



# Marine Alliance for Science and Technology for Scotland

a marine partnership for Scotland

<http://www.masts.ac.uk>

## MASTS MEMBERS

MASTS members include the majority of Scotland's marine science capacity both in terms of infrastructure and intellectual resources. Whilst MASTS was initiated with a core of 10 member institutions, it is expanding as Associate Members join. The original MASTS consortium was funded by a combination of the Scottish Funding Council and matched funding allocated by member institutions with a total of £75m being committed between 2009-2016/17. In addition to paying for infrastructure development, 34 new posts have been created together with 48 PhD studentships. Funds are also being used to facilitate coordination of marine science and to establish lasting collaborative networks within a defined science framework.

Beyond 2017, MASTS must become self-sustaining. This is likely to occur through a combination of member's subscriptions, some core support from public sources, together with income generated from MASTS science coordination and management activities.

Associated Members can, for example, come from other academic institutions, government bodies and industry. Associate membership provides full access to the MASTS website and resource map, together with the potential to apply for specific allocations of funding which are occasionally disbursed through MASTS.

Associate members can also become full participants in our science Themes and Forums and take part in MASTS organised activities such as workshops, seminars and conferences together with other networking activities. Associate Members may also wish to support their PhD students in joining MASTS Graduate School activities.

MASTS is increasingly recognised nationally and internationally as an organisation that represents the marine science community in Scotland. Members of the MASTS community are actively involved in helping to drive the marine science agenda and we are represented at the highest level within the UK and EU.

[www.masts.ac.uk](http://www.masts.ac.uk)

HERIOT WATT UNIVERSITY

University of St Andrews

Edinburgh Napier UNIVERSITY

SAMS

University of Glasgow

University of the Highlands and Islands  
Levens Castle College

Oileigh na Gàidhealtachd agus nan Eilean  
Colaisde a' Chaisteil

SOI Millport

University of Strathclyde Glasgow

1495 UNIVERSITY OF ABERDEEN

UNIVERSITY OF STIRLING

NAFC Marine Centre  
University of the Highlands and Islands

eri

THE UNIVERSITY OF EDINBURGH

marinescotland

The Scottish Government

MASTS - Members

To find out more about becoming an Associate Member of MASTS contact:

Email: [info@masts.ac.uk](mailto:info@masts.ac.uk)

Website: <http://www.masts.ac.uk>





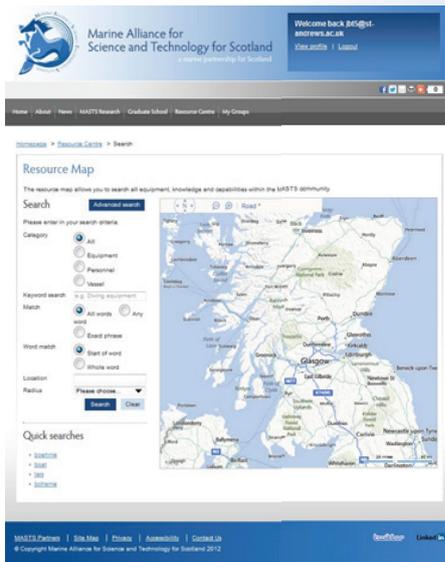
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## MASTS - RESOURCE CENTRE

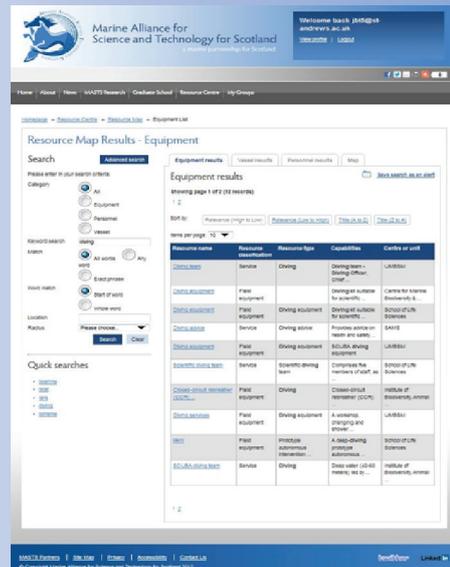
MASTS member institutions have significant marine research assets ranging from large ocean going research vessels to inshore craft, remotely operated vehicles, and diving facilities together with a host of specialist equipment, services and expertise. Much of this information is captured and made available to MASTS members through our Resource Map, accessible at: [www.masts.ac.uk/resource-centre/](http://www.masts.ac.uk/resource-centre/)



The map is a core facility of our virtual Resource Centre which is designed to encourage sharing of physical assets such as equipment and services as well as cross disciplinary utilisation of valuable intellectual resources particularly in areas such as mathematical modelling and the development of technology.

The centre is entirely web-based and provides details of a variety of intellectual, technical and operational resources that individual or groups of partner institutes wish to promote and may make accessible.

Access to the MASTS Resource Map is unrestricted to MASTS members, however, users must first register their details on the MASTS website in order to gain login privileges. Users can register at: [www.masts.ac.uk/register.aspx](http://www.masts.ac.uk/register.aspx).



Resource searches can be undertaken using categories, keywords, or a combination of the two. Options for selecting location are also provided. Results can then be viewed as a spread sheet style list or a map display. Previous searches can be quickly accessed using the displayed 'Quick Searches' links.

For further information on the MASTS website and Resource Centre, please contact us at: [masts@st-andrews.ac.uk](mailto:masts@st-andrews.ac.uk)





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## MASTS GRADUATE SCHOOL

The MASTS Graduate School is a pan-Scotland initiative which provides education and training to the MASTS student community. This training includes both technical and core skills to ensure that MASTS graduate students have the full complement of skills required to achieve the best in their future careers.

The MASTS Graduate School is led by the Dean of Graduate Studies (Prof Axel Miller, SAMS) and supported by the Graduate School Steering Group (GSSG).

The functions that the GSSG fulfil include:

- Provision of a Graduate School Retreat
- Coordination of specific training and workshops.
- Development of the graduate internship programme
- Coordination of MASTS-wide expert seminars
- Convenor of the Scottish Marine Group Postgraduate Meeting
- Organisation of a core scientific skills development programme
- Sector best practice: MASTS graduate school interface
- Coordination of links with overseas institutions and training of postgraduate students
- Assisting in the coordination of Making the Most of Masters projects
- Future development of a MASTS Doctoral Training Partnership

The annual MASTS Graduate School Retreat takes place mid-March in Aviemore, Inverness-shire. The goal of the retreat is to bring together the geographically dispersed MASTS postgraduate population and to create a tight-knit student community, while providing useful and informative training sessions and seminars.

Making the Most of Masters (MMM) is a method by which organisations can benefit through working with postgraduate students and universities to undertake specific research projects targeted to identified needs.

For more information see:

<http://masts-mmm.weebly.com/index.html>



Internships: There is growing interest across the higher education sector in building closer links between academia and external stakeholders: potential employers, regulatory bodies, research funders, policy makers, lobbyists, and many others. MASTS see the facilitation of internship opportunities as a core interface for bringing future cohorts of 'influencers' into direct contact with individuals and institutional cultures. Completing an internship should maximise impact from research and enhance personal and professional development.

Internships offer appointees an excellent opportunity to build working relationships and extend their research experience into business, policy or other settings (or vice versa) - this programme is not just for students - academics and employees are welcome to participate. Internships can last between two weeks and four months. Appointees may work either full time or part time and are generally expected to spend between 50-100% of their time in the host organisation. If you are interested in undertaking or providing an internship please contact Dr Iain Matthews on: [imm7@st-andrews.ac.uk](mailto:imm7@st-andrews.ac.uk).



Prof Axel Miller – Dean of Graduate Studies

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## THEME - DYNAMICS AND PROPERTIES OF MARINE SYSTEMS

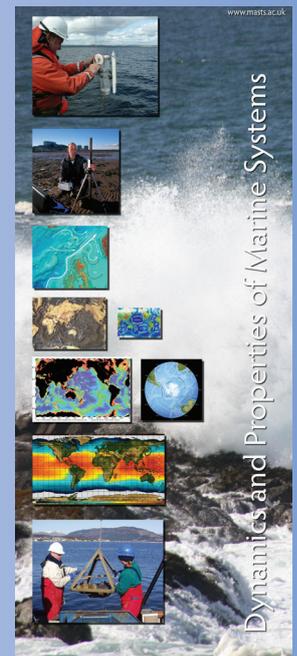
This Theme embraces the fundamental physical attributes and dynamics of marine systems including marine physics, chemistry, sedimentology, geomorphology and oceanography.

The description of the marine system includes the analysis of past condition, spatial mapping of present conditions, and the impacts of future change on the dynamics and properties of the system. Important aspects of climate change such as predicting sea-level rise, modelling ocean atmospheric exchange and sea ice extent, fall within this theme. Technological developments that allow improved interpretation of marine systems are integral to this Theme.

MASTS also has links with the SAGES research pool which has shared interests in the dynamics and properties of marine systems.

The preeminent scientific challenge of the 21st Century is to understand and quantify Earth's current and future climate. How will climate variability impact the ocean's sustainable resources and what are the human impacts of such change? Observing, modelling and quantifying marine systems is key to understanding their response to increasing carbon dioxide. Oceans determine the rate, extent and character of climate by their long-term storage and transport of heat and carbon and dominance of the global fresh-water cycle. A critical challenge is to integrate our understanding of ocean systems on different timescales and across disciplines and to propose testable hypothesis of how these systems interact.

New technology, particularly the development of observing platforms and novel sensors will likely provide sustained observations of physical, chemical, biological and geological properties, and so play a critical role in this challenge for the 21st century.

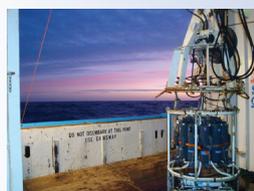


Theme Leader – Dr Stuart Cunningham; a MASTS lecturer at SAMS and a physical oceanographer with over 20 years experience and 800+ days at sea.  
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Deputy Leader – Prof Mark Inall; Associate Director for Research and Principal Investigator in Physical Oceanography at SAMS.  
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### Steering Group:



Dr David McKee  
Dr Bee Berx  
Dr Seb Hennige  
Prof David Dritschel  
Dr Alan Hills

University of Strathclyde  
Marine Scotland Science  
Heriot-Watt University  
University of St Andrews  
Scottish Environment Protection Agency



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## THEME - BIODIVERSITY, FUNCTION AND SERVICES

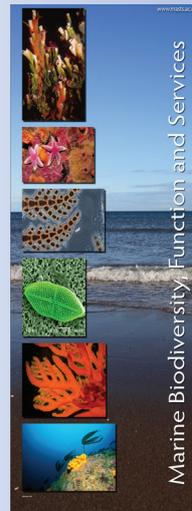
The link between the diversity, distribution in space and time, and resilience of marine organisms is central to this theme.

In addition, the role of marine biodiversity in supporting ecosystem function and providing ecosystem services across the variety of marine habits, from coastal wetlands and estuaries to the deep sea, are included.

This theme encompasses research on the societal value that is placed on marine habitats and the socio-economic impacts of exploitation and climate change.

The scope of this theme is central to the Scottish Government research agenda for 2011-16. Maintaining marine ecosystem goods and services and addressing the challenges of climate change are vital to the Scottish economy and the management of ecosystems is essential for the conservation of key habitats and species.

This theme will be led by Prof Teresa Fernandes who has over 20 years experience of coastal and marine environments. This theme will develop the MASTS strategy in the area of biodiversity and ecosystem services in order to contribute to our fundamental knowledge in this area and to inform national and international governments and organisations.



**Theme Leader – Prof Teresa Fernandes:**  
Senior lecturer at Heriot-Watt University focusing on contaminants in natural systems and their effects on species and communities as well as the management of aquatic and coastal systems.  
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**Deputy Leader - Prof Murray Roberts:**  
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### Steering Group:

- |                          |   |
|--------------------------|---|
| Susan Chambers           | National Museum of Scotland                       |
| Prof Nick Hanley         | University of Stirling - MASTS Coastal Zone Forum |
| Dr Scot Mathieson        | Scottish Environment Protection Agency            |
| Dr David Donnan          | Scottish Natural Heritage                         |
| Dr Paul Tett             | SAMS  |
| Prof Michael Burrows     | SAMS  |
| Dr Bhavani Narayanaswamy | SAMS - MASTS Deep Sea Forum                       |





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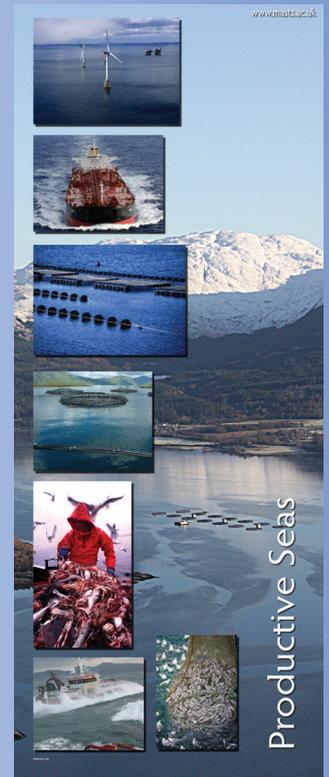
## THEME - PRODUCTIVE SEAS

The Theme of Productive Seas is a key area for MASTS activity with major scientific challenges encompassing the balance of exploitation against the resilience and capacity of natural systems to supply resources against a backdrop of increasing demand and climate change.

Both energy and food security will be fundamental drivers for marine science. Scotland is in many ways at the forefront of marine energy production through established and emerging fossil fuel extraction and marine renewables development in particular. Aquaculture is pivotal to the rural economy of some areas within Scotland and is likely to expand into the production of other non-food products and services through biofuels, marine biotechnology and genomics.

Scotland's capture fishery remains one of the largest in Europe and its long term survival will hinge upon the development of sustainable fisheries management founded on good science. As well as delivering strategic science, the Forums within this Theme will also need to be actively engaged with policy, regulation and industry to address both immediate and longer term challenges.

Through representation of the Productive Seas Theme on the Marine Strategy Forum together with other strategic academic and public bodies, MASTS is well placed to help inform and to respond to evolving research requirements.

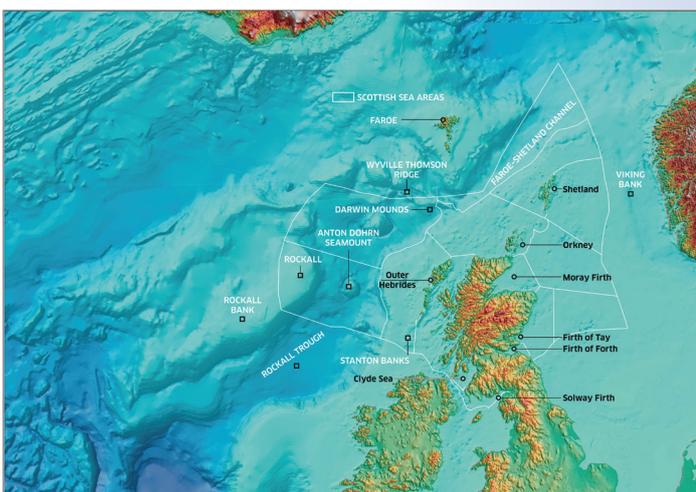


Theme Leader: – Prof Jimmy Turnbull;  
Deputy Director of the Institute of Aquaculture (University of Stirling) with over 20 years experience in the sector.  
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### Steering Group:

Dr Sam Anson  
Dr Paul Fernandes  
Dr Ben Wilson

Marine Scotland  
University of Aberdeen -  
MASTS Fisheries Science Forum  
SAMS -  
MASTS Marine Energy Forum  
University of Stirling -  
MASTS Sustainable Aquaculture  
Forum





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## COASTAL FORUM

The Coastal Zone Forum provides a network for multidisciplinary marine and social science to address the management of the coastal zone and the ecosystem services it provides.

The coastal zone in Scotland is at a critical juncture with the advancement of coastal and marine planning, development of marine renewables, increasing impacts of climate change, the problems of coastal erosion and coastal defense, and implementation of marine protected areas. These drivers are creating challenges, opportunities and impacts for coastal communities and MASTS.

This forum is strongly linked with the MASTS Biodiversity, Function and Services Theme, and uses Scotland's world leading expertise in the valuation of coastal systems. This forum aims to strengthen the link between biodiversity research, ecosystem analysis, policy development and regulation by producing work of high scientific quality which contributes to the policy debate and the needs of stakeholders. Recent examples include sustained regeneration of habitats, work on bathing waters in Europe; through investigation of eco-labeling for salmon farms; and through impact analysis of potential Marine Conservation Zones. This forum will put in place strategies which develop the human capital and skill sets of the MASTS community in responding to these challenges.

The MASTS Coastal Zone Forum has already been the impetus behind new interdisciplinary partnerships including joint Ph.D. studentships and regular workshops. This forum will also build on existing links with national and international research organisations.

This forum is led by Prof Nick Hanley. Prof Hanley is an environmental economist who is increasingly working on coastal and marine issues.



Forum Convenor – Prof Nick Hanley; Professor of Environmental Economics and Chair of Economics Division at the University of Stirling  
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Deputy Convenor – Dr Tavis Potts; lecturer and Principal Investigator in Ocean Governance and Policy at SAMS. Tavis is also coordinator of the Centre for Sustainable Coasts (CSC)  
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### Steering Group:

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Prof Mark Huxham  
Prof Kenny Black  
Dr Sam Anson

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## DEEP SEA FORUM

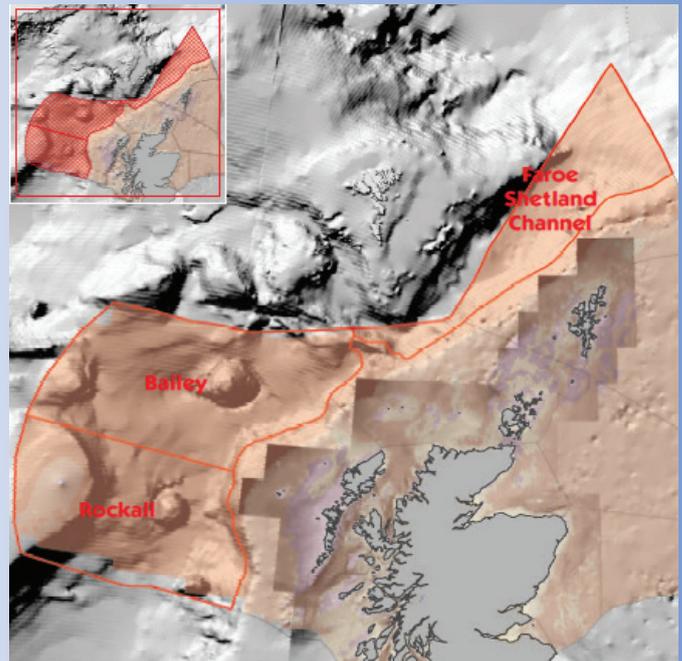
Scotland has a vast deep-sea area stretching out to the 200 nautical mile boundary, encompassing a range of diverse habitats as well as economic resources such as fishing, oil and gas. In addition to scientific interest in the deep-sea, policy makers are required to protect many of these poorly understood habitats and the often fragile ecology and biodiversity that they support. Increasing access to deep sea habitats and exposure through various media has also stimulated significant public curiosity in the life found in these deep, cold, dark environments.

A more holistic approach to studying the deep-sea is needed which requires engagement with researchers representing a variety of disciplines including ecologists, chemists, physicists, modelers, and climate scientists. These researchers have to be supported by technology that can operate remotely under extreme conditions. Only then can we truly begin to understand how deep sea ecosystems function.

The MASTS Deep Sea Forum aims to:

- Interact with the different communities which have an interest in the deep-sea
- Engage with new partners and promote collaboration across disciplines in order to further deep water research both at a national level as well as internationally
- Ensure greater integration between researchers investigating deep/shallow water and the climate/atmosphere
- Discuss and help deliver the best scientific knowledge available to policy makers

Deep sea researchers operating within the MASTS community have access to a variety of state of the art equipment, some of which has been specifically designed to operate and sample in the deepest parts of the world's oceans. The challenge of conducting research in these extreme environments means that much of the science is by definition, cutting edge. However, use of modern technology, together with practical ingenuity is leading to novel discoveries including species and ecosystems new to science.



Forum Convenor – Dr Bhavani Narayanaswamy; Lecturer and Principal Investigator in Deep Water Benthic Ecology at SAMS  
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Deputy Convenor – Dr Alan Jamieson; Lecturer and Principal Researcher into the biological exploration of the deep sea and associated technology at Oceanlab, University of Aberdeen  
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### Steering Group:

Dr David Bailey	University of Glasgow
Dr Andrew Dale	SAMS
Dr Francis Neat	Marine Scotland Science
Dr Heather Stewart	British Geological Survey
Dr Robert Turnewitsch	SAMS



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## FISHERIES SCIENCE FORUM

The MASTS Fisheries Science Forum aims to be a collective world class fisheries science facility which provides research and advice relevant to sustainable fisheries management.

The forum will work under the MASTS 'Productive Seas' Theme to improve our understanding of marine [fish and shellfish] systems, and the human [fisheries] influence on them, by undertaking research into the ecology, economics, sociology, and governance of commercially exploited marine fish and fisheries. This is important not only for the long-term economic future of an important global industry, but for the well-being of rural communities, and the food security and good health of the general public.

The forum will complement and supplement work carried out by national agencies such as Marine Scotland, but focus on medium to long-term strategic research, although members may provide short-term objective scientific advice on fisheries matters, as well as expert opinion and comment. The forum will use and develop innovative technology and tools in support of these goals, drawing on the broader range of expertise available in the Scottish HEI community and the Scottish fishing industry. Finally, the forum will help to develop a new generation of fisheries scientists, providing a vibrant research atmosphere and training opportunities for young scientists.



Forum Convenor - Dr Paul Fernandes; MASTS reader at the University of Aberdeen whose research focuses on commercial fisheries, particularly those of importance to Scotland.  
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Deputy Convenor – Dr Douglas Speirs; a lecturer at the University of Strathclyde working in the field of marine ecosystem and fisheries modelling.  
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### Steering Group:

Tara Marshall	University of Aberdeen
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Clive Fox	SAMS
David Borchers	University of St Andrews
Robin Cook	University of Strathclyde
Karen Diele	Edinburgh Napier University
Mike Heath	University of Strathclyde
Philip Smith	University Biological Station Millport
Peter Wright	Marine Scotland Science
Kenny Coull	Scottish Fisherman's Federation
Hazel Curtis	Seafish



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## SUSTAINABLE AQUACULTURE FORUM

The focus of this forum spans the entirety of the Scottish aquaculture sector; encompassing the production of fin-fish, shellfish, invertebrates and algae.

Scotland is the third largest producer of salmon in the world and has a total aquaculture production of ~160,000 tonnes a year, with a first sale value of worth ~£585 million (~€687 million). Although much smaller in scale, there are also ambitious targets for the expansion of shellfish production, continuing interest in developing other marine aquaculture species together with algal cultivation.

The pace and scale of aquaculture development has been accompanied and underpinned by the growth of world leading aquaculture research expertise in our Universities and research institutes, many of whom have been at the heart of European and wider international efforts to develop sustainable aquaculture.

Scotland has been proactive in developing a robust and effective policy and regulatory framework for aquaculture. This process is ongoing and most clearly illustrated in the recent passing of the Aquaculture and Fisheries Bill which is designed to ensure that farmed and wild fisheries - and their interactions with each other, continue to be managed effectively, maximising their combined contribution to supporting sustainable economic growth with due regard to the wider marine environment. Scotland's draft Marine Plan makes explicit provision for aquaculture expansion with the ambition of 32% growth for the salmon sector and 100% increase in shellfish production by 2020.

Whilst current commercial production remains focused on relatively few species, strategic research related to the cultivation of other marine fish and algae continues and there is an increasing pressure to moving the industry further offshore.



The potential to co-locate aquaculture alongside marine renewables development is also an area of research interest. Multidisciplinary research is being commissioned and applied by the aquaculture industry in an attempt to reduce its environmental impact. Much still needs to be done towards reducing the losses related to disease and parasites, diversifying the industry, managing and genetically improving farmed species, replacing and reducing marine ingredients within aquafeeds and in the design of better sited and contained production systems. MASTS is working with the industry to help achieve these aims.



Forum Convenor - Prof Brendan McAndrew; Head of the Genetics and Reproduction Research Group based within the Institute of Aquaculture at the University of Stirling.  
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Michele Stanley  
Adam Hughes  
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Alastair Lyndon  
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Fiona Hannah

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Marine Scotland Science  
SAMS  
SAMS  
University of St Andrews  
Heriot-Watt University  
NAFC Marine Centre  
University Biological Station  
Millport





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## MARINE ENERGY FORUM - Renewables

In addition to being an established centre for offshore oil and gas production Scotland is also becoming a major international hub of activity and expertise for marine renewable energy including offshore wind, wave and tidal-stream in particular.

The Marine Energy Forum addresses the requirement for MASTS to develop a recognisable and structured community capable of delivering scientifically excellent research to inform the sustainable development and operation of the infrastructure used to produce energy in the marine environment.

The principal focus of the MASTS Marine Energy Forum will be the interactions between energy production infrastructure and its operations with the marine environment. These interactions include biotic, chemical and physical interactions together with relevant socio-economic and governance aspects. The Renewables section of the Marine Energy Forum plans to concentrate on information flow and opportunities for building scientifically valid and lasting collaborations.

There is significant political and economic pressure to expand the marine renewable sector in Scotland which has some of the world's best wind, wave and tidal resources. Close collaboration between the developers, regulators and scientists will be required to provide the underlying science needed to inform the development of this rapidly evolving sector.

MASTS' links with the UK Centre for Marine Energy Research and the Energy Technology Partnership will help to ensure that advances in engineering and physics related to renewables take place in parallel with a better understanding of the environment in which renewable energy will be generated.



Forum Convenor - Dr Ben Wilson; Senior lecturer at SAMS and Principal Investigator in Mammalogy and Marine Renewables.

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Deputy Convenor – Dr Beth Scott; Senior Lecturer at the University of Aberdeen investigating the functional linkages between oceanographic processes, life history traits and population dynamics.

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Hartley Anderson Ltd.  
NERC  
Marine Scotland Science  
Energy Technology Partnership

