provides regulation and scientific advice underpinned by research to support the Scottish Government's vision of a sustainable and growing aquaculture industry, while safeguarding the high health status of shellfish, farmed and wild fish stocks in Scotland.

### **SCIENCE DELIVERY:**

#### **PROJECTS /MILESTONES COMPLETED**

<b>Monitoring and Advice (54)</b>	<b>47</b>
<b>Research Projects (7)</b>	<b>4</b>
<b>External Contracts (29)</b>	<b>25</b>

#### **PUBLICATIONS**

<b>Peer-reviewed papers</b>	<b>22</b>
<b>Book chapters</b>	<b>0</b>
<b>Government Reports, Conference Proceedings &amp; Presentations</b>	<b>23</b>
<b>Commissioned Reports</b>	<b>0</b>

« 460 site inspections conducted »»

# AQUACULTURE AND FISH HEALTH



## Key Highlights and Impact from 2017/18

Implemented new regulatory requirements to demonstrate satisfactory measures for prevention, control and reduction of sea lice on marine salmonid farms.

Started Assemble Plus, a new EU trans-national access programme enabling use of the Marine Scotland Science marine aquaria for European investigators.

Delivered industry testing for potential sea lice treatment.

Delivered collaborative research, using Horizon 2020 funding, with the Biotechnology and Biological Science Research Council, Natural Environment Research Council aquaculture initiative, Scottish Aquaculture Innovation Centre and European Union (EU).

Provided respected scientific advice on sea lice management through a programme of research aimed at understanding the distribution and transmission of sea lice in the environment and their impacts. Work continues with Norwegian and Irish scientists to develop a European standardised approach to sea lice dispersal modelling.

Provided disease testing and mussel species identification to businesses to assist in their management.

Started new research into gill health with the Scottish Aquaculture Innovation Centre, University of Aberdeen, Scottish Sea Farms and Biomar.

Developed international standards for biosecurity of animal infection laboratories as part of the EU VetBionet consortium.

## Delivery Against Key Programme Objectives

Contributed to the Multi-Annual National Control Plan (MANCP) for the UK. <https://www.food.gov.uk/business-guidance/multi-annual-national-control-plan>

Completed a national programme of surveillance, inspection, testing and regulation relating to aquatic animal health.

Conducted 460 risk-based and evidence led inspections of sites, including responding to reports of mortality, escapes, sea lice and other issues in aquaculture as well as wild fish and shellfish.

Maintained independent accreditation by VETQAS & UKAS for inspections and disease testing.

Assisted in the aquaculture planning process as a statutory consultee, in supporting sustainable development.

Provided new advice on microplastics and management of carpet sea squirt within oyster farms, including the development of an oyster trade network to assess invasive species risk.

Protected safe trade in aquatic animals and markets for aquaculture products to support the import and export of live animals for the industry.

Published annual aquaculture production surveys for the shellfish and finfish industries (official statistics).

Provided an analysis of the changes in mean numbers of sea lice per fish in the aquaculture industry evidencing reductions over the last 3 years at a national level.

Supported two marine salmon farms covered by restrictions to control Bacterial Kidney Disease. Sites were followed, cleaned and disinfected, and restrictions were withdrawn.

**PROGRAMME MANAGER:**  
**Stuart MacDonald**

## **BUSINESS OPERATIONS (BO)**

### **PROGRAMME OBJECTIVE:**

The Business Operations (BO) Programme supports science delivery directly through participation in research and monitoring projects, and indirectly by providing crucial support in the following areas: Information Technology (IT), Health and Safety and Finance and Contracts. The Programme also offers operational support for Freshwater Fisheries Science, Learning and Development, and Business Support for the Head of Science and Programme Managers.

FINANCE AND CONTRACTS

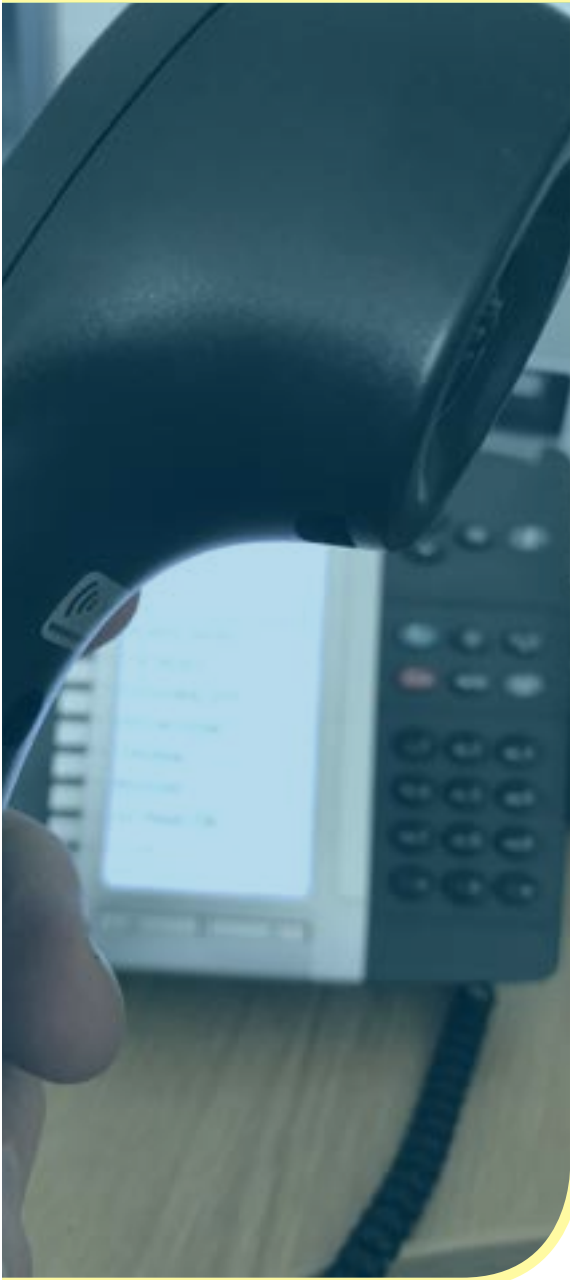
LEARNING AND DEVELOPMENT

BUSINESS SUPPORT

FORMATION TECHNOLOGY

« 378 Health & Safety training days across 30 different aspects of activities undertaken by Science staff »»

# BUSINESS OPERATIONS



## Key Highlights and Impact from 2017/18

Maintained the healthy and safe workplace culture through applied and specialised training, and guidance for safer working practices.

Recruited a new Human Resources Manager to provide additional support to MSS staff.

Improved communication by rolling out of new telephony system and wireless access points across MSS sites.

Listened and acted upon staff suggestions by offering: targeted training, more social events and an onsite gym with equipment information sessions.

Replaced data storage facilities.

Reviewed MSS sites in a 'spend to save initiative' to investigate how on-going maintenance costs can be reduced.

Developed an improved project reporting tool to assist in making better informed decisions.

Aligned business support to improve delivery for identified science priority areas.

## Delivery Against Key Programme Objectives

Upgraded the Off Scots Environment (OSE) connectivity to provide faster throughput between users and servers.

Created 'virtual' servers in the Marine Laboratory computer suite which reduced running costs and our environmental footprint.

Used high-performance "virtual" machines to create an internal cloud service to reduce time spent running models or purchasing external resources.

Delivered over 430 training days in addition to supporting formal (college/university) training, all-staff meetings, seminars and staff engagement events.

Filled 25 vacancies successfully as of 31 March 2018.

Delivered Light, Exhaust and Ventilation (LEV) awareness sessions to more than 65 staff to promote better use and knowledge of fume cupboards and extraction arms.



**PROGRAMME MANAGER:**  
**Dr Bill Turrell**

## **ENVIRONMENT MONITORING AND ASSESSMENT (EMA)**

### **PROGRAMME OBJECTIVE:**

The Environment Monitoring and Assessment (EMA) Programme delivers environmental monitoring, assessment, research and advice to help Scotland achieve clean, healthy, safe, productive and biologically diverse marine and coastal environments, demonstrated by 'Good Environmental Status (GES)'.

### **SCIENCE DELIVERY:**

#### **PROJECTS/MILESTONES COMPLETED**

<b>Monitoring and Advice (62)</b>	<b>59</b>
<b>Research Projects (20)</b>	<b>9</b>
<b>External Contracts (9)</b>	<b>9</b>

#### **PUBLICATIONS**

<b>Peer-reviewed papers</b>	<b>33</b>
<b>Book chapters</b>	<b>0</b>
<b>Government Reports, Conference Proceedings &amp; Presentations</b>	<b>44</b>
<b>Commissioned Reports</b>	<b>0</b>

“ This year marine litter became a new focus for us. We are planning more work in this area to understand the sources, sinks and impact of litter in Scottish seas ”

# ENVIRONMENT MONITORING AND ASSESSMENT



First Minister addresses the Arctic Forum

## Key Highlights and Impact from 2017/18

Provided background information about the problem of marine plastics in Scottish waters, as well as microplastics in food.

Carried out work around marine litter at Arrochar, at the head of Loch Long, in the Clyde.

Maintained seabed litter and floating microplastics monitoring.

Concluded MSS input to OSPAR assessments for reviewing progress towards Good Environmental Status (GES). UK targets for GES were reviewed, and advice for monitoring biodiversity was given.

Continued research to support the management of marine invasive non-native species and helped develop a more strategic approach to their monitoring and management in Scottish waters.

Participated in a workshop to bring together the users and developers of the Scottish Shelf model, as well as industry sectors who benefit from advice underpinned by the model.

Helped organise the 'Arctic Circle Forum' in Edinburgh, convened by the First Minister, and initiated a process to look at MSS monitoring in the context of Arctic science and management.

## Delivery Against Key Programme Objectives

Performed all inshore and offshore environmental monitoring as planned - data was quality checked, archived and submitted to national and international data centres.

Provided scientific representation and input on behalf of Scotland, or the UK, on environmental issues including:

- ecosystem health assessment;
- climate change impact and assessment;
- marine monitoring; and
- marine invasive non-native species.

Provided support for the management of *Didemnum vexillum* in Loch Creran.

Supplied evidence and advice to manage marine litter and plastics in Scottish waters.

Delivered monitoring and advice for a number of marine incidents and participated in an incident response exercise.

Supplied input to the OSPAR Intermediate Assessment 2017 and the UK Marine Strategy Framework Directive (MSFD) assessment, giving particular emphasis to biodiversity, fish health assessments, hazardous substances in sediment and biota, and the pelagic habitat.

**PROGRAMME MANAGER:**  
**Dr John Armstrong**

## FRESHWATER FISHERIES (FF)

**PROGRAMME OBJECTIVE:**  
The Freshwater Fisheries (FF) Programme provides science and advice in support of the management of Scotland's freshwater and migratory fish and fisheries.

**SCIENCE DELIVERY:**

### PROJECTS/MILESTONES COMPLETED

Monitoring and Advice (51)	49
Research Projects (13)	9
External Contracts (3)	3
<b>PUBLICATIONS</b>	
Peer-reviewed papers	22
Book chapters	1
Government Reports, Conference Proceedings etc	51

“ 2,116 salmon and sea trout catch returns processed ”

# FRESHWATER FISHERIES



Satellite tags

## Key Highlights and Impact from 2017/18

Provided Ministers with new research outputs into the extent to which coastal fisheries are likely to influence salmon from different rivers.

Completed a review project analysing relevant historical information from tagging studies. Found that 90% of recoveries were within 127 km anti-clockwise to 157 km clockwise from the fishery. The maximum distance of effect was 907 km.

Collected further data from the Armadale fishery using tagged salmon and acoustic receivers distributed among 47 rivers. Results were consistent with previous findings and by employing more technically advanced methods it further strengthens the analysis. This study also revealed a high incidence of red vent syndrome in salmon. This is associated with parasitic infestation.

## Delivery Against Key Programme Objectives

Studied the survival of smolts on the River Dee by using acoustic tracking.

Provided extensive advice to policy colleagues and the wider freshwater fisheries sector.

Reported the assessment of the potential to test the effects of sea lice on salmon

populations to the Scottish Aquaculture Research Forum (SARF).

Developed and updated Scottish Government Conservation Regulations to produce, where possible, river gradings.

Published papers showing genetic signatures associated with salmon locations within river catchments.

Assessed emigration patterns and swimming trajectories of smolts on Loch Linnhe using acoustic tracking.

Maintained a network of river temperature loggers and accrued the data.

Published a model for fisheries managers, with web-based tools, to predict temperature profiles and sensitivity to climate change, in any river.

Processed 630 applications to stock fish and use otherwise illegal methods.

Participated in a number of public and community outreach projects; primarily a Freshwater Fisheries open day for stakeholders and members of the public.

Developed a working partnership with a local High School to provide collaborative research.

**PROGRAMME MANAGER:**  
**Dr Matt Gubbins**

## PLANNING AND ENVIRONMENTAL ADVICE (PEA)

### PROGRAMME OBJECTIVE:

The Planning and Environmental Advice (PEA) Programme provides the evidence base to support national and regional planning and management of Marine Protected Areas (MPAs) in Scottish waters. It also provides advice on monitoring, environmental assessments and management measures to achieve 'Good Environmental Status' for the Marine Strategy Framework Directive (MSFD).

### SCIENCE DELIVERY:

#### PROJECTS/MILESTONES COMPLETED

Monitoring and Advice (14)	14
Research Projects (6)	3
External Contracts (5)	5
PUBLICATIONS	
Peer-reviewed papers	24
Book chapters	1
Government Reports, Conference Proceedings etc	21
Commissioned Reports	0

◀◀ 10 Marine Protected Areas surveyed around 17/18 ▶▶

## PLANNING AND ENVIRONMENTAL ADVICE



Flame shell

Photo : Graham Saunders SNH

### Key Highlights and Impact from 2017/18

Co-chaired an ICES Working Group on Marine Planning and Coastal Zone Management, and hosted an ICES workshop on Co-existence and Synergies in Marine Planning.

Published the Scottish Marine Protected Area (MPA) Monitoring Strategy with Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC).

Joined research vessel surveys, with the SNH dive team, to document the impacts of dredging on a flame shell bed in Loch Carron. This led to a proposed extension of the Marine Protected Area (MPA) and a review of Priority Marine Features outside of MPAs.

Deployed acoustic moorings and fish traps to gather data across a suite of MPAs using funding from the European Maritime and Fisheries Fund (EMFF).

Commissioned and co-designed an underwater video unit capable of being deployed from fishing vessels.

Co-authored a high impact publication in Nature: Ecology and Evolution on the evolutionary ecology of deep sea fish (round-nosed grenadier).

Published details of a unique deep water ecosystem discovered in the Hatton-Rockall basin.

### Delivery Against Key Programme Objectives

Attended a number of international marine planning events including: ICES, EU Marine Spatial Planning Expert Group and the EU Commission's Blue Growth conference and initiated joint working on assessment techniques.

Published the Scottish MPA monitoring strategy, announced by the Cabinet Secretary for Environment, Climate Change and Land Reform.

Worked with SNH to survey eight inshore MPAs and JNCC to survey two offshore MPAs .

Continued research on the biology, predicted distribution and connectivity of some key protected features of the MPA network (sea pens, sandeels, fan mussels and skate).

Established a project management team to monitor the inshore MPA network, using EMFF funding, for the next two years.

Published results measuring the baseline status of hydrocarbon contamination of deep sea ecosystem components in waters north west of Scotland.

**PROGRAMME MANAGER:**  
**Dr Ian Davies**

## RENEWABLES AND ENERGY (RE)

### PROGRAMME OBJECTIVE:

The Renewables and Energy (RE) Programme applies best regulatory practice, supported by high quality science, to ensure that renewable energy on land and at sea are developed in a planned and sustainable manner and supports the regulation of the oil and gas industries. The sustainable management of Scotland's marine and freshwater resources requires us to provide robust science and reliable advice in these areas that are central to Scotland's economic plans.

### SCIENCE DELIVERY:

#### PROJECTS / MILESTONES COMPLETED

Monitoring and Advice (20)	20
Research Projects (18)	18
External Contracts (9)	9
PUBLICATIONS	
Peer-reviewed papers	11
Book chapters	2
Government Reports, Conference Proceedings etc	4
Commissioned Reports	3

« 7 Research vessel surveys undertaken »

Trawling for smolts from MRV *Scotia*.  
Photo by Ross Gardiner, © Crown copyright

# RENEWABLES AND ENERGY



## Key Highlights and Impact from 2017/18

Chaired a working group to draft a conservation strategy for harbour porpoise.

Provided support to the appeal process relating to Ministers' decisions to agree to the construction of offshore wind farms in the Forth/Tay area. The Supreme Court decided not to consider the appeal as Ministers had acted in accordance with their statutory requirements.

Monitored emigrating salmon smolts with the Dee District Salmon Fishery Board (DDSF) and River Dee Trust (RDT) to understand their movement and early phase marine migration in the River Dee. This led to a larger project to provide data on smolt migration from

the Aberdeen and Aberdeenshire coast over several years. MSS also carried out surface trawling for smolts, in the Moray Firth, with genetic assignment to rivers or regions of origin, providing further migration route data.

Continued a long term acoustic monitoring programme for cetaceans (and ambient noise levels) in coastal waters to the east of Scotland to improve risk assessments from projects such as offshore wind farms and harbour improvements.

Collected data and deployed 10 cetacean monitoring moorings throughout the Inner Hebrides and Minches, funded by the European Maritime and Fisheries Fund (EMFF).

Contributed to the delivery of two EU Interreg funded projects:

- COMPASS - monitoring protected species in western Scotland and Irish waters; and
- Jomopans - monitoring and reporting of anthropogenic noise in the North Sea.

## Delivery Against Key Programme Objectives

Participated in ICES Marine Renewables working group (WGMRE) and US WREN expert group on environmental impacts of wind farms.

Supported delivery of the Thanet seabird study to inform collision risk.

Continued with membership of steering groups for UK scientific meetings; encouraging links within the UK research community.

Met all advice requests for renewable energy development and offshore oil and gas development.

Designed, commissioned and managed projects to assess environmental consequences of renewable energy development.

Increased external income through participation in EU-funded projects on marine planning through:

- EU H2020 (e.g. MUSES); and
- EU Interreg (e.g. NorthSEE, COMPASS).

Supervised two PhDs and agreed to support three new PhDs. In addition, one staff member acquired an MSc qualification.



**PROGRAMME MANAGER:**  
**Dr Carey Fraser**

## SCIENCE OPERATIONS (SO)

### PROGRAMME OBJECTIVE:

The Science Operations (SO) Programme provides scientific, engineering and logistics support services to Marine Scotland Science (MSS) and their collaborators. The programme contains professional statisticians, scientists, engineers, and quality, data and information managers who contribute to the planning, construction and operation of various science programmes and projects.

### SCIENCE DELIVERY:

Service Level Agreements	25
36 research surveys conducted	
534 days at sea	

« 75,119 km travelled by our research vessels »»

Sample being investigated on aboard MRV Scotia

# SCIENCE OPERATIONS



## Key Highlights and Impact from 2017/18

Prepared and submitted the Scottish Fisheries Data Collection Framework Annual Report. The UK scored over 90% compliance against planned outcomes of the programme and data transmission. This is the second year in a row that the UK has performed well and is a credit to the staff responsible.

Analysed UK monitoring data for contaminants in biota and sediment, the results of which form the basis of the Marine Strategy Framework Directive (MSFD) assessments of trends and status of contaminants in biota and sediment. Contaminant levels are generally decreasing or stable and status is generally good or very good.

Led sessions at the first marine focussed event in DataFest, a Scotland-wide event run by The Data Lab. Staff presented an introduction to marine data and the work towards open data that are findable, accessible, interoperable, and re-usable. This was followed by a demonstration of Marine Scotland's Open Data Network, the features of the Marine Scotland Maps portal and wider integration.

Coordinated the Self-Assessment Team that is preparing the application for an Athena SWAN gender equality charter.

## Delivery Against Key Programme Objectives

Facilitated publication of Open Data on the Marine Scotland Data portal. Every dataset on this portal has additional metadata, a digital object identifier (DOI) and a pre-formatted citation box for referencing the dataset.

Collaborated with Sea Fisheries colleagues on the annual workplan for the revised fisheries Data Collection Framework, and assisted with merging the four UK administrations' work plans into a single UK submission. The UK workplan was one of the very few that did not need to be re-submitted.

Participated in a survey on MRV *Alba na Mara* to develop a new drop frame and stereo image system used to monitor Scotland's Marine Protected Area (MPA) network. Modifications and improvements were made onboard the vessel, maximising the information gained from the survey and preventing downtime.

**PROGRAMME MANAGER:**  
**Dr Coby Needle**

## SEA FISHERIES (SF)

### PROGRAMME OBJECTIVE:

The Sea Fisheries (SF) Programme provides advice on fish stocks that helps to ensure the best possible sustainable catching opportunities, as well as timely support on all implications of relevant ongoing and forthcoming political and regulatory changes.

### SCIENCE DELIVERY:

#### PROJECTS /MILESTONES COMPLETED

Monitoring and Advice (28)	28
Research Projects (4)	2
External Contracts (5)	3

#### PUBLICATIONS

Peer-reviewed papers	12
Book chapters	0
Government Reports, Conference Proceedings etc	12
Commissioned Reports	3

« 15 Research vessel surveys completed »»

# SEA FISHERIES



Starfish

## Key Highlights and Impact from 2017/18

Appointed two new Fisheries Observers, enabling 'at-sea' observer and market-sampling schedules to proceed as planned.

Appointed temporary staff to cover two maternity leaves.

Co-chaired three ICES Working Groups (WGs):

- Assessment on the Celtic Seas Ecoregion;
- Herring Assessment; and
- *Nephrops* surveys.

Continued collaboration with the pelagic fishing industry for the second year of the acoustic survey of herring on the west coast.

## Began new research projects on:

- Smart fishing and monitoring technologies;
- Indicators of stock status for data-poor stocks;
- Collaborative work on pelagic fisheries; and
- Developments in data collation and analysis for stock assessments.

Continued developing analysis methods for Fully-Documented Fisheries (FDF), with important input from a Buckland-Smith studentship, along with two Careerwise internships.

Hosted a New Zealand delegation who wanted to learn about the FDF processes MSS is putting in place.

## Delivery Against Key Programme Objectives

Participated fully in the relevant ICES Fishery Expert Group meetings.

Completed stock assessments of national crab, lobster and scallop stocks.

Provided a significant number of advisory consultations, briefings, advice and recommendations to policy colleagues in Edinburgh, London, Brussels and elsewhere. Policy requests included:

- Potential implications of Brexit for fisheries and fisheries science;
- EU Landing Obligation;
- West of Scotland cod; Inshore (including razorfish and wrasse) monitoring, science and fishery management; and
- Fishing gear development.

Conducted sampling and monitoring programmes efficiently (at-sea observers, market sampling, research-vessel surveys, and data collation).

Contributed to a number of data-provision mechanisms including Data Collection Framework (DCF) data calls.

Supervised university students and assisted with courses specifically for the fishing industry and other stakeholders.

Developed the role and work of the MSS Staff Engagement Group (SEG); a staff group created to improve communication and interaction throughout MSS.

Continued our STEM outreach activities with local schools.

## SHIPS REVIEW

It has once again been a busy, but very successful, year for our vessels serving Scotland's marine research needs. The MRVs *Scotia* and *Alba na Mara* have spent an impressive 259 and 275 days at sea; covering 50,839 km\* and 24,280 km respectively.

Our vessels hosted 260 individual scientific staff, engineers, stakeholders, students and visiting colleagues aboard 36\*\* dedicated research surveys. Each vessel has fully equipped laboratories on-board allowing the scientists to conduct their research in real time, often changing the course of the survey programme in light of their findings.

Marine Scotland is a member of the Marine Alliance for Science and Technology for Scotland (MASTS) and continues to collaborate with other MASTS members such as Scottish Natural Heritage (SNH) and Scottish Environment Protection Agency (SEPA), as well as collaborating with Historic Environment Scotland (HES) and the Joint Nature Conservation Committee (JNCC) through provision of vessel time. In 2017/18 a total of 61 vessel days were assigned to stakeholder surveys, including the multibeam mapping of World War One ship wrecks at Scapa Flow with HES.

\* steaming distance not recorded for one operational survey (0318S)

\*\* one survey not undertaken due to mechanical failure (0417S)



« Scotia and Alba na Mara spent 534 days at sea covering 75,119 kilometers »»

Rendezvous with MRV *Scotia* in Scapa Flow

# SHIPS REVIEW



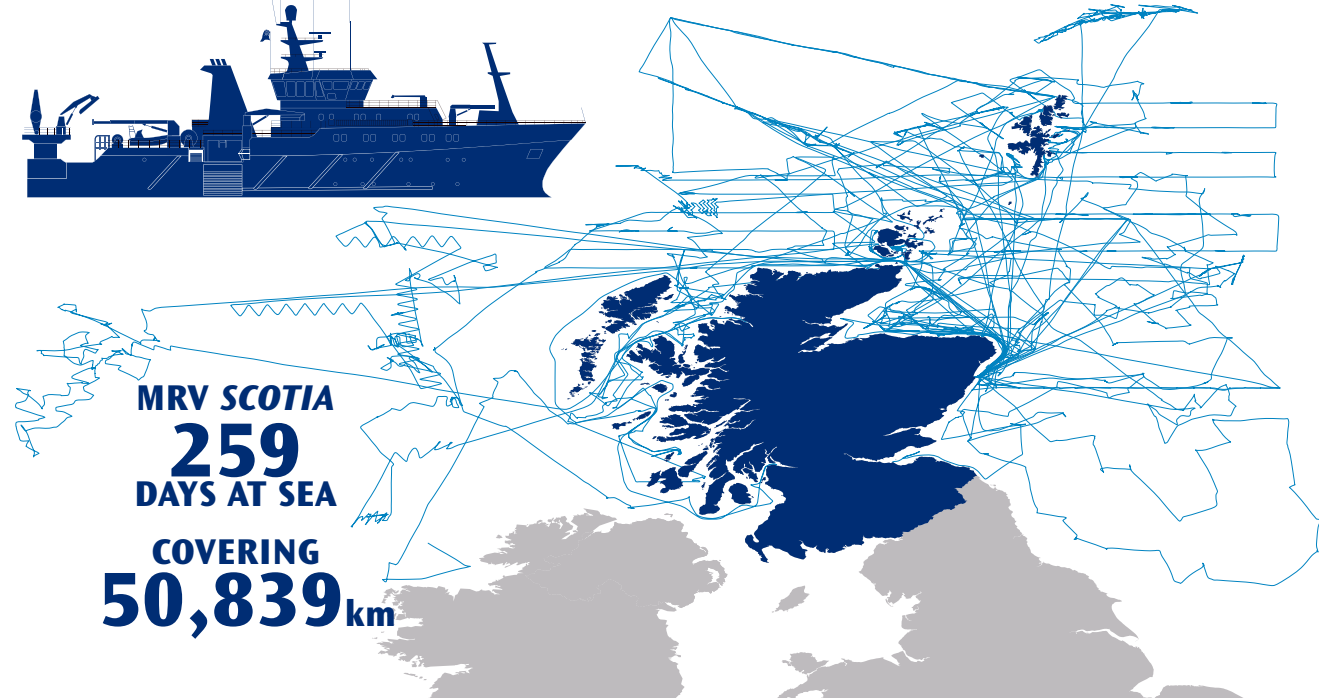
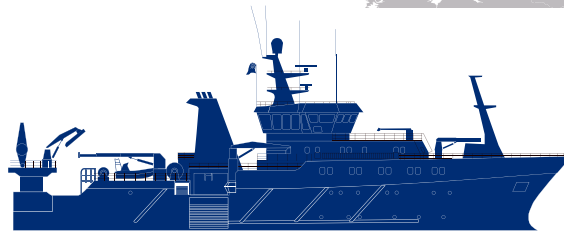
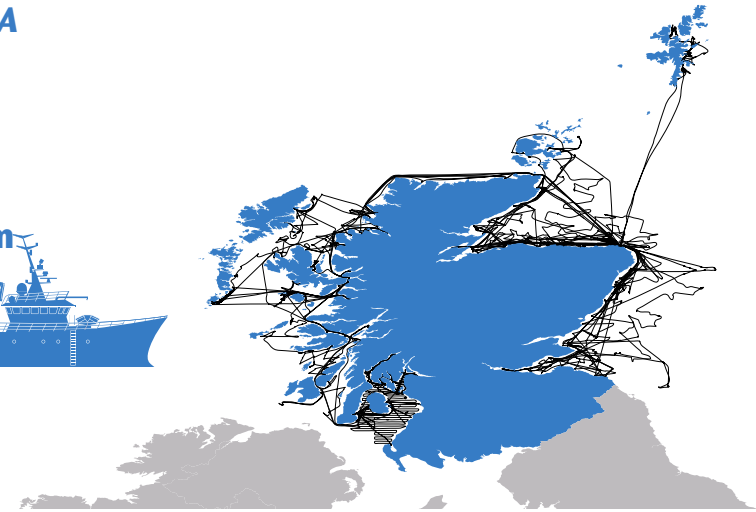
MRV *ALBA na MARA*

**275**

DAYS AT SEA

COVERING

**24,280 km**



MRV *SCOTIA*

**259**

DAYS AT SEA

COVERING

**50,839 km**

« 5 new methods & assays accredited »

« 180 open data sets »

« 2,700 internal quality control tests, 620 external quality control samples analysed »

### Key Highlights and Impact from 2017/18

The report from the United Kingdom Accreditation Service (UKAS) annual surveillance visit confirmed that MSS continues to show a strong commitment to delivering high quality tests and inspections. Only a small number of improvement actions were raised during the visit.

The internal audit process is used to proactively identify improvements across the quality system. Twenty Internal quality audits and six Inspector competency audits were completed.

Eight validation plans for improving currently accredited or introducing new methods were agreed. New methods for Organotin and Particle Size Analysis have been validated and accredited by UKAS.

The flexible scope process in Molecular Genetics allows MSS to validate new methods independently from UKAS. Tests for Oyster Herpes Virus, Infectious Pancreatic Necrosis and *Bonamia* spp. were accredited in the last year.

Performance of accredited methods is assured on a daily basis through running Internal Quality Control (IQC) samples alongside test samples. Over 2,700 such tests were run in the last year, with an average success rate > 97%.

To provide an objective external assessment of method performance, MSS methods are submitted to appropriate External Quality Assurance (EQA) schemes such as those maintained by Quasimeme, Bequalm, Aquacheck and Community Reference Laboratories (CRLs). During 2017/18, 620 external quality control samples were analysed, with an average success rate >96%, improving on the 2016/17 return.

The Marine Scotland Data portal now has over 180 open datasets available, with over 500 individual resources available for download. These range from Scottish Marine and Freshwater Science reports, with associated data, to a climatology dataset with over 130,000 records.

# KEY PERFORMANCE INDICATORS (KPIs)

Marine Scotland Science (MSS) has undertaken an annual review of performance against a set of Key Performance Indicators (KPIs) for many years. The process was initiated when MSS was an Agency and there was a requirement to report to the Scottish Parliament. However, continuation of the use of KPIs permits a longer-term assessment to be made of any changes in performance. Over time, there has been a change in emphasis such that assessing ‘impact’ is more critical today than even three or four years ago, hence the specific reference to ‘impact’ within each Programme summary.

Individual Programme publications are also presented in the Programme summaries, however, for consistency, publications are summarised in this section. A summary is presented in this Annual Review highlighting key aspects of:

- A. Delivery of service
- B. Quality of science output
- C. Collaboration
- D. Balance between Strategic Science and routine activities

“ 102 Peer-reviewed publications ”

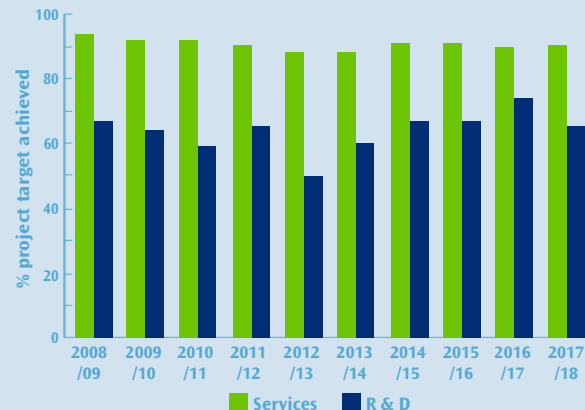
## A. Delivery of service

1. Plan, execute and report a programme of science to meet the needs of Scottish Government.

In 2017-18, Marine Scotland Science achieved 90.2% of its services targets and 64.8% of research project milestones (see plot below). The achievement rate for scientific services such as monitoring and advice has remained stable but research achievements are more variable and the number of research projects has decreased in total.

2. Plan and conduct an annual programme to achieve most efficient use of available days on research vessels.

Marine Scotland research vessels served an impressive 259 and 275 days at sea for MRV *Scotia* and MRV *Alba na Mara*, respectively. These remain the most active research vessels in both Scotland and the wider UK.



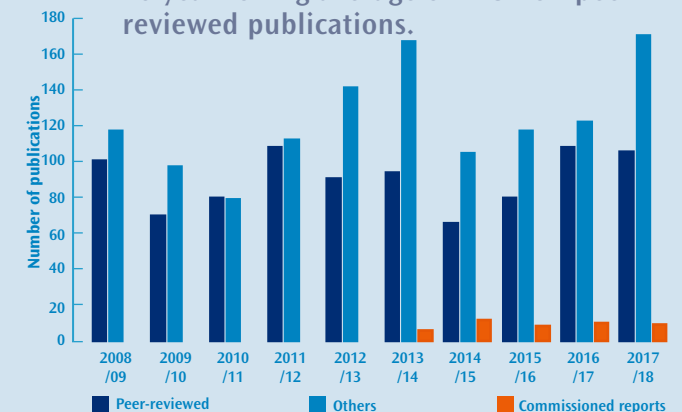
## B. Quality of science output

1. Number of peer-reviewed publications and book chapters.

In 2017/18, MSS produced 106 peer reviewed papers and book chapters. This is a very slight decrease from 108 in 2016/17 but is well above the 10 year rolling average of 90 such publications per year. Publication output, particularly peer-reviewed papers, is an important route for maintaining scientific reputation and credibility for Marine Scotland.

2. Number of non-peer-reviewed publications produced, e.g. Scottish Marine and Freshwater Science Series, Marine Scotland Science Reports, Fish and Shellfish Stocks booklet, Conference proceedings, posters and presentations.

The number of non-peer-reviewed publications and conference presentations and proceedings was 170. This represents a highly significant output from Marine Scotland Science and is well above the 10 year rolling average of 123 non-peer-reviewed publications.





# KEY PERFORMANCE INDICATORS (KPIs)

CLICK TO LINK TO ASSOCIATED DOCUMENTS

▶ ABSTRACT BOOKLET



▶ MARINE SCOTLAND SCIENCE STAFF PUBLICATIONS 2017/18

3. **Commissioned reports.**  
Since 2013/14 MSS has published commissioned reports which often relate to work funded by the SG's Contract Research Fund. Nine were published in 2017/18, which is equal to the 5-year rolling average.
4. **Results of external and internal audits.**  
The United Kingdom Accreditation Service (UKAS) conducts an annual visit to assess a range of accredited methods against the ISO 17025 Testing and 17020 Inspection standards. Following the visit, MSS staff were complimented on their excellent technical competence and quality system knowledge.

The internal audit programme to support the accreditation system was up to date at the end of the calendar year.

## C. Collaboration

1. **Value of externally funded work in total and for strategic research projects.**  
In recent years, there has been a concerted effort for MSS to be involved in EU funded projects. This requires a period of time to build up as there needs to be collaborations formed, projects formulated and bids assessed. MSS has experienced some significant success in recent times as illustrated in the Table below.
2. **Communications with stakeholders.**  
MSS works with a very wide range of stakeholders. These include other government departments, other devolved administrations, those directly involved in many maritime industries or activities, and students who might one day become staff or collaborators of MS. Staff from MSS

### Income values for 2017/18

Type of Income	Value/£
Commercial Contracts	1,256,285
EU Contracts <sup>^</sup>	404,203
Miscellaneous Receipts	109,794
<i>Sub-Total</i>	1,770,282
European Maritime and Fisheries Fund (Data Collections Framework)	2,000,000
<b>Grand Total</b>	<b>3,770,282</b>

Together with the income from the data Collection framework, MSS took in over £3.7 million. This exceeds the target for 2017/18 of £3.4 million.

# KEY PERFORMANCE INDICATORS (KPIs)

also collaborated on many projects with academic and other research colleagues in Scotland and worldwide. Individual examples of this work can be found in the highlights from each Programme.

3. **Integration of natural and socioeconomic sciences with policy.**  
MSS gives due consideration to the socioeconomic evidence and works collaboratively with the Marine Analytical Unit to provide integrated evidence and advice to policy.

## D. Balance between strategic science and routine activities

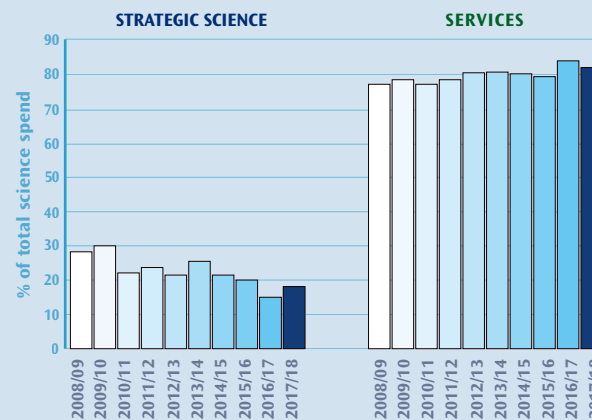
1. **Proportions of science programme budget allocated to strategic science and to scheduled activities.**

At the beginning of the year, 18.1% of the direct science project budget was allocated to strategic science projects and 81.9% allocated to advice, monitoring and regulatory services. Although the strategic science budget increased from 2016/17, it should be noted that 2016/17 represented a particularly low budget allocation. Overall there continues to be a very strong focus on advice and regulatory activities. There tend to be fewer R&D projects conducted. However MSS continues to directly fund a number of PhD studentships.

2. **Proportion of in-year resource, reallocation between strategic science and ongoing activities.**  
At the end of the year, out-turn figures show that 16.9% of the budget was spent on strategic science and the remaining 83.1% on advice, monitoring, regulatory and surveillance work. This balance reflected an in-year decrease in strategic science and represents the second lowest spend on strategic science (*see plot below*).

## Impact of MSS

The Programme summaries in this report provide examples of the impact of MSS. MSS staff provide advice direct to SG policy divisions and other national stakeholders. This knowledge also supports international policy and regulations through participation in e.g. ICES, OSPAR and other international organisations. This work often draws on long data series and knowledge and expertise built up over many years.



# MARINE SCOTLAND SCIENCE REPRESENTATION 2017/18

	Fisheries	Environment	Energy	Aquaculture	Freshwater Fisheries	General Science
International	EU-Norway & CS NEAFC ICES EGs	OSPAR ICES EGs	WREN ICES EGs	SAV Tri-nation WG ICES EGs Gill Health Initiative WG ScoFaNo Collaboration	NASCO ICES EGs IASRB	ICES Council & ACOM
Europe	Advisory Councils STECF			EURLs CEAF COFASP DG SANCO FVO UK Mission EAS organising committee	Click columns for explanation of acronyms and their relevant links	EFARO EMBRC European projects
UK		MSCC/UKMMAS MCCIP – SG & MG UKIMON Exec Com UKMBMPB NERC SGs OGUK OSRF / MTIG	SCOS MREOG ORELG EOSCA Chemical WG OGUK Environment Advisory Group	Animal By-product Waste Disposal Group BBSRC/NERC SG Defra CVO		MSCC Vessel Coordination Group
Scotland	FMAC / IFMAC FIS-SG FISA selection panel Fishermen's Associations	MCPB SSDAG SHSAG SBS Biodiversity CG SCSEMP MINNSWG	SPORRAN FLOWW	Ministerial WGS (MGSA) SARF board CoGP MG ISLM Grp PO liaison ScotMER Scottish-NRL	MS/SNH/SEPA IF FFAG SFCC	MASTS CAMERAS MSF
Local	IFGs Clyde 2020	Clyde 2020 SG and RAG SOTEAG & Mon Com	Developers Groups & RAGs	Salmon Fishery Boards	Salmon Liaison Group	MarCRF

# MARINE SCOTLAND SCIENCE STAFF PUBLICATIONS 2017/18 (285)\*

## Peer-reviewed Publications (102)

Abascal, A.J., J. Sanchez, H. Chiri, M.I. Ferrer, M. Cardenas, A. Gallego, S. Castanedo, R. Medina, A. Alonso-Martirena, B. Berx, W.R. Turrell, and S.L. Hughes. 2017. Operational oil spill trajectory modelling using HF radar currents: A northwest European continental shelf case study. *Marine Pollution Bulletin* 119 (1):336-350.

Armstrong, J.D., S. McKelvey, G.W. Smith, P. Rycroft, and R.J. Fryer. 2018. Effects of individual variation in length, condition and run-time on return rates of wild-reared Atlantic salmon *Salmo salar* smolts. *Journal of Fish Biology* 92 (3):569-578.

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Catarino, D., S. Stefanni, P.E. Jorde, G.M. Menezes, J.B. Company, F. Neat, and H. Knutsen. 2017. The role of the Strait of Gibraltar in shaping the genetic structure of the Mediterranean Grenadier, *Coryphaenoides mediterraneus*, between the Atlantic and Mediterranean Sea. *PLoS One* 12 (5):e0174988.

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- Macdonald, A. & Middlemas, S.J. 2017. Licensing of fishing introductions (stocking). Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Madgett, A. 2017. Bioaccumulation of persistent organic pollutants and trace metals in Scottish marine food webs

- and their relationship with trophic level and fatty acid signatures. *MASTS Annual Science Meeting, Glasgow, UK*, 4-6 October 2017.
- Madgett, A.S., K. Yates, L. Webster, C. McKenzie, and C.F. Moffat. 2017. Fatty acids and stable isotopes – unravelling the web. *PALS Research Student Symposium, Robert Gordon University, Aberdeen, Scotland*, 8 December 2017.
- Malcolm, I.A. 2017. Juvenile Salmon Assessment. Talk. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Malcolm, I.A., Glover, R., Millidine, K., Millar, C., Jackson, F. & Fryer, R.J. 2018. Salmon stocking and river network smoothers. Talk. *BIOSS, James Hutton Institute, Aberdeen, UK*, 19 March 2018.
- Malcolm, I.A. & Jackson, F. 2017. Scotland river temperature monitoring network (SRTMN). Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Malcolm, I.A., Jackson, F.L., Millidine, K., Glover, R. and Fryer, R. 2017. Potential use of SSRNMs in context of WFD: benefits and constraints. Talk. U.K. Technical Advisory Group, Freshwater Task Team. Presented via VC, 19 September 2017.
- Malcolm, I.A. & Millidine, K. 2017. Understanding the status of salmon populations using juvenile electrofishing data. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
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- McCartney, A. & Millidine, K. 2017. What can water chemistry tell us about fish and fisheries. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
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- Middlemas, C. 2017. Freshwater fisheries science in Scotland. *Marine Scotland Science Poster. Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Middlemas, S.J. 2017. Licensing the use of otherwise illegal fishing methods and times. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Middlemas, S.J. 2017. Conservation Regulations. Talk. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry*. 13th May 2017.
- Middlemas, S.J. 2018. Advances in conservation regulations modelling. Talk. *Scottish Fisheries Coordination Centre Annual Meeting, Faskally House, Pitlochry*. 7-8 February 2018.
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- Milne, D., and J. Rasmussen. 2017. Marine Scotland Open Data Network. *Oceans 17 Conference, Aberdeen, UK*, 19-22 June 2017.
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- Moffat, C.F. 2017. Marine Scotland. Indian/South African Expert Group, *MASTS 7th Annual Science Meeting: Sea Change – changing seas, changing times, University of Strathclyde, Glasgow, UK*, 4–6 October 2017.
- Moffat, C.F. 2017. OSPAR - remit, influence and contribution towards delivering a clean, healthy and biologically diverse North-East Atlantic, used sustainably. *Sea Scotland 2017– Sustainable Development of Scotland's Seas: Securing Progress in Uncertain Times, Dundee, Scotland*, 21 June 2017.
- Moffat, C.F. 2017. A day at the seaside, a life with our seas. *28th Annual Newth Lecture, Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Oban, Scotland*, 10 November 2017.

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- Moffat, C.F. 2018. Good morning and welcome. *Future of marine biodiversity monitoring: providing adequate levels of evidence across biodiversity*, Birmingham, UK, 27 – 28 March 2018.
- Moffat, C.F. 2018. Marine Scotland: Science for Our Seas. *MASTS Indian Mission to the UK*, Royal Society of Edinburgh, Edinburgh, Scotland, 26 February 2018.
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- Morris, D. 2017. Tracking studies of post-smolts on Scotland’s west coast. Talk. *Scotland’s Atlantic Salmon Festival*. Inverness. 30-31 August 2017.
- Morris, D.J. 2017. Tracking salmon at sea. Talk. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day*, Atholl Palace, Pitlochry. 13th May 2017.
- Morris, D.J. 2017. West coast sea trout fisheries. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day*, Atholl Palace, Pitlochry. 13th May 2017.
- Morris, D.J. 2017. Interactions and effects of sea lice on wild salmon. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day*, Atholl Palace, Pitlochry. 13th May 2017.
- Morris, D.J. 2017. Life cycle of the trout. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day*, Atholl Palace, Pitlochry. 13th May 2017.
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- Petterson, E., E. Brudal, I. Matejusova, Ø Haugland, and M. Karlsen. 2018. Characterization of four SAV2 strains from Norway. TriNation meeting, Bergen, Norway, 13-15 March 2018.
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- Sanchez, J., A.J. Abascal, H. Chiri, M.I. Ferrer, M. Cárdenas, A. Gallego, S. Castanedo, R. Medina, A. Alonso-Martirena, B. Berx, W.R. Turrell, and S.L. Hughes. 2018. *An operation oil spill trajectory simulation system for Scottish waters based on HF Radar currents. Interspill 2018 Conference, at ExCel, London, 13-15 March 2018.*
- Sangiuliano, S. 2018. Marine Renewable Energy Planning. *Ontario Planning Journal 33 (2):8-9.*
- Sheehan, P.M.F., B. Berx, A. Gallego, R.A. Hall, K.J. Heywood, S.L. Hughes, and B.Y. Queste. 2017. High-resolution glider observations of tidal flows and frontal dynamics in the northwestern North Sea. *MASTS Annual Science Conference, Glasgow, UK, 4-6 October 2017.*
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- Smith, G.W. 2017. Salmon fishery statistics - 2016 season. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry. 13th May 2017.*
- Smith, G.W. 2017. Sea trout fishery statistics - 2016 season. Poster. *Marine Scotland Science Freshwater Fisheries Laboratory Open Day, Atholl Palace, Pitlochry. 13th May 2017.*
- Smout, Jones, and K.L. Brookes. 2017. Mapping the spatial distribution of marine mammals based on telemetry data. *22nd Biennial Conference on the Biology of Marine Mammals, Halifax, Nova Scotia, Canada, 22-27 October 2017.*
- Soares, S.; Campbell, M.; Gibson, P.; Kinnear, S.; Turriff, J.; Munro, E. & L. Blackadder, L. 2017. Survey of king scallops (*Pecten maximus*) for the presence of Apicomplexan parasite in the Scotland. *18th International conference on diseases of fish and shellfish (EAFP), Belfast, 4-7 September 2017.* Oral communication.
- Soares, S., Still, N., Mayes, A., Stagg, H., Black, J., Munro, E. 2017. A mortality event of brown crab (*Cancer pagurus*) in northern Scotland. *18th International conference on diseases of fish and shellfish (EAFP), Belfast, 4-7 September 2017.* Poster.
- Soares, S., Walker, A., Elwenn, S., Gardon, A., Black, J., Munro, E. 2017. First isolation of *Flavobacterium psychrophilum* associated with reports of moribund wild European eel (*Anguilla anguilla*) from two rivers in Scotland. *18th International conference on diseases of fish and shellfish (EAFP), Belfast, 4-7 September 2017.* Poster.
- Stagg, H, R Merino, P Oladimeji, N Steiropoulos, and E. Munro. 2017. Validation of a field qPCR test for the detection of salmonid alphavirus (SAV). *European Association of Fish Pathologists conference, Belfast, UK, 4-7 September 2017.*
- Stagg H.E.B., N. Vendramin, S Guðmundsdóttir, N Ruane, H Sigurðardóttir, D Christiansen, A Cuenca Navarro, E Munro & N J Olesen. 2017. Isolation and characterisation of a new ranavirus isolated from lumpfish in the north Atlantic area. *4th International Ranavirus Symposium at the 10th International Symposium on Viruses of Lower Vertebrates (ISVLV), Budapest, Hungary, 5 – 9 June 2017.*
- Susdorf, R., N. Salama, D. Lusseau, and E. de Eyto. 2017. Sea Lice effect on wild Atlantic salmon fecundity. *British Society for Parasitology 55th Annual Spring Meeting, Dundee, UK, 2-5 April 2017.*
- Williamson, L., F. Bachl, J. Illian, K.L. Brookes, I. Graham, P. Thompson, and B. E. Scott. 2017. Differences between the overall distribution vs. foraging detections of harbour porpoise. *22nd Biennial Conference on the Biology of Marine Mammals, Halifax, Nova Scotia, 23-27 October 2017.*
- Williamson, L.D., F.E. Bachl, J. Illian, B.E. Scott, K.L. Brookes, and P.M. Thompson. 2017. Interannual and seasonal trends in the distribution and foraging detections of harbour porpoise. *MASTS Annual Science Meeting, Glasgow, UK, 4-6 October 2017.*
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### Commissioned research (9)

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- Evers, C, C Blight, D Thompson, J Onoufriou, and G Hastie. 2017. Determining the water column usage by seals in the Brims lease site. *Scottish Marine and Freshwater Science Vol 8 (22):30pp.*
- Fox, C. 2018. Report on razor clam surveys in the Sound of Harris and the Ayrshire coast of the Clyde (Girvan to North Bay). *Scottish Marine and Freshwater Science Vol 9 (3):54pp.*
- Fox, C. J. 2017. To Develop the Methodology to Undertake Stock Assessments on Razor Fish Using Combinations of Video Monitoring and Electrofishing Gear. *Scottish Marine and Freshwater Science Vol 8 (6):92pp.*
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## Fisheries

EU Norway & CS	Bilateral fisheries agreement between EU, Norway and coastal states. See <a href="http://ec.europa.eu/fisheries/cfp/international/agreements/index_en.htm">http://ec.europa.eu/fisheries/cfp/international/agreements/index_en.htm</a>
NEAFC	North East Atlantic Fisheries Commission <a href="http://www.neafc.org/">http://www.neafc.org/</a>
ICES EGs	International Council for the Exploration of the Sea (ICES) Expert Groups <a href="http://www.ices.dk/community/groups/Pages/default.aspx">http://www.ices.dk/community/groups/Pages/default.aspx</a>
Advisory Councils	<a href="http://ec.europa.eu/fisheries/partners/advisory-councils/index_en.htm">http://ec.europa.eu/fisheries/partners/advisory-councils/index_en.htm</a>
STECF	European Commission Science, Technical and Economic Committee for Fisheries <a href="https://stecf.jrc.ec.europa.eu/">https://stecf.jrc.ec.europa.eu/</a>
COFASP	Cooperation in Fisheries, Aquaculture and Seafood Processing <a href="http://www.cofasp.eu/">http://www.cofasp.eu/</a>
FMAC	Fisheries Management & Conservation Group <a href="http://www.gov.scot/Topics/marine/Sea-Fisheries/engagement/FMAC">http://www.gov.scot/Topics/marine/Sea-Fisheries/engagement/FMAC</a>
IFMAC	Inshore Fisheries Management and Conservation Group <a href="http://www.gov.scot/Topics/marine/Sea-Fisheries/InshoreFisheries/ifmac">http://www.gov.scot/Topics/marine/Sea-Fisheries/InshoreFisheries/ifmac</a>
FIS - SG	Fisheries Innovation Scotland Steering Group <a href="http://www.fiscot.org/">http://www.fiscot.org/</a>
FISA	Fishing Industry Science Alliance <a href="http://www.gov.scot/Topics/marine/science/FISA">http://www.gov.scot/Topics/marine/science/FISA</a>
Fishermen's Associations	Numerous: <a href="http://www.swfpa.com/">http://www.swfpa.com/</a> <a href="http://www.scottishpelagic.co.uk/">http://www.scottishpelagic.co.uk/</a> <a href="http://www.scottishfishermen.co.uk/">http://www.scottishfishermen.co.uk/</a> <a href="http://www.scottishcreelfishermensfederation.co.uk/">http://www.scottishcreelfishermensfederation.co.uk/</a> <a href="http://www.sff.co.uk/">http://www.sff.co.uk/</a>
IFGs	Inshore Fisheries Groups <a href="http://ifgs.org.uk/">http://ifgs.org.uk/</a>
Clyde 2020	<a href="http://www.gov.scot/Topics/marine/marine-environment/Clyde2020">http://www.gov.scot/Topics/marine/marine-environment/Clyde2020</a>

## Environment

OSPAR	OSPAR Commission <a href="http://www.ospar.org/">http://www.ospar.org/</a> MSS staff are members of and contributed to a number of committees, working groups and intersessional correspondence groups (ICGs) including: Coordination Group Committee on Environmental Impacts of Human Activity (EIHA) (by correspondence) Working Groups on Monitoring and on Trends and Effects of Substances in the Marine Environment (MIME). ICG to manage preparation and publication of IA 2017 and QSR 2021 (MAQ) (Chair) ICG on the protection of species and habitats (POSH) ICG on Marine Protected Areas (MPA) ICG on underwater noise (NOISE) ICG on coordinated biodiversity assessment and monitoring (ICG-COBAM) (by correspondence)
ICES EGs	International Council for the Exploration of the Sea (ICES) Expert Groups <a href="http://www.ices.dk/community/groups/Pages/default.aspx">http://www.ices.dk/community/groups/Pages/default.aspx</a>
JRC MSFD Review Groups	European Commission Joint Research Centre <a href="https://ec.europa.eu/jrc/">https://ec.europa.eu/jrc/</a> This organisation held a number of expert review groups to consider changes to the 2012 Commission Decision on targets and indicators for some of the Descriptors of Good Environmental Status for the Marine Strategy Framework Directive
UKMMAS	UK Marine Monitoring and Assessment Strategy <a href="http://webarchive.nationalarchives.gov.uk/20130123162956/http://www.defra.gov.uk/environment/marine/science/ukmmas/">http://webarchive.nationalarchives.gov.uk/20130123162956/http://www.defra.gov.uk/environment/marine/science/ukmmas/</a>
MCCIP	Marine Climate Change Impact Partnership <a href="http://www.mccip.org.uk/">http://www.mccip.org.uk/</a> Co-funded by Marine Scotland and MSS are represented on the overarching Management Group and Steering Group.
UK-IMON	UK Integrated Marine Observing Network initiative <a href="http://www.uk-imon.info/">http://www.uk-imon.info/</a> MSS contributes the Scottish Coastal Observatory (ScObs) monitoring (long term monitoring sites) to UKIMON and is represented on the Executive Committee.
UKMBMPB	UK Marine Biodiversity Monitoring Programme Board. Oversees UK biodiversity monitoring conducted by JNCC for Natura 2000, MSFD and MPA purposes. MS represented by Michael McLeod. <a href="http://jncc.defra.gov.uk/page-3356">http://jncc.defra.gov.uk/page-3356</a>

WFD UKTAG TTs	MSS is represented on a number of Task Teams reporting to the UK Water Framework Directive Technical Advisory Group <a href="http://www.wfduk.org/">http://www.wfduk.org/</a> including: Alien Species Group Chemistry Task Team Marine Task Team
NERC SGs	Natural Environment Research Council <a href="http://www.nerc.ac.uk/">http://www.nerc.ac.uk/</a> MSS staff are represented on project steering groups.
OGUK OSRF / MTIG	Oil and Gas UK Oil Spill Response Forum Modelling Technical Interest Group. <a href="https://oilandgasuk.co.uk/about-us/forums/">https://oilandgasuk.co.uk/about-us/forums/</a>
SSDAG	Scotland's Seas Data and Assessment Group. Chaired by MS Marine Planning and Policy Division, this group oversees the revision of Scotland's marine Atlas and the continuing development of National Marine Plan interactive.
SHSAG	Scottish Habitats and Species Assessment Group.
SBS	Scottish Biodiversity Strategy <a href="http://www.gov.scot/Topics/Environment/Wildlife-Habitats/biodiversity/BiodiversityStrategy">http://www.gov.scot/Topics/Environment/Wildlife-Habitats/biodiversity/BiodiversityStrategy</a>
Biodiversity CG	New structures in place (2016) to oversee what were Scottish Biodiversity Strategy Governance structures <a href="https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy">https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy</a> The new structures are yet to be formalised, but can be seen here. MSS is represented on the Invasive Non-Native Species Group (Lyndsay Brown), Science Support Group (Matt Gubbins) and Ecosystem Health Indicators Sub-group.
SCSEMP	Scottish Clean Seas Environmental Monitoring Programme. Coordinates contaminant and nutrient monitoring in Scottish waters between MSS and SEPA.
MINNSWG	Marine Invasive Non Native Species Working Group. The only marine focussed group dealing with non-native species at a Scottish level.
Clyde 2020 SG and RAG	<a href="http://www.gov.scot/Topics/marine/marine-environment/Clyde2020">http://www.gov.scot/Topics/marine/marine-environment/Clyde2020</a> MSS is represented on both the Steering Group and Research Advisory Group.
SOTEAG and MON COM	Shetland oil Terminal Environmental Advisory Group <a href="http://www.soteag.org.uk/">http://www.soteag.org.uk/</a> MSS is represented on the committee and the Monitoring Committee.

## Energy

WREN	World Renewable Energy Network <a href="http://www.wrenuk.co.uk/index.html">http://www.wrenuk.co.uk/index.html</a>
ICES EGs	International Council for the Exploration of the Sea (ICES) Expert Groups <a href="http://www.ices.dk/Pages/default.aspx">http://www.ices.dk/Pages/default.aspx</a>
SCOS	Special Committee on Seals <a href="http://www.smru.st-andrews.ac.uk/research-policy/scos/">http://www.smru.st-andrews.ac.uk/research-policy/scos/</a>
ScotMER	Scottish Marine Energy Research Programme
CEAF	Cumulative Effects Assessment Framework
MREOG	Marine Renewable Energy Ornithology Group.
ORELG	Offshore Renewables Energy Licensing Group <a href="http://www.gov.scot/Topics/marine/Licensing/marine/scoping/orelg">http://www.gov.scot/Topics/marine/Licensing/marine/scoping/orelg</a>
EOSCA Chemical WG	European Oilfield Speciality Chemicals Association MSS represented on the UK Chemical Working Group
OGUK EAG	Oil and Gas UK Environment Advisory Group
SPORRAN	Scottish Offshore Renewables Research Framework. Multiple representation from MSS chairing various research and monitoring coordination groups <a href="http://www.gov.scot/Topics/marine/Licensing/marine/scoping/orelg/SpORRAN">http://www.gov.scot/Topics/marine/Licensing/marine/scoping/orelg/SpORRAN</a>
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) <a href="https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/our-partnerships/the-fishing-liaison-with-offshore-wind-and-wet-renewables-group/">https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/our-partnerships/the-fishing-liaison-with-offshore-wind-and-wet-renewables-group/</a>
Developers Groups and RAGS	MSS staff regularly attend through membership of site specific developers groups and associated research advisory groups eg The Forth and Tay Offshore Wind Developers Group (FOWWDG).

## Aquaculture

SAV tri-nation WG	Salmonid Alphavirus Trination Working Group <a href="http://trination.org/about/A">http://trination.org/about/A</a> collaboration between Scotland Norway and Ireland to progress management of pancreas disease in salmon.
ICES EGs	International Council for the Exploration of the Sea (ICES) Expert Groups <a href="http://www.ices.dk/community/groups/Pages/default.aspx">http://www.ices.dk/community/groups/Pages/default.aspx</a>

Gill Health Initiative WG	<a href="https://www.scoop.it/t/asem-aquaculture-health/p/4076330581/2017/03/11/gill-health-initiative-meeting-2017">https://www.scoop.it/t/asem-aquaculture-health/p/4076330581/2017/03/11/gill-health-initiative-meeting-2017</a>
EURLs	EU Reference Laboratory for Crustacean, Fish and Mollusc Diseases <a href="http://www.eurl-fish.eu/Activities">http://www.eurl-fish.eu/Activities</a> <a href="http://www.eurl-mollusc.eu/Main-activities/NRLs-network">http://www.eurl-mollusc.eu/Main-activities/NRLs-network</a> <a href="http://www.eurl-fish-crustacean.eu/">http://www.eurl-fish-crustacean.eu/</a>
Food Stanards Scotland	Shellfish review workshop covering the shellfish monitoring programme.
ARCH-UK	<a href="https://www.aquaculturehub-uk.com/">https://www.aquaculturehub-uk.com/</a> Meetings to advise on research direction in fish health. Participate in advisory board of this research network funded by joint research councils.
Defra CVO	Department for Environment, Food and Rural Affairs Chief Veterinary Officer. Aquatic animal health and contingency planning.
Strategic Farmed Fish Health Framework Working Group	<a href="http://www.gov.scot/Topics/marine/Fish-Shellfish/Strategic-Framework">http://www.gov.scot/Topics/marine/Fish-Shellfish/Strategic-Framework</a> MS co-chairs and MSS scientists are members of the working group
SARF board	Scottish Aquaculture Research Forum. <a href="http://www.sarf.org.uk/">http://www.sarf.org.uk/</a> MSS is represented on the board and MSS scientists are represented on project steering groups.
CoGP MG	Code of Good Practice Management Group <a href="http://thecodeofgoodpractice.co.uk/">http://thecodeofgoodpractice.co.uk/</a>
EU Fish Health Network	Meeting of fish health officials focussing on salmonid aquaculture in Northern European Countries
PO Liaison	Regular quarterly liaison meetings with the Producer Organisations eg <a href="http://scottishsalmon.co.uk/">http://scottishsalmon.co.uk/</a>
Scottish-NRL	MSS acts as the Scottish National Reference Laboratory for fish, mollusc and crustacean diseases <a href="http://www.gov.scot/Topics/marine/Fish-Shellfish/aquaculture/NRL">http://www.gov.scot/Topics/marine/Fish-Shellfish/aquaculture/NRL</a>
Salmon Fishery Boards	Fish Health Inspectorate Staff regularly attend meetings of Fishery Boards to participate in issues related to aquaculture and biosecurity.
PO Liaison	Regular quarterly liaison meetings with the Producer Organisations eg <a href="http://scottishsalmon.co.uk/">http://scottishsalmon.co.uk/</a>

## Freshwater

NASCO	North Atlantic Salmon Conservation Organization <a href="http://www.nasco.int/">http://www.nasco.int/</a>
ICES EGs	International Council for the Exploration of the Sea (ICES) Expert Groups <a href="http://www.ices.dk/community/groups/Pages/default.aspx">http://www.ices.dk/community/groups/Pages/default.aspx</a>
IARSB	International Atlantic Salmon Research Board <a href="http://www.nasco.int/sas/">http://www.nasco.int/sas/</a>
MS/SNH/SEPA IF	Marine Scotland / Scottish Natural Heritage / Scottish Environment Protection Agency Information Forum
FFAG	Fish and Fisheries Advisory Group <a href="http://www.sepa.org.uk/environment/water/river-basin-management-planning/who-is-involved-with-rbmp/ffag/">http://www.sepa.org.uk/environment/water/river-basin-management-planning/who-is-involved-with-rbmp/ffag/</a>
Wild Fisheries SRG	Wild Fisheries Stakeholder Reference Group <a href="http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/refgroup">http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/refgroup</a>
SFCC	Scottish Fisheries Coordination Centre <a href="http://www.sfcc.co.uk/">http://www.sfcc.co.uk/</a>
Salmon Liaison Group	<a href="https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/MSBiologist">https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/MSBiologist</a>

## General Science

ICES Council and ACOM	International Council for the Exploration of the Sea <a href="http://www.ices.dk/Pages/default.aspx">http://www.ices.dk/Pages/default.aspx</a> Council and Advisory Committee. MSS is represented on Council by Matt Gubbins (one of two UK delegates to ICES) and on the Advisory Committee by Nick Bailey. <a href="http://ices.dk/community/groups/Pages/ACOM.aspx">http://ices.dk/community/groups/Pages/ACOM.aspx</a>
EFARO	European Fisheries and Aquaculture Research Organisation <a href="http://www.efaro.eu/">http://www.efaro.eu/</a> Marine Scotland is a member of EFARO
EMBRC	European Marine Biological Resource Centre <a href="http://www.embrc.eu/">http://www.embrc.eu/</a> A new resource pooling initiative and an ERIC (European Research Infrastructure Consortium) across marine research institutes in Europe. MSS is a signatory.
European Projects	Many MSS scientists are partners in European projects (Horizon 2020, INTERREG, Parliament funds etc). This is a key mechanism by which MSS scientists collaborate with European partners.
MSSC	Marine Science Coordination Committee <a href="https://www.gov.uk/government/groups/marine-science-co-ordination-committee">https://www.gov.uk/government/groups/marine-science-co-ordination-committee</a> Oversees the coordination of Marine Science in the UK.



MASTS	Marine Alliance for Science and Technology Scotland <a href="http://www.masts.ac.uk/">http://www.masts.ac.uk/</a> Many MSS scientists participate in MASTS Fora and Themes. MSS has representatives on the Executive Committee and Governing Council.
CAMERAS	Coordinated Agenda for Marine, Environment and Rural Affairs Science <a href="http://www.gov.scot/Topics/Research/About/EBAR/CAMERASsite">http://www.gov.scot/Topics/Research/About/EBAR/CAMERASsite</a> The Scottish Marine Science Strategy was developed through CAMERAS and a number of MSS scientists are represented on various CAMERAS working groups.
MSF	Marine Strategy Forum <a href="http://www.gov.scot/Topics/marine/seamanagement/forum">http://www.gov.scot/Topics/marine/seamanagement/forum</a> The key forum for routine dialogue between Marine Scotland and its stakeholder organisations. MSS is represented and various scientists attend as required to update on progress with specific work areas.
MarCRF	Marine Collaboration Research Forum <a href="https://www.abdn.ac.uk/environment-food-security/marcrf/">https://www.abdn.ac.uk/environment-food-security/marcrf/</a> This forum was set up to enhance local collaboration with Aberdeen University. It funds a number of PhD studentships, small grants and a post doctoral research fellow in Marine Spatial Planning.