

A Century of Marine Monitoring in Scotland: A Small Nation at one of the Gateways to the Arctic

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Abstract: *Scotland has sustained marine monitoring in support of government, society and marine industries for over 130 years. Over this period we have also been involved in marine monitoring which has failed in different ways. This paper discusses lessons learnt in a small country situated at one of the gateways to the Arctic and historically linked to other Arctic nations.*

Scotland is a nation of about 5 million people situated at one of the gateways to the Arctic. The people of Scotland have historical links with the peoples of Scandinavia, Faroe and Iceland. Scotland has a mixture of a few large cities, some larger towns plus many remote rural communities, including on our islands; Shetland, Orkney and our smaller isles. Our coastal communities have relied on fishing for many centuries for employment and economy. In Scotland, fishing is still very much focussed around family boat ownership rather than large companies. Today the industry is split between inshore fisheries, predominantly small day boats crewed by one or two people which target shellfish and are based on the west coast, and offshore fisheries consisting of larger vessels from our major fishing ports (Peterhead, Fraserburgh and Lerwick), and targeting demersal and pelagic fish species, as well as scallops and prawns..

Since the 1970s new industries such as aquaculture (mainly on the west coast for salmon, but some shellfish as well), and oil and gas (mainly in the North Sea) have come along to add to our maritime industries. In the very recent past marine renewables have been added to the mix. Other marine industries, including ship building and whaling, were important in the past, but have now declined or ceased.

Marine monitoring started in Scotland in the late 1800's following the birth of marine science in large programmes such as the Challenger Expedition. The Marine Laboratory Aberdeen started in 1893 as a fish hatchery, but rapidly developed into a science base which provides advice to the Scottish administration. Since its foundation, the Marine Laboratory has been involved in many different forms of marine monitoring ranging from small projects based on citizen science, up to major internationally coordinated programmes. Programmes include oceanographic, contaminant and fish stock health monitoring.

Many lessons have been learnt, been forgotten, and then re-learnt along the way. We currently operate monitoring programmes which have been sustained for over 130 years in one case, over many decades for much of our monitoring, to some programmes of just a few years duration. Monitoring sustainability has often relied on the fact that we have owned our own vessels. Hence we have been able to decide what monitoring we sustain based on our own knowledge of Scotland, its people and environments, and it's concerns without having to convince funding committees or remote panels of "experts".

Our longest time series, across the Faroe Shetland Channel and which monitors both the warm water flow of Atlantic water towards the Arctic, as well as one of the few deep water cold, dense outflows from the Arctic, was initiated by an international project trying to understand changes in the “great fisheries”, i.e. North Sea herring. When the project ended, we maintained the time-series as being a key one to provide the context to changes in Scottish waters.

Over the intervening century, Scotland has experienced great changes in its fisheries and fish stocks, such as the collapse of the herring fisheries in the 1970s, and the decline and subsequent recovery of cod in the 2000’s. For our larger, offshore fishing industry, the results of our monitoring is often viewed based on its outcomes. For fishermen, monitoring and assessments which result in more catching opportunities is “good” science, whereas monitoring which results in advice for reduced catching opportunities is “bad” science. Marine scientists must maintain objectivity as their goal, and be prepared to deliver bad news as well as good. However, they also need to manage expectations.

While the need to provide advice to manage the fisheries is still a key driver of our monitoring, in the last decade the need to assess the health of the ecosystem in general has risen up as a priority, driven by global marine sustainable development policies such as the Stockholm Declaration (1972), the Rio Declaration (1992) and Agenda 21 (1992).

For many years, in Scotland at least, we struggled to understand what the practical implementation of the “ecosystem approach” meant. This confusion was greatly helped in 2002 with the publication of the UK Governments “vision” for our seas, as “clean, safe, healthy, productive and biologically diverse oceans and seas”, to which the Scottish Government added “managed to meet the long term needs of nature and people”. This phrase had a fundamental effect on what we monitored and how we organised our monitoring. A set of simple words were extremely powerful in conveying to the public and to scientists the purpose of our monitoring. The phrase is now built into the European implementation of the ecosystem approach; the European Marine Strategy Framework Directive (MSFD). The MSFD requires member states to assess the health of its marine ecosystems under 11 Descriptors; Biological diversity; Non-indigenous species; Commercial fish and shellfish; Food webs; Eutrophication; Sea-floor integrity; Hydrographical conditions; Contaminants; Contaminants in seafood; Marine litter; Underwater noise. This has driven us to establish new monitoring programmes for aspects of the environment we previously largely ignored, such as introduced sound and marine litter.

Finally, when trying to coordinate our national marine monitoring within international efforts, we have learnt that an overriding need is good, clear, transparent governance. Governance needs three levels; “Leadership” which includes the politicians and administrators who control funding and policy, and add legitimacy and clear purpose to monitoring; “Management” which includes resource managers and Directors of institutes who can redirect people and ships, and implement a strategic approach; and “Operational” which includes the people that actually implement the monitoring “on the ground”. Transparency is needed so the public can see what the governance is doing, and trying to do, and understand why. Without good governance we have seen monitoring programmes stagnate and not be able to meet current challenges, struggle to obtain cohesive data quality and delivery, and cease owing to a failure to link monitoring, driven by a specific technology, to societal need.