AGMACS (06)28

ADVISORY GROUP ON MARINE AND COASTAL STRATEGY

REPORT FROM THE AGMACS SCIENCE STREAM

Background

1. The Paper at Annex A, "Report of the AGMACS Science Stream", is presented following the discussion at AGMACS 1st meeting (see minutes item 4 -work streams) when the Marine Science sub-group was established, under the chairmanship of Robin Cook, to take forward the issues identified in AGMACS (05)05 on "Performance Indicators, Research and Science".

Discussion

2. The sub-group offers the attached draft report of its findings, together with a number of recommendations (see page 3 of Annex A).

3. The report is in draft and discussion on the recommendations, the implications for Scotland and comments on the content are welcome. An opportunity is available for the submission of written comments within the next 3 weeks. The sub-group will bring a final version to the next meeting for endorsement.

Conclusion

AGMACS is invited to consider the recommendations in the report and discuss. Detailed comments can be made to Robin Cook. The final report will be tabled at the next meeting of AGAMACS, scheduled for 13 November 2006.

Secretariat
AGMACS
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AGMACS (06)28 ANNEX A

Report of the AGMACS Science Stream

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Recommendations

Developing performance indicators

1. **MARG should be the primary forum in which performance indicators should be developed. (17)**
2. **The Group presents Annex 1 as a first compilation of an inventory of data that is relatively easy to prepare. The Group recommends that if Defra lets a contract to compile an inventory, this would provide a suitable means of documenting <u>all</u> the appropriate data currently available and there would be no need for a stand alone Scottish data identification exercise. Annex 1 should be passed to Defra as an initial contribution from Scotland. (19)**
3. **The Group recommends that the Scottish Executive should support Scottish input to marine data centres and the MDIP process and add value to it from a Scottish perspective. (34)**
4. **If the MDIP process clearly does not address Scottish needs, add value to Scottish capacity or it is found that due to the requirement of, for instance, MSP , that Scotland's needs are not being met, then the Group recommends Scotland should consider establishing its own marine data centre, first undertaking an appraisal of the costs and benefits. (34)**

New areas of research

5. **A review should be undertaken under each of the three SEERAD science strategy cross cutting themes (responding to climate change, protecting biodiversity, environmental, social and economic sustainability) to document current marine research and how this relates to the three indicator categories of 'clean and safe', healthy and biodiverse' and 'productive'.(37)**
6. **Research should be undertaken on the science of indicators and how they can be useful to managers. (38)**

Integration and co-ordination of science and research

7. **SEERAD should convene a meeting of heads of marine science organisations and other relevant agencies to discuss how a science co-ordinating body might be established and function.(45)**

Introduction

1. The ACMACS Science Stream (the Group) was established under the Advisory Group on the Marine and Coastal Strategy (AGMACS) to address the issue identified on page 30 of : *'Seas the Opportunity' to:*

"Identify indicators of progress towards objectives, including identifying new research and science needs".

2. The Group addressed this task under three main strands, (see paper AGMACS (05) 05):

   i. Developing Performance Indicators
   ii. New Areas of Research
   iii. Integration / Co-ordination of Science and Research

3. The development of performance indicators (i) will enable us to measure progress towards the objectives and outcomes contained in '*Seas the Opportunity*'. The measure of success depends on the establishment of scientifically sound baselines and scientifically robust ways of monitoring movement from those baselines.

4. Identifying new areas of research and science (ii) is necessary to underpin the objectives of '*Seas the Opportunity*'. This will also assist in the required assessment of what is currently known about the coastal and marine environments, and importantly, clarify where there are gaps in knowledge.

5. The better integration / co-ordination of science and research – both within Government Agencies and between those Agencies and other research providers (iii) – will enable us to achieve the necessary support of policy more efficiently through the use of existing structures and the avoidance of duplication.

6. Through the three strands of work it was anticipated that the Group would be able to respond to the following issues for consideration:

   i. How scientific agencies can achieve greater integration and collaboration within their individual organisations and with other organisations?
   ii. How can we maximise and build on the work of existing groups / initiatives that are already considering performance indicators (e.g. the Marine Biodiversity Working Group (MBWG); National Marine Monitoring Programme (NMMP) and the SSMEI pilots?).
   iii. Should Scotland invest in a mechanism to co-ordinate its marine data?
   iv. Taking the above point into account is there a need for a new Scottish Marine Advisory Policy committee and if so, how would it move issues forward?
   v. Are we satisfied with our current state of interaction and communication with the UK, Europe, OSPAR and other organisations? If not, where and how do we need to improve?
   vi. What baselines and performance indicators do we need for *Seas the Opportunity*?
   vii. How can climate change indicators, hydrography/physical oceanography be made more visible and therefore contribute to wider ecosystem assessments?

viii. What new science or research is needed to support the elements of *Seas the Opportunity*?

7. While the Group has been making its assessment, the UK Marine Bill has been out for consultation. It was not in the Group's remit to give detailed consideration as to how the proposals within the UK Marine Bill, such as Marine Spatial Planning and a Marine Management Organisation, if they applied to Scotland might affect the need for or operational aspects of indicators, research and science. However, some observations have been made below. The Group is also aware of the work being undertaken by another AGMACS work Stream on marine spatial planning and that a paper on the options for a [Scottish] Marine Management Organisation ([S]MMO) is being prepared. In general it would seem that more detailed consideration of the science and indicators issues will be required in light of the recommendations from these papers and any decisions that follow regarding a [Scottish] ([S]MMO) or a system of marine spatial planning (MSP) for Scotland's territorial waters.

8. The policy landscape is continually changing. The European Commission published a draft Marine Strategy Directive in October 2005. This is currently being negotiated through the Brussels machinery. Once in force, it will require Member States to develop national marine strategies on the basis of assessments and ongoing monitoring of their marine environments, all with the aim of achieving good environmental status. Monitoring, indicators and science will be critical to this process and the final nature of the Directive will have to be considered in shaping any indicators, research and science for Scotland.

9. In June 2006, the European Commission published a Maritime Green Paper as an overarching sustainable development approach to management of Europe's oceans and seas. The new approach reflects the principles of ecosystem based management and relies on the current draft Marine Strategy Directive to deliver the environmental pillar. The Green Paper takes dual cross-cutting and sectoral perspectives covering such areas as climate change, ocean acidification, adapting to coastal risks, the environment, research and technology, science and marine data. It also introduces, *inter alia*, the possibility of an Atlas of Europe's seas and the need for a system of marine spatial planning for maritime activities. So again, the indicators, research and science requirements for Scotland have to be seen against this developing background.

Scottish Interests

10. In considering its work, the Group felt that it would be desirable to identify whether there are particular issues of interest to Scotland that may be inadequately dealt with in a broader UK process. Are there, for example, attributes about the Scottish seas and coasts that are unique or largely of Scottish concern? While it is by no means exhaustive, it proved relatively easy to list examples of where

Scotland has interests that are unique or which are dominant interests from a UK perspective. These include:

Aquaculture: Most of the UK marine aquaculture industry is in Scottish waters and therefore are special issues for remote coastal communities, tourism and environmental impacts.
Deep water habitat, fjord/sea loch habitat, and reef and cold water coral: These habitats are significant and, within the UK, largely found in Scotland.
Marine Sound: This is likely to be an important issue in Scotland with its large cetacean populations.
Radioactivity: Much of the radioactivity discharged into UK waters flows through Scottish waters.
Sea birds: Scotland is home to internationally important breeding populations of seabirds, around five million birds in all, which are not replicated in other UK countries.
Phytoplankton community: Plankton populations will differ in northern latitudes and have important implications for harvesting shellfish, for example.

11. It is also worth reflecting on the fact that many aspects of the Scottish economy in relation to the sea, such as oil and gas, renewable energy, fishing and eco-tourism, have greater significance in Scotland than in the UK as a whole.

12. The Group felt that this list provided good examples to justify why there may be a need to consider indicators and supporting science that were adapted to Scottish needs. It may be worth expanding this list in future.

Developing Performance Indicators

Indicators

13. An essential part of the management of the marine environment is the ability to measure the state of the seas to enable managers to evaluate whether human intervention is required to change this in some preferred direction. The environment is multifaceted, encompassing not just biological elements but physical and chemical as well as the human dimension. Determining ‘state’ is therefore a complex task that requires a considerable amount of information and sophisticated tools to convert raw data into meaningful indicators that managers can interpret. Embarking on a process to develop indicators should not be undertaken lightly in view of the resources required and should, wherever possible, make use of existing work.

14. *Seas the Opportunity* is a strategy document developed for Scottish needs. There is also a UK strategy document, *Charting Progress*, produced through a Defra-led process that has similar policy objectives and science requirements. The Group considered the UK process that is being established to implement the main actions

identified in *Charting Progress* - the "UK Marine Monitoring and Assessment Strategy" (UKMMAS) that includes a number of elements including a process for identifying indicators. It is important that Scotland supports this UK approach. It is also important that any Scottish process should not duplicate this effort but ensure that Scotland benefits from it and should, if appropriate, add value to it from a Scottish perspective. In particular, there are two principal concerns that need to be satisfied:

- That Scottish interests are adequately represented in the UK process, and
- That any indicators developed would have relevance to *Seas the Opportunity*.

15. On the first of these the Group felt that Scotland was strongly represented at the Marine Assessment Policy Committee (MAPC), the Marine Assessment and Reporting Group (MARG) and on the three Tier III Evidence Groups that have been established. The Group was therefore satisfied that Scottish interests were adequately catered for, although this was reliant on the current representatives remaining committed and involved, and in general there is no need to establish a Scottish mechanism to undertake the same work.

16. The 'visions' in both '*Charting Progress* and '*Seas the Opportunity*' for the marine environment are similar with an emphasis on seas that are:

    - Clean and safe
    - Healthy and biologically diverse
    - Productive

17. Preliminary work by MAPC and MARG adopted a proposal influenced by Scottish input that any indicators developed should be done so in the context of the three categories above as these would then measure performance directly in the context of the vision. Currently MAPC and MARG are working out the details of how this work will be undertaken and funded. **The Group agreed that this was an appropriate framework for any Scottish system and recommends that MARG should be the primary forum in which performance indicators should be developed.**

Supporting Data and Data Management

18. Any system of indicators will require data upon which it depends. At an early stage the Group sought to assemble a list of monitoring data available in Scotland in the various agencies and research institutes. It quickly became clear that the task would be complex and time consuming if it was to include all activity and it was not possible to assemble a complete list in the time available. However, Annex 1 lists those monitoring data that were readily located and illustrates the category of indicator that the data might support. Although locational information has been included, it should be noted that to make a comprehensive and useful database, detailed geographical information would be required.

19. Much of Annex 1 relates to monitoring activity conducted under legislative obligations e.g. Directives. What is clear from this exercise is that Scotland possesses a considerable amount of monitoring data already that could be used for the purposes of developing and supporting a system of performance indicators. The Group noted that whereas the three Tier III Evidence Groups (under UKMMAS) had started to develop similar lists to document current UK monitoring activity, these groups were finding the process complex and difficult, possibly because of the number of organisations involved. It was understood that because of this complexity a proposal had been made to Defra that a contractor should prepare such an inventory of UK data that may be used to develop indicators. **The Group presents Annex 1 as a first compilation of an inventory of data that is relatively easy to prepare. The Group recommends that if Defra lets a contract to compile an inventory, this would provide a suitable means of documenting <u>all</u> the appropriate data currently available and there would be no need for a stand alone Scottish data identification exercise. Annex 1 should be passed to Defra as an initial contribution from Scotland.**

20. In the event that the Defra contract is not progressed, SEERAD will need to consider ways to identify more exhaustively those data that exist in Scotland and how they might be managed. This is a significant undertaking and will take several months of dedicated effort to complete. In the event of an introduction of marine spatial planning, it may be necessary to undertake this task which could be a role for a [Scottish] Marine Management Organisation if established.

21. If the Marine Strategy Directive proposed by the European Commission is adopted by the European Parliament and European Council, it is worth noting that considerably enhanced monitoring may be required relating to the concept of 'good environmental status', with an initial assessment of the current environmental status of our marine waters required by 4 years after the Directive comes into force (i.e. by around 2011-12), and a monitoring programme to assess progress towards targets for achieving 'good environmental status' to be in place within 6 years of the Directive coming into force (i.e. by around 2013-14). SEERAD will need to work with Defra on achieving these challenging requirements, and it would be wise to ensure that any structures we propose now

are consistent with these requirements. However it is worth noting that the European Marine Strategy is based around the three components listed in paragraph 13, and therefore we are satisfied that what we propose could go some considerable way to meet the demands of any Marine Strategy Directive that passes into legislation.

Options for Marine Data Management in Scotland

22. The policy requirement for an integrated approach to monitoring and assessing the state of the sea requires access to a multitude of different data, much of which is already collected by a variety of different agencies. If data collection and management remains distributed and uncoordinated then there will inevitably be inefficiencies in the way the information is accessed and used. There is also a danger that agencies perform duplicated and repeated data gathering activities. Hence there is an argument for some kind of data centre that manages marine data in an organised way.

23. To maximise benefit from Scotland's own marine environmental strategy, *Seas the Opportunity* which together with this paper (paragraph 10) has identified particular Scottish marine interests, it will be necessary for Scotland to have access to data on its own national and regional scale. For example, if managers wish to establish an area where human activity in the sea is to be regulated, they will need to undertake an analysis of the area based on data relevant to the issue. It may also be necessary to prepare a "State of the Scottish Seas" at some future point to report on the delivery of *Seas the Opportunity*. It is also the case that any future assessment is likely to be undertaken on a regional basis with UK waters sub-divided into a number of regions (for Charting Progress there were 8 regions of which five were of direct relevance to Scotland). In each of these cases, easy access to multi-sectoral Scottish data at an appropriate scale is therefore highly desirable. Organisation and access to data for decision making would become even more important in the event of marine spatial planning being established.

24. Two developmental tracks are presently converging on the development of repositories for marine data.

25. The marine science community has for some time been aware that multi-sectoral databases are required, and that the Internet, and associated technologies, now provide the mechanism by which this can be done. Globally this is now seen in the creation of what could be collectively described as "marine observatories", where multi-sectoral databases are accessible to all through the web.

26. The policy community are aware that, in order to fulfil their own requirements to meet the national and international statutory requirements referred to above, Governments need multi-sectoral data repositories. This is seen in the establishment of the UK Government's Marine Data Information Partnership

(MDIP). This initiative is trying to bring together the main data suppliers into a partnership to facilitate data management and data provision to users, with an emphasis on archiving data within data archive centres (DACs).

27. There are two proposals for the Scottish Executive to consider in order to provide a facility to access data needed to support implementation of its strategy:

(a) Participate in the MDIP process by supporting the establishment of UK-wide DACs

28. The MDIP process was launched in March 2005 and was given added impetus in December 2005 with the appointment of a Project Manager. It has a busy work programme to develop its ideas by end of 2007.

29. There are a number of advantages of the MDIP process. Many of the current drivers for marine monitoring are international and reports are made at the UK level e.g. OSPAR and ICES. The new Marine Strategy Directive will add a further UK level reporting regime. A UK approach has the possibility of achieving economies for this international reporting and may ensure that initial direct costs are shared between UK and devolved administrations. There could also be gains from MDIP knowledge and experience.

30. MDIP is in the process of identifying data archive centres (DACs). These could be themed DACs (of which there are some already) or geographic DACs (which would be new). Themed DACs would specialise in particular types of data (e.g. meteorological, oceanographic, and biological although all data would be geographically referenced: this is part of the data archiving protocol). This would mean that to extract data for a specific geographic area e.g. Scotland, data needs to be sourced from a variety of centres whereas at national scale, ideally users will want access to a range of different data types from a single point of entry.

31. There are some concerns about the way that MDIP and the existing Marine Environmental Data Action Group (MEDAG) would operate together. Although there is a joint sponsor board through the Inter-Agency Committee on Marine Science and Technology (IACMST) to oversee the work, it is complex and much effort will be required to ensure its success.

32. One of the biggest issues to tackle with data availability is that some data holders have trading fund status (an obligation to be commercial) and are seeking to sell their data while other government departments and the public and private sectors expect free access to data gathered at public expense. These problems mean that MDIP may take some time to achieve its main objective of “collect once, use many times” relating to efficient use of data and there may not be full confidence in the approach being capable of delivering this ambition. Another aim is to provide access to quality marine data.

(b) Establish a Scottish Marine Data Centre

33. For various reasons there may be a requirement for, or benefit from the establishment of a Scottish DAC. This would allow Scottish data to be accessed from its own centre and enable data to be managed to meet Scottish needs, for example, reporting on the Scottish marine ecosystem or for implementing marine spatial planning. It need not interfere with or compromise MDIP necessarily since MDIP has not yet decided on the overall optimum structure for DACs. A Scottish centre could facilitate transmission of Scottish data to a UK centre if required. With the Internet technology available it may not even be necessary for Scottish data to be held in Scotland provided access could be gained easily, for example, through a Scottish portal. Any virtual portal would have some initial direct cost for Scottish infrastructure but this may be offset by the benefits. Long term indirect costs could be shared with UK and devolved administrations as a Scottish data centre would benefit from MDIP infrastructure, but not be solely reliant on it. A further possibility, which fits neatly within the MDIP structure, is for a themed DAC to be located in Scotland. These options also have to be considered further in the context of the nature of Marine Management Organisations established as a result of the UK Marine Bill, if any.

34. The Group recognises that Scotland will always need the ability to access Scottish data from DACs (wherever they may be) to be able to present assessments for Scottish seas be these for internal use or as a contribution to international requirements e.g. for OSPAR or the emerging Marine Strategy Directive. **The Group recommends that the Scottish Executive should support Scottish input to marine data centres and the MDIP process and add value to it from a Scottish perspective.** We should also keep an open mind as to whether this will require a dedicated Scottish DAC. It would be very useful if the MDIP DAC Working Group could be encouraged to explore how the requirements of the devolved administrations fitted into the emerging DAC structure and whether any existing data holders could be considered as DACs. **If the MDIP process clearly does not address Scottish needs, add value to Scottish capacity or it is found that due to the requirement of, for instance, MSP , that Scotland's needs are not being met, then the Group recommends Scotland should consider establishing its own marine data centre first undertaking an appraisal of the costs and benefits.** This may be through an [S]MMO if one is established. In the meantime, the possibility of a themed Scottish DAC or portal accessing existing DACs can be explored.

New Areas of Research

35. Scotland already has a significant capability in marine research. For more than a century the Marine Laboratory in Aberdeen (now part of FRS), the Gatty Marine Laboratory in St Andrews, the Dunstaffnage Marine Laboratory (now part of SAMS group) and the University Marine Station, Millport, have engaged in

marine research. The re-location of the Sea Mammal Research Unit to St Andrews, and the establishment of NAFC in Shetland and Oceanlab in Aberdeen have added to this capacity. There are also a number of marine scientists in Scottish universities such as Heriot-Watt, Glasgow, Napier, Stirling and Strathclyde that make an important contribution to the country's capacity. Overall Scotland has strengths in most of the key areas such as aquaculture, marine chemistry, oceanography including ocean climate, fisheries, marine ecology, marine mammals, plankton, hazardous substances and contaminants.

36. In the time available to the Group it was not possible to review all the relevant science presently being carried out in Scotland and hence identify gaps but it is clear from the inventory in Annex 1 that there is already a considerable amount of relevant research being done. Identifying gaps is also partly contingent on the development of indicators. The Group felt that one way to approach the question of identifying new research needs would be to consider the three broad cross cutting science themes contained in the SEERAD science strategy (Strategic Research for SEERAD: Environment, Biology and Agriculture, 2005-2010, SE 2005) as a means to review the existing science base and hence identify gaps. The three themes are:

    - Responding to Climate Change: Climate change is widely recognised as one of the most serious environmental threats facing our planet. Consequences for Scotland's marine environment and coastal communities need to be better understood, as do the causes of climate change and how the impacts can be mitigated. An active involvement in the Marine Climate Change Impacts Partnership (MCCIP) process, a part of the UKMMAS, will help address this so this is encouraged and MCCIP's work should be evaluated to ensure that Scottish issues are addressed.

    - Protecting Biodiversity: Biodiversity has economic importance through the supply of food, natural products, environmental services and natural heritage. It also enriches our lives and is a measure of the sustainability of our society. Global concerns over the loss of biodiversity are reflected within Scotland where, as elsewhere, biodiversity is under threat from many factors including development, intensive fishing, climate change and pollution. The Marine Biodiversity Research Co-ordination Group (MBRCG) has already been established as part of the implementation of the Scottish Biodiversity Strategy. This type of co-ordination mechanism is to be encouraged.

    - Environmental, Social & Economic Sustainability: This theme aims to produce knowledge and capability for the development and implementation of evidence based policy and practice that ensures the environmental, economic and social sustainability of Scotland. This

move towards an ecosystem-based approach mirrors the recent changes in approach under the EU Common Fisheries Policy. The Group notes that as part of the MAPC process, development of socio-economic objectives and indicators for the marine environment has commenced. A Scottish dimension may be needed to supplement the UK picture and it is understood that some initial research has been commissioned by the Scottish Executive to be presented to AGMACS.

37. **The Group recommends that a review is undertaken under each of these three themes to document current research and how this relates to the three indicator categories of 'clean and safe', healthy and biodiverse' and 'productive'.** The MBRCG has already begun to review the second of these categories, and could play a key role in the wider review recommended here.

38. While it is necessary to establish the current range of research being undertaken, the science of developing indicators to support the management of the marine environment is perhaps an area where increased effort may be appropriate. Although the general principle of using indicators to help inform managers and provide information to the public is easy to understand, the challenge of developing indicators that are meaningful and convey useful information in a way that informs decisions on management interventions is not at all straight forward. This would be a useful area of research. **The Group recommends that more research is undertaken on the science of indicators and how they can be useful to managers and understood by the public.**

Integration and co-ordination of science and research

39. There are a large number of organisations in Scotland that are involved in marine science and research. These are distributed inside government and in the wider public sector, as well as at research institutes and universities. As *Seas the Opportunity* is so broadly orientated, most of these organisations have a role to play in informing the strategy through the science that they undertake. Inevitably, with a large number of organisations with different ownership, objectives and funding arrangements, the overall picture is of a fragmented knowledge base. Nevertheless most of these organisations are networked in some way and the degree of collaboration is high. What is needed is to build on the already close links in order to be more strategic in the way science is managed and co-ordinated.

40. Within the SEERAD family, particularly FRS, SNH and SEPA, there is probably a need for better co-ordination at Departmental/institutional level to achieve greater integration of science programmes to deliver SEERAD priorities efficiently. There is already good collaboration at an operational level but his tends to be *ad hoc* and could benefit from higher level awareness of the need to resource science in the agencies in a more co-ordinated way. One of the

important factors that contributes to the problem is the separation of planning between the sponsoring groups within SEERAD and more integration of science planning in the Department would help. The Group noted that the recently-appointed Chief Scientific Advisor in SEERAD has a remit to address this issue.

41. The role of promoting and developing economic development in the coastal and shelf seas, and particularly in the Highlands and Islands, is captured under the initiative of "Smart, Successful Scotland". This strategy is led by the regional Enterprise companies, working in concert with Regional Councils. HIE and Highlands and Islands Council are proactive in seeking funding and support for marine research and development, particularly where commercial improvements (such as in marine (bio)technology) are led by Scottish organisations and SMEs. Their strategy dovetails with economic and social sustainability matching the environmental strategy of SEERAD.

42. While there are informal networks at Director level among some of the marine science institutes such as FRS, SAMS, SMRU and UMBS Millport, the Group felt there was scope, given the likely need of the *Seas the Opportunity*, for a more formal means of the various agencies and institutes to meet to consider opportunities to work together more closely and add value to their existing programmes through collaboration.

43. At present there is an initiative led by St Andrews University and involving the universities in Scotland with a strong marine interest, SAMS and FRS to establish a marine science pool. The pool is principally intended to increase capacity and excellence, but the Scottish Funding Council (SFC) has indicated its desire to see the pool supporting SE policy and this may be a condition of funding. This would be part funded by the SFC, the universities participating in the pool and FRS. If successful, therefore, the pool offers a mechanism to better integrate marine science in Scotland and also provide some of the science needs of the *Seas the Opportunity*. However, at this stage there is no guarantee that the pool will be funded by SFC; a decision is expected in 2007. If funding is not available an alternative mechanism would be required to achieve the same aim.

44. The Group felt that involvement with international organisations such as OSPAR the European Commission, ICES and the European Marine Board was broadly satisfactory. The ERAD family agencies are closely involved with the EC, ICES and OSPAR, while SMRU and SAMS have links with the ESF Marine Board and NERC. Nevertheless, there may be some scope for more dialogue at national level to raise awareness throughout the Scottish marine science community of developments on the international stage.

45. The discussions of these questions lead to the conclusion that there is a need for a structure in Scotland at institute/agency director level that could facilitate inter-agency collaboration, improve communication and help deliver science in priority areas. Such a body would need to include SEERAD as a partner to facilitate

science programmes that are relevant to policy. I could complement the Marine Science Pool (should it be established) but would need to be broader than the seven research organisations involved in the proposal to include users of science. This would facilitate discussion between providers and end users so that science priorities and delivery mechanisms/agencies could be identified The Group felt that is was too early to be prescriptive about exactly what this structure would look like but **recommends that SEERAD convenes a meeting of heads of marine science organisations and other relevant agencies to discuss how such a body might be established and function.** One immediate task of such a group might be to take forward recommendation 5 (paragraph 37) to review the current state of research on the three main strands of the SEERAD science strategy.

Summary and discussion

46. At the outset, a set of questions were posed which the Science Stream was asked to address. This section briefly refers back to those questions in the light of the commentary above. As highlighted in paragraph 7, the following should be read bearing in mind the current consideration of marine spatial planning and the need for a [Scottish] Marine Management Organisation, by which the establishment of either could change the emphasis of what is required.

47. *How scientific agencies can achieve greater integration and collaboration within their individual organisations, and with other organisations?* This is considered in paragraphs 39-45. There is already a high degree of co-operation across organisations but there is a need for a more formal structure at institutional level to facilitate collaboration.

48. *How can we maximise and build on the work of existing groups / initiatives that are already considering performance indicators (e.g. the Marine Biodiversity Working Group; National Marine Monitoring Programme (NMMP) and the SSMEI pilots?).* The principal means of achieving this should be through MARG and MAPC as part of the Defra led UKMMAS process (paragraphs 13-19). This offers the most comprehensive forum to develop indicators in which Scotland is directly engaged and is influential. There does not appear to be any need to establish another process for Scotland.

49. *Should Scotland invest in a mechanism to co-ordinate its marine data?* The Group felt that in view of the distributed nature of the science base in Scotland, there is a need for Scotland to have a body that can manage data efficiently and provide a service to Scottish users. It is not clear at this stage if this should simply be a part of the MDIP process or whether it should be a Scottish initiative. (paragraphs 22-34). However, the MDIP process should be supported and encouraged to include the Scottish dimension.

50. *Taking the above point into account is there a need for a new Scottish Marine Advisory Policy committee and if so, how would it move issues forward?* The Science Stream has advised that the principal vehicle for developing indicators should be MARG, which is part of the UKMMAS MAPC process. To that extent there is no need for a Scottish MAPC. However, there probably is a need for a group that would co-ordinate what goes into MARG and reviews its outputs to ensure that Scottish interests are catered for. It would be a mistake to establish such a structure without having input from AGMACS as a whole as such a structure might need to perform other tasks, such as reporting on indicators and offering advice on their implications. Such a task would have a much broader remit than science alone and would need to include socio-economic considerations.

51. *Are we satisfied with our current state of interaction and communication with the UK, Europe, OSPAR and other organisations? If not, where and how do we need to improve?* In general interaction and communication were thought to be satisfactory though it was felt that the group suggested in paragraph 47 would be beneficial to wider collaboration.

52. *What baselines and performance indicators do we need for 'Seas the Opportunity'?* This is something that needs to be produced by the UKMMAS MARG process (paragraph 50)

53. *How can climate change indicators, hydrography/physical oceanography be made more visible and therefore contribute to wider ecosystem assessments?* This pre-supposes these indicators are insufficiently visible, yet no suite of indicators has yet been agreed. The Science Stream has suggested that research needs should be addressed under three cross cutting themes one of which is responding to climate change (paragraphs 36-37). This should assist in emphasising the need for climate change science and indicators.

54. *What new science or research is needed to support the elements of 'Seas the Opportunity'?* This question is dealt with in paragraphs 35-38. There is clearly a substantial amount of science already being done in Scotland that can support *'Seas the Opportunity'*. It is worthwhile considering reviewing the existing science base in Scotland to see whether there is a need for new science and this should be done in relation to the three main cross-cutting themes in the SEERAD science strategy.

Annex 1 - Summary of Scottish marine monitoring data

Version: 1 August 2006

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Food Standards Agency, Scotland (monitoring carried out by FRS, Integrin Advanced Biosystems Ltd, SAMS and SSQC Ltd on behalf of FSAS)									
Shellfish algal biotoxin monitoring	1990 (PSP) 1992 (DSP) 1999(ASP) (Fisheries Research Services)	2005	Continuous, but sites vary on an annual basis	High risk sites fortnightly April to October. Other sites monthly. All sites monthly - November to February.	UKAS Accreditation: ASP: 2000 DSP and PSP: 2002	FRS LIMS	Shellfish Hygiene Directive	Safe, Productive	
	2005 (Integrin Advanced Biosystems Ltd and CEFAS)	On-going							
Shellfish microbiological contamination	1992 (Fisheries Research Services and SSQC Ltd)	On-going	Continuous – sites vary on an annual basis	Varies. Since ca. 2002 a minimum of six samples per annum requested by the FSAS	UKAS accredited (1999?) UKAS accredited at SSQC since 2005 (for samples from Shetland)	FRS LIMS	Shellfish Hygiene Directive	Clean, Safe, Productive	*E. coli* analysis as an indicator of faecal pollution Limited data available on *Salmonella* spp. and FRNA bacteriophage.
Toxic Phytoplankton	1994 (Fisheries Research Services)	2005	Continuous – some sites vary on an annual basis	Weekly – April to October Monthly – Nov to February	UKAS Accreditation from 2005	FRS Phytoplankton data base and FSAS	Shellfish Hygiene Directive	Safe, Productive	Focus on *Alexandrium* spp., *Dinophysis* spp., *Pseudo-nitzschia* spp., *Protoperidinium* spp., *Prorocentrum lima* and *Lingulodinium polyedrum.*
	2005 (SAMS)	On-going							

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Contaminants in shellfish	2002 (Fisheries Research Services)	On-going	Broken 2002 2004 2006	Samples collected pre-spawning	UKAS Accreditation	FRS Contaminant Database and FSAS	Shellfish Hygiene Directive	Clean, Safe, Productive	Other ad hoc monitoring for FSAS, e.g. following *Jambo* grounding
Fisheries Research Services (FRS)									
Offshore Standard Oceanographic Sections	1903 (Faroe-Shetland Channel) 1972 (Northern North Sea)	On-going	Broken pre 1950, continuous since then	3 times per year April/May Sep/Oct Dec	FRS quality checks + checked at ICES and BODC	FRS, BODC, ICES	Ecosystem Assessment; Impact of climate change		Data collected: Ocean profiles of temperature, salinity and nutrients *Calanus* Monitoring included in December Cruise in FS Channel
Offshore biological monitoring - Faroe/ Shetland Channel *Calanus finmarchicus* abundance	1995	On-going	Continuous	Annual (December)		FRS archive	Offshore Ecosystem monitoring	Healthy and Biologically Diverse	Over-wintering *Calanus* monitoring to provide key species index of relevance to climate influences on North Atlantic and North Sea plankton productivity
Inshore Temperature Monitoring	1996 (first site started in 1996, new sites added 1996-2005)	On-going	Continuous since then	Hourly	FRS quality checks	FRS	Ecosystem Assessment; Impact of climate change		Sea surface temperature recorded at 6 sites around Scotland (Findon, Mallaig, Orkney, Shetland and Loch Maddy, Cromarty). Salinity and nutrients taken on a weekly basis at Orkney, Shetland and Loch Maddy
Long Term Coastal temperature time series	1979(Fair Isle) 1953 (Millport)	On-going	Continuous	Daily pre 2003, now hourly	FRS quality checks	FRS	Ecosystem Assessment; Impact of climate change		FRS has taken over these historical temperature time series to ensure continuation of measurements
Winter nutrient time series	2001	On-going	Continuous	Annual	UKAS Accreditation		OSPAR Eutrophication Strategy	Clean and Safe	TOxN, phosphate, silicate. Ammonia was measured in 2001, 2005 and 2006
Hazardous substances - reference mussel monitoring sites	1999 for Loch Etive 2005 for Loch Ewe, Bute, Shell Bay, and Aberdeen	On-going	Continuous	monthly	UKAS Accreditation	FRS Contaminants Database	OSPAR Hazardous Substabces Strategy; OSPAR CEMP	Clean and Safe	2 farmed mussel sites (Loch Ewe and Etive) 3 natural mussel sites (Shell Bay, Bute and Aberdeen). Historic (Loch Etive) – PAHs Current – PAHs, CBs, PBDEs

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
CSEMP[1] monitoring sites	1999 (Phase II)	On-going	continuous	annual	CSEMP QA Scheme	1. FRS UKAS archive 2. FRS Contaminants Database 3. UK CSEMP Database 4. ICES	OSPAR Hazardous Substabces Strategy; OSPAR CEMP	Clean and Safe	Sediment and biota from 6 sites around Scotland monitored for PAHs, CBs and metals
Clyde Trend Monitoring	Garroch Head and Pladda for fish since 1993. Four additional Clyde sites and two reference sites since 1999.	On-going	Continuous	Annual	UKAS Accreditation	FRS Contaminants Database	OSPAR Hazardous Substances Strategy; OSPAR CEMP	Clean and Safe	Five test sites and one reference site (Pladda) within the Clyde and two further 'reference' sites (Colonsay and Broad Bay); PAH, CB, metals in fish liver and sediments; EROD and bile in fish Sediment samples at all sites since 1999
East coast dab contaminant and disease monitoring programme	2000	On-going	Continuous	Annual	UKAS Accreditation	FRS Contaminants Database ICES Database (fish disease)	OSPAR Hazardous Substabces Strategy; OSPAR CEMP	Healthy and Biologically Diverse	Locations include Moray Firth (Beatrice), Fair Isle, St Abbs Head, Bell Rock and Marr Bank. PAH, EROD and bile in dab Externally visible fish disease
Sea loch nutrient "hotspot" - monitoring	2002	On-going	Winter, spring and summer surveys in 2002, 2004, 2005. Winter only in 2003	Seasonal (3 times annually)	UKAS for nutrients, sediments, phytoplankton	1.OSPAR report 2.UKAS archive for UKAS methods 3. Spreadsheets held by FRS EI Group	OSPAR Eutrophication Strategy	Clean & Safe, Healthy & Biologically Diverse	Data types: nutrients & ratios, chlorophyll, temperature, salinity, DO, organic Carbon and PSA in sediments, phytoplankton, macroalgal cover. Covers sea lochs in North Minch and Voes in Shetland.
Imposex in marine gastropods	1987	On-going	Late summer every 2-5 years	Every 2-3 years in Sullom Voe, every 3 – 5 years at other Scottish sites	External QA - QUASIMEME	1. ICES database 2. FRS and other (SOTEAG) Reports	OSPAR CEMP	Clean & Safe	Most data on *Nucella lapillus*, some ad hoc *Buccinum undatum* data. National surveys in 1991/2, 1997/8, 2004 now coordinated through CSSEG[2].

[1] Clean and Safe Environmental Monitoring Programme, formerly known as the National Marine Monitoring Programme (NMMP)
[2] CSSEG – Clean and Safe Seas Evidence Gathering

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Phytoplankton community time series	Varying length from 1997	On-going	Continuous -currently six sites around the Scottish coast New site coming on line in July 2006	Weekly all year (weather permitting)	Sample log -in, Toxic species analysis and data reporting all UKAS accredited	FRS Excel spreadsheets	Effects of environmental parameters (e.g. climate change/ eutrophication) on the phytoplankton community. Development of tools for WFD, EcoQO, OSPAR eutrophication criteria.	Healthy, Clean, Safe, Biologically Diverse, Productive (from a biological point of view)	Full community phytoplankton time series (including toxic species) in conjunction with physical and chemical data from the water column taken at the same frequency. Chlorophyll and zooplankton also sampled at two sites (see ocean climate time series and Zooplankton community time series)
Toxic phytoplankton (linked to previously FSAS-funded toxic phytoplankton programme)	2005	On-going	Continuous 6 sites from coastal ecosystem monitoring programme	Weekly all year round	UKAS Accreditation from 2005	FRS Phytoplankton data base	FRS coastal ecosystem monitoring See phytoplankton community time series	Healthy, Clean, Safe, Biologically Diverse	Focus on all potentially harmful species
Inshore Ecosystem Monitoring at Stonehaven: Phytoplankton community Zooplankton Community Inorganic nutrients Chlorophyll Temperature Salinity	1997	On-going	continuous	weekly		FRS Access Database (FRS website)	FRS Inshore Ecosystem Monitoring Site	Healthy and Biologically Diverse	Single station 3 km offshore of Stonehaven. Data submitted to WFD team and ICES plus some to SEPA
Inshore Ecosystem Monitoring at Loch Ewe Phytoplankton community Zooplankton Community Inorganic nutrients Chlorophyll Temperature Salinity	2002	On-going	continuous	weekly		FRS Access Database (FRS website)	FRS Inshore Ecosystem Monitoring Site	Healthy and Biologically Diverse	Single station just north of Isle of Ewe.
Benthic diversity time series - NMMP Benthic Data set	2001	On-going	Continuous	Annual	NMBAQC	1.UK CSEMP database 2. ICES	OSPAR CEMP	Healthy and Biologically Diverse	Biota from 6 sites around Scotland monitored

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Benthic diversity time series - Garroch Head data set	1972	On-going	Intermittent (See comments)	NA	No	FRS Environment Protection Group (Paper records)	Food Environment Protection Act	Clean and Safe	The true benthic monitoring here was done by Glasgow City 'Council' and its successors through Dunstaffnage Marine Laboratory and its successors. Disposal operations ceased in 1999 and the last, post cessation benthos samples were collected in 2005 but were collected on behalf of Scottish Water who is now the responsible authority on the matter.
Benthic diversity time series - MAFCONS data set, Infauna and Epifauna	2001	2004	Continuous	August and November	Infauna- NMBAQC Epifauna- No	MULTISPECIES Shared drive	EU	Healthy and Biologically Diverse	Impacts of fishing on benthic ecology
Benthic diversity time series - Early benthic and intertidal records from various stations around Scotland: St Andrews Bay Gairloch Experiment Benthic Mapping-Minches RoxAnn Data, West coast Minches	 1958 1930 1980 1996 1996	 1980 1955 1990 1998 2000	Would have to go back and review the paper records.			 Paper records Paper records Paper records Paper records PC21, NAS7	 Unknown Unknown Unknown Unknown Unknown	Healthy and Biologically Diverse	
Bell Rock disposal site	1975	1979	Continuous	6 monthly (May and Oct?) then a 5 yearly check	No	Paper records, old computer linear files	Sewage disposal site	Clean and Safe	Benthic monitoring undertaken by Edinburgh City Council and successors through SEPA. Disposal of sewage sludge ceased in 1999 and the last survey was undertaken in 2002 by FRS. No plans to do any further monitoring.
St Abbs Head disposal site	1975	1979, 1982, 1987	Continuous	6 monthly (May and Oct?) then a 5 yearly check	No	Paper records, old computer linear files	Sewage disposal site	Clean and Safe	
Benthic diversity time series - Beryl Oilfield monitoring	1982	1988	Continuous	1982, 1984?, 1985, 1988	No	Paper records, old computer linear files	Oilfield using Oil Based Muds	Clean and Safe	
Scottish dredged material sea disposal sites.	1990	Ongoing	Intermittent	Annual at different sites	Most	FRS and OSPAR	Food and Environment Protection Act	Productive Seas	Rolling programme of collecting sediment from majority of regularly used Scottish sea disposal sites for chemistry mainly.

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Commercial Fish and Shellfish Landings – Amount and Effort	1960s (1900 – 1960 on paper)	Ongoing	Continuous	Monthly	Unknown	Electronic (FRS and ERAD)	Common Fisheries Policy	Healthy and Biologically Diverse Productive	Official statistics By species / vessel / gear type / ICES Stat Square
Commercial Fish and Shellfish Landings – Biological Data	1960s (1900 – 1960 on paper)	Ongoing	Continuous	Quarterly	Most	Electronic (FRS)	Common Fisheries Policy	Healthy and Biologically Diverse Productive	Market Sampling By species / vessel / gear type / ICES Stat Square
Commercial and non-commercial fish and shellfish – biological data	!975	Ongoing	Continuous	Quarterly	Most	Electronic (FRS)	Common Fisheries Policy	Healthy and Biologically Diverse Productive	Observer Sampling By species / vessel / gear type / ICES Stat Square
Commercial and non-commercial fish and shellfish – distribution, abundance and biological data	1970s (1900 – 1970 on paper)	Ongoing	Continuous	By Cruise	Most	Electronic (FRS)	Common Fisheries Policy	Healthy and Biologically Diverse Productive	Research Vessel Surveys and sampling
Joint Nature Conservation Committee (JNCC)									
Seabird Monitoring Programme	This is led by JNCC, in partnership with RSPB and Shetland Oil Terminal Environmental Advisory Group. Its aim is to ensure that sufficient data on breeding numbers of seabirds are collected- both regionally and nationally - to enable their population and conservation status to be assessed , and to ensure that sufficient data on appropriate demographic parameters such as breeding performance and survival are collected to help to investigate the factors responsible for population changes. Data on all 25 species of seabird breeding in Scotland are collected, though JNCC-funded work concentrates on cliff-nesting species. JNCC funds detailed annual monitoring at three Key Sites in Scotland - Isle of May (partly funded by Centre for Ecology and Hydrology), Canna and Fair Isle, and undertakes triennial monitoring of breeding numbers in Orkney (also annual monitoring of breeding success) and in Grampian region. In addition, data are submitted from colonies throughout Scotland from a wide group of contributors, many of whom are voluntary.								
Scottish Association for Marine Science (SAMS)									
Broadscale surveys of rocky shore community structure. 200 sites around the coast of Scotland, including the outer isles.	2001	ongoing		5 yearly			Climate change		Part of a UK and Ireland initiative. Repeat of work done in the 1950s
Yearly censuses of population densities and growth rates of juvenile fishes in shallow sandy nursery areas. Including abundance and species of other fish and crustaceans on a Scottish (west coast) sandy beach.	1972	ongoing	Broken	monthly during season			Population studies		1972-76,1986-89, 1995-97 currently yearly from 2001
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Surveys of population structure in bivalves (*Donax vittatus*) on west and east coast Scottish beaches, giving growth, recruitment and mortality	1977	1983	Continuous	monthly		Access database	Population studies		Work carried out by Dr Alan Ansell and Linda Robb.
Inshore fish populations in Scottish Sea Lochs.	1969	1980	Continuous	monthly		Access database	Fisheries		Work carried out by Dr John Gordon and others.
Deep Sea Benthos Biodiversity & morphology	1973	On going	broken	Compilation of annual cruises		Access database	Biodiversity		Majority of samples from Rockall Trough area.
Diver surveys of juvenile gadoids at Saulmore Point and Millport.	1995	On-going	continuous	Originally monthly, now bi-annually		excel	Fisheries		Monthly since the early 1990s. Used to make early predictions of year class strength in cod stocks by MAFF
Sub-tidal seawater temperatures	1995	ongoing	continuous	Hourly					Clyde (Millport), 1 station at 6m (continuous)
Sub-tidal seawater temperatures	1995	ongoing	continuous	Hourly					Oban area, 1 station at 10 m (continuous), 1 station at 6m (occasional), 1 station at 18m (occasional)
Surveys of Scottish sea bird populations on small islands from Mull of Kintyre to North of Oban.	1982	On-going	continuous	Annually		Access database/ Excel/ paper records	Ecological		Monitoring carried out during the breeding season by Dr Clive Craik. Digitization in progress.
Nutrient data Loch Eil, Etive, Fyne, Goil, Linnhe, Firth of Lorne, Easdale.	1975	1992	broken			Paper records			
Deep-sea fish from the Rockall Trough and Porcupine Seabight abundance and morphology.	1975	1992	broken				Fisheries		Rescue project being carried out currently.
Fish Larvae in Scottish Sea Lochs.	1970	1976	continuous			Paper records	Fisheries		Work carried out by Dr John Gordon.
Ellett line oceanographic section from Sound of Mull to Rockall. Profiles of temperature, salinity, nutrients from surface to seabed. Continuous surface record.	March 1975	1996		3 or 4 a year until 1995		BODC, ICES	Ocean status and condition		More information can be found at www.noc.soton.ac.uk/GDD/hydro/ ... nph/ellett/index.php
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Ellett line oceanographic section from Sound of Mull to Iceland via Rockall (contd). Present data also include oxygen, fluorescence, backscatter	1996	ongoing	Most years at least once. SAMS occupations 2000, 2003, 2005	annually	Observations are calibrated	BODC, ICES	Climate change, ocean status and condition. NERC strategic monitoring section		This work is now shared with the National Oceanography Centre, Southampton, with responsibility changing every year. It has been occasionally supported by FRS
Tiree passage current meter mooring, monitoring velocity, temperature and salinity off the west of Scotland	April 1980	ongoing	continuous	hourly		BODC	NERC strategic monitoring site		
Wyville Thomson Ridge mooring that monitors the return flow of the North Atlantic thermohaline circulation into the Rockall Trough	Sept 2003	ongoing	continuous - gap from April 2004 to Oct 2005			BODC	Climate change. NERC strategic monitoring site		
Profiles of Temperature, Salinity, Oxygen & Fluorescence, Chlorophyll & nutrients. Core Analysis Loch Etive	1978	2003	continuous	Monthly		BODC	Restricted Exchange Environment		Currently discontinuous. No work has been carried out from 2003.
Scottish Environment Protection Agency (SEPA)									
Contaminant monitoring of levels of List I and List II substances in surface waters for Clyde Estuary, Cart Estuary, Garnock Estuary, Irvine Bay, Ayr Bay	1986	Ongoing		4/yr		1986-90 hard copy 1991 onwards computer	Dangerous Substances Directive	Clean, Safe	Looking at: Cd, Hg, Cu, Ni, Pb, Zn, Cr, salinity, suspended solids Reported annually to Scottish Office/Scottish Executive
Contaminant monitoring of levels of List I and List II substances in surface waters for Forth Estuary and Firth of Forth	1981	Ongoing		4/yr		1981-90 hard copy 1992 onwards computer	Dangerous Substances Directive	Clean, Safe	Looking at: Cd, Hg, Cu, Ni, Pb, Zn, Cr, salinity, suspended solids Reported annually to Scottish Office/Scottish Executive
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Contaminant monitoring of levels of List I and List II substances in sediments for Clyde Estuary, Cart Estuary, Garnock Estuary, Irvine Bay, Ayr Bay	1990	Ongoing		1/yr until 1997 then 4 reps every 3 years		1990-91 hard copy 1992 onwards computer	Dangerous Substances Directive	Clean, Safe	Cd, Hg, Cu, Ni, Pb, Zn, Cr, Mn, PSA, TOC
Contaminant monitoring of levels of List I and List II substances in fish for Clyde Estuary, Irvine Bay, Ayr Bay	1990	Ongoing		4/yr in Clyde, 1/yr in Irvine & Ayr Bays until 1997 then every 2 years		1990-91 hard copy 1992 onwards computer	Dangerous Substances Directive	Clean, Safe	Cd, Hg, other metals as above
Contaminant monitoring of water from Seamill, Lochs Long, Goil, Riddon and Fyne, East Kyle	1982	Ongoing		1/yr		1982-83 and 1987-91 hard copy 1992 onwards computer	Shellfish Growing Waters Directive	Clean, Safe	T, Sal, DO, pH, colour, suspended solids, Cd, Hg, As, Cr, Cu, Ni, Pb, Zn, organics Reported to Scottish Office/Scottish Executive
Contaminant monitoring of shellfish from Seamill, Lochs Long, Goil, Riddon and Fyne, East Kyle	1982	Ongoing		1/yr 2/yr in 1998-99		1982-83 and 1987-91 hard copy 1992-94 computer	Shellfish Growing Waters Directive	Clean, Safe	Cd, Hg, Cr, Cu, Ni, Pb, Zn, DDE, *-HCH, HCB, DDD, DDT, PCBs, length, wet wt, dry wt, width Reported to Scottish Office/Scottish Executive
Contaminant monitoring in shellfish for Clyde Estuary, Firth of Clyde Ayrshire and Argyll Coasts	1980	Ongoing		1 survey every 2 years		1980-90 hard copy 1991 onwards computer	Spatial and temporal trends in a range of toxic, persistent and bioaccumulative substances in mussels, and to provide data for submission to the OSPARCOM international programme.	Clean, Safe Productive Healthy	Cd, Hg, Cr, Cu, Ni, Pb, Zn, Mn, DDE, DDD, DDT, *-HCH, HCB, PCBs, Endosuplhan, length, width, wet wt, dry wt
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Contaminant monitoring in shellfish for Firth of Forth	1981	Ongoing		Annually		1981 onwards on computer for trace metals 1990 onwards on computer for trace organic determinands	Spatial and temporal trends in a range of toxic, persistent and bio-accumulative substances in mussels, and to provide data for submission to OSPAR.	Clean, Safe Productive Healthy	Cd, Hg, Cr, Cu, Ni, Pb, Zn, Mn, DDE, DDD, DDT, *-HCH, HCB, PCBs, Endosuplhan, length, width, wet wt, dry wt
Contaminant monitoring in brown algae for Clyde Estuary, Firth of Clyde Ayrshire and Argyll Coasts	1982		1982, 83, 85, 87, 89	Occasionally		Hard copy reports	Spatial and temporal trends in a range of toxic, persistent and bio-accumulative substances in brown algae, and to provide data for submission to the OSPAR.	Clean, Safe Healthy	Cd, Hg, Cr, Cu, Ni, Pb, Zn, Mn
Contaminant monitoring in brown algae for Firth of Forth	1982	Ongoing		Annually		1982 onwards on computer for estuarine sites	Spatial and temporal trends in a range of toxic, persistent and bio-accumulative substances in brown algae, and to provide data for submission to OSPAR.	Clean, Safe Healthy	Cd, Hg, Cr, Cu, Ni, Pb, Zn, Mn
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Contaminant monitoring in sediments in Upper Clyde Estuary	1972	Ongoing		At least 2/yr until 1993, then annually		1972-90 hard copy 1991 onwards computer	Spatial and temporal changes in trace metals concentrations in benthic sediments, and their relationships to physical character of the sediments and to infaunal populations.	Clean, Safe Healthy	Cd, Cr, Cu, Mn, Ni, Pb, Zn, Hg (since 1984), PSA, %OC, Eh, interstitial sal (some) Total and free sulphide
Contaminant monitoring in Irvine and Ayr Bays	1973	Ongoing		1/yr		1973-92 hard copy 1993-98 computer Metal levels low sea monitoring will be discontinued	Spatial and temporal changes in trace metals concentrations in sediments, in relation to effluents discharged via long sea outfalls, sediment character and infaunal populations	Clean Safe	Cd, Cr, Cu, Mn, Ni, Pb, Zn, PSA, %OC Ayr Bay as control
Contaminant monitoring in Forth Estuary	1981		1981 -1998	1/yr at 4 sites			Spatial and temporal changes in trace metals concentrations in benthic sediments, and their relationships to physical character of the sediments and to infaunal populations	Clean Safe	Cd, Cr, Cu, Mn, Ni, Pb, Zn, PSA, %OC

Monitoring Programme	Date Started	Date stopped or on-going	Continuous or broken (with dates)	Periodicity	Data quality assured	Data storage	Basis of monitoring	UKMMAS Relevant area	Comments
Contaminant monitoring				1/yr at 3 sludge dump sites (Garroch Head, Bell Rock & St Abbs)			FEPA license, dredged and dumped materials.	Clean Safe	Cd, Cr, Cu, Mn, Ni, Pb, Zn, PSA, %OC, trace organic compounds
Water quality monitoring for Clyde Estuary and Firth of Clyde							Water quality monitoring identification of hotspots determination of spatial and temporal trends.	Clean Safe	
Clyde Estuary water quality survey. Glasgow-Gourock	1967	Ongoing		12-18/yr		1967-82 hard copy 1982 onwards computer			Temp, Sal, DO, %SAT
Clyde Estuary water chemistry survey. Glasgow - Hole.	1973	Ongoing		6-8/yr		1973-82 hard copy 1982 onwards computer			Temp, Sal, DO, %SAT, Nitrate, Nitrite, Ammonia, Orthophosphate, Silicate, Transparency, pH
Firth of Clyde Survey. Transects across Inner Firth. Gourock - Hunterston.	1974	Ongoing		4-6/yr		1974-81 hard copy 1982 onwards computer 1994 onwards computer			Temp, Sal, DO, Nitrate, Nitrite, Ammonia, Orthophosphate, Silicate, Transparency + Chl a Temp, Sal, DO, Nitrate, Nitrite, Ammonia, Orthophosphate, Silicate, Transparency + Chl a
Ardgowan Survey: Dunoon - Cumbraes.	1994	Ongoing		4/yr					
Water quality monitoring for Lochs Long, Goil, Gare and Holy Loch	1969	Ongoing		4-6/yr		1969-82 hard copy 1982 onwards computer	Water quality monitoring identification of hotspots determination of spatial and temporal trends.	Clean Safe	Temp, Sal, DO, Nitrate, Nitrite, Ammonia, Orthophosphate, Silicate, Transparency + Chl a
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Water quality monitoring for Loch Striven	1975	Ongoing		4-6/yr		1975-82 hard copy 1982 onwards computer	Water quality monitoring identification of hotspots determination of spatial and temporal trends.	Clean Safe	Ammonia, Orthophosphate, Silicate, Transparency + Chl a , Temp, Sal, DO, Nitrate, Nitrite
Water quality monitoring for Irvine/Ayr Bays	1976	Ongoing		4-6/yr		1976-82 hard copy 1982 onwards computer	Water quality monitoring identification of hotspots, major inputs and trends.	Clean Safe	Temp, Sal, DO, NO_3, NO_2, NH_3, Orthophosphate, Silicate, Transparency, Chl a
Sea loch winter chemistry monitoring for Loch Fyne, Kilbranan and Bute Sounds	1976	Ongoing		1/yr until 1997 then every 2/yrs		1976-82 hard copy 1982 onwards computer	To monitor the water chemistry to establish peak winter consent - rations of nutrients.	Clean Safe	Temp, Sal, DO, NO_3, NO_2, NH_3, Orthophosphate, Silicate, Transparency, Chl a
Water quality monitoring in Forth Estuary	?	Ongoing		Initially 24/yr now 13/yr (1 winter 12 summer)		from 1981 data on computer		Clean Safe	Temp, sal, DO, ss, NO_2, NO_3, PO_4, NH_4
Winter nutrient time series for Firth of Forth	?	Ongoing		1/yr		from 1981 data on computer		Clean Safe	Temp, sal, DO, NO_2, NO_3, PO_4, NH_4, SiO_2
Nutrient and phytoplankton for Firth of Forth	1991	Ongoing		7/yr		Data on computer		Clean Safe	Temp, sal, DO, NO_2, NO_3, PO_4, NH_4, SiO_2 Chl a
Contaminant monitoring for Clyde Estuary: Glasgow – Leven confluence	1974		1974-76 1977-89 1992-97	Monthly 3-6/yr 2/yr		Quantitative Hard copy, technical reports, published papers.	Pollution impact monitoring/ Trend analysis	Clean Safe Healthy	Faunal abundance, species diversity, Sediment - Eh, OC, PSA, TM's. Water - pH, DO, Sal
Benthic diversity for: Glasgow-Gourock Leven-Gourock	 1967 1980s			 1 occasional		Hard copy. Semi-quantitative Hard copy	Distribution and composition study.	Clean Safe Diverse	Faunal abundance, species diversity
Sediment contamination and benthic diversity for Battery Park	1989		1989, 92, 95, 98	3 yearly		Quantitative Computer files and hard copy	Sewage discharge impact study	Clean Safe Diverse	Faunal abundance, species diversity, Sediment - OC, TM's, PSA.
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Benthic diversity time series for Forth Estuary				1/yr		Quantitative Hard copy, technical reports,	Time series monitoring.	Clean Safe Diverse	Faunal abundance, species diversity, Sediment - Eh, OC, PSA,
Phytoplankton monitoring in Firth of Clyde and Clyde Sea Lochs	1990		Annually from 1990-98			Semi-quantitative Raw data.	Marine Algae-watch Monitoring marine phytoplankton communities to assess frequency and occurrence of unusual or harmful algal blooms.	Clean Safe	Dominant taxa - estimates of cell concentrations *per* litre
Fish contaminant and species composition monitoring for Irvine & Ayr Bays	1974		1974-97	1/yr		Hard copy 74-91 Raw data sheets 92-94 on computer	Fish population composition and trace metal analysis.	Clean Safe Biologically Diverse	Cd & Hg levels in flesh, livers, etc. species composition, abundances, length, weights. Survey combined for EC Dangerous substances monitoring.
Ecotoxicology surveys	1991		1991 (Clyde) 1998 (SEPA W Region) 1989 (SEPA N Region)	One-off Rolling programme Rolling programme		Hard copy report	TBT study looking at incidence of imposex in dogwhelks	Clean Safe	TBT Incidence of imposex in dogwhelks
Sea Mammal Research Unit (SMRU)									
Annual survey of grey seal pup production	1962	On-going	1962-1982 excludes Hebrides 1983-present includes all major breeding areas.	Annual during the breeding season (Oct-Dec)	Yes	SMRU, upcoming transfer to BODC	Vertical aerial survey	Healthy and Biologically Diverse	ORPAR EcoQO Annual Advice to Government about seal population management. UK Special Committee on Seals
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Estimation of harbour seal population size. Moray Firth, Firth of Tay annually; remainder on a 5-year cycle, although we survey some areas more frequently as required by SNH	1988-present	On-going	Coverage varies by region	Annual during the moulting season (August)	Yes	SMRU, upcoming transfer to BODC	Coastal helicopter surveys using a thermal imager	Healthy and Biologically Diverse	ORPAR EcoQO Annual Advice to Government about seal population management. UK Special Committee on Seals
Annually, indicators of grey seal condition at North Rona and Isle of May	~1992-present	On-going	Coverage complete for North Rona	Annual during the breeding season (Oct-Nov)	No	SMRU	Long-term monitoring of known individuals	Healthy and Biologically Diverse	
Every 10 years, estimation of cetacean abundance over the European continental shelf	1995 and 2005 only	On-going		Summer season only	Yes	SCANS II web site	Ship- and aircraft-based line transect surveys	Healthy and Biologically Diverse	Conducted as an international collaboration by European countries. Coordinated by SMRU
Continuous, collation of data on bycatch of cetaceans in fisheries	1999-present	On-going	UK-wide but concentrated in bass fishery in SW Approaches	Depends upon fishery	Yes	SMRU	Marine observers on fishing vessels	Healthy, Clean, Safe, and b Biologically Diverse	
Scottish Natural Heritage (SNH)									
Maintains a rolling programme of marine Site Condition Monitoring throughout Scotland, mainly concentrating on the features of interest identified for 34 Special Areas of Conservation and 45 Sites of Special Scientific Interest									
Site Condition Monitoring:: Berwickshire and North Northumberland Coast SAC and SSSI	2003 1997 (seals)	On-going		Requirement to report once in a six-year cycle (rolling programme) Annually (seals)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, sea caves, grey seal *Halichoerus grypus*
Site Condition Monitoring: Dornoch Firth and Morrich More SAC and SSSI	2004 1992 (seals)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No Seals data reviewed by Scientific Committee on Seals.	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Estuaries, eel grass bed, common seal *Phoca vitulina*
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Site Condition Monitoring: Firth of Lorn SAC	2005	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: : Littoral & sublittoral rocky reef
Site Condition Monitoring: Firth of Tay and Eden Estuary SAC and SSSI	2002 (broadscale mapping) 1997 (seals)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No Seals data reviewed by Scientific Committee on Seals	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Estuaries, subtidal sandbanks, intertidal mudflats and sandflats, common seal *Phoca vitulina*
Site Condition Monitoring: Isle of May SAC	2002 (broadscale mapping) 1979 (seals)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No Seals data reviewed by Scientific Committee on Seals	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, grey seal *Halichoerus grypus*
Site Condition Monitoring: Loch Creran SAC	2005	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Sublittoral rocky reef, biogenic (*Serpula vermicularis*) reef
Site Condition Monitoring: Loch Laxford SAC	2001 (broadscale mapping)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Intertidal mudflats and sandflats, littoral & sublittoral rocky reef
Site Condition Monitoring: Loch Moidart and Loch Shiel Woods SAC and SSSI	2003	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Intertidal mudflats and sandflats
Site Condition Monitoring: Loch nam Madadh SAC and SSSI (Incl. Loch an Duin SSSI)	2004	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive, UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Subtidal sandbanks, intertidal mudflats and sandflats, Lagoons, shallow inlets and bays, littoral & sublittoral rocky reef, Tidal rapids, Stonewort *Lamprothamnium papulosum*
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Site Condition Monitoring: Loch of Stenness SAC and SSSI	1999 (broadscale mapping) 2001-2003 (monitoring)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive, , UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Lagoons
Site Condition Monitoring: Loch Roag Lagoons SAC and SSSI	2002	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive: UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Lagoons
Site Condition Monitoring: Lochs Duich, Long and Alsh Reefs SAC	1989 (broadscale mapping) 2004 (monitoring)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef
Site Condition Monitoring: Luce Bay and Sands SAC	2006 (broadscale mapping)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Shallow inlets and bay, littoral & sublittoral rocky reef, intertidal mudflats and sandflats, subtidal sandbanks
Site Condition Monitoring: Moine Mhor SAC	2000	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Intertidal mudflats and sandflats
Site Condition Monitoring: Moray Firth SAC (Habitat)	2004 (broadscale mapping)	On-going		Requirement to report once in a six-year cycle	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Subtidal sandbanks
Site Condition Monitoring: Moray Firth SAC (Bottlenose dolphin)	2005	On-going		Requirement to report once in a three-year cycle (rolling programme)	No		Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Bottlenose dolphin *Tursiops truncatus.* Previously collected data from the Lighthouse Field Station (University of Aberdeen) has been incorporated into the monitoring programme.
Monitoring Programme	**Date Started**	**Date stopped**	**Continuous or**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant**	**Comments**

		or on-going	broken (with dates)					area	
Site Condition Monitoring: Mousa SAC	2003 (Broadscale mapping) 1997 (seals)	On-going		Requirement to report once in a six-year cycle (rolling programme) Rolling census over five–year period (seals)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, sea caves, common seal *Phoca vitulina*
Site Condition Monitoring: North Rona SAC	Not started as of 2006 1974 (seals)	On-going	Continuous (seals)	Requirement to report once in a six-year cycle (rolling programme) Annually (seals)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Features monitored: Littoral & sublittoral rocky reef, sea caves, grey seal *Halichoerus grypus*
Site Condition Monitoring: Obain Loch Euphoirt SAC and SSSI	2002	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive, UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Lagoons
Site Condition Monitoring: Papa Stour SAC (Incl. Sandness Coast SSSI)	2003	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive, UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, sea caves
Site Condition Monitoring: Sanday SAC and SSSI	1999/2000 (Broadscale mapping) 1985 (seals)	On-going	Continuous (seals)	Requirement to report once in a six-year cycle (rolling programme). Rolling census over five–year period (seals)	No. Seals data reviewed by Scientific Committee on Seals	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, intertidal mudflats and sandflats, subtidal sandbanks, common seal *Phoca vitulina*
Site Condition Monitoring: Solway Firth SAC and SSSI	2004	On-going		Requirement to report once in a six-year cycle	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Estuaries, subtidal sandbanks, mudflats
Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) SAC	2003	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Subtidal sandbanks
Site Condition Monitoring: Sound of Barra pSAC	2006	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Subtidal sandbanks
Site Condition Monitoring: South Uist Machair SAC	2002	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Lagoons
Site Condition Monitoring: St Kilda SAC	1997 2000 (Broadscale mapping)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef, sea caves
Site Condition Monitoring: Sullom Voe SAC	2004 (Broadscale mapping)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Shallow inlets and bays, littoral & sublittoral rocky reef
Site Condition Monitoring: Sunart SAC and SSSI	2001 (Broadscale mapping)	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Littoral & sublittoral rocky reef
Site Condition Monitoring: The Vadills SAC and SSSI	2003	On-going		Requirement to report once in a six-year cycle (rolling programme)	No	Marine Recorder, SNH archive, SNH SCM database, SNH website	Habitats Directive, UK Common Standards Monitoring	Clean, Healthy, Safe, Biologically Diverse	Features monitored: Lagoons, tidal rapids, Egg wrack *Ascophyllum nodosum* ecad *mackaii*
Site Condition Monitoring: Treshnish Isles SAC	2003 (Broadscale mapping) 1984 (seals)	On-going	Continuous (seals)	Requirement to report once in a six-year cycle (rolling programme). Annually	Seals data reviewed by Scientific Committee on Seals	Marine Recorder, SNH archive, SNH SCM database, SNH website, SMRU (seals)	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Features monitored: : Littoral & sublittoral rocky reef, grey seal *Halichoerus grypus*

				(seals)					
Monitoring Programme	**Date Started**	**Date stopped or on-going**	**Continuous or broken (with dates)**	**Periodicity**	**Data quality assured**	**Data storage**	**Basis of monitoring**	**UKMMAS Relevant area**	**Comments**
Ascrib, Isay and Dunvegan	1988	On-going	Continuous	Rolling census over five–year period	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Common seal *Phoca vitulina*
Eileanan agus Sgeiran Lios mor	1988	On-going	Continuous	Rolling census over five–year period	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Common seal *Phoca vitulina*
Monach Islands	1960	On-going	Continuous	Annually	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Grey seal *Halichoerus grypus*
South - East Islay Skerries	1996	On-going	Continuous	Rolling census over five–year period	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Common seal *Phoca vitulina*
Yell Sound Coast	1984	On-going	Continuous	Rolling census over five –year period	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Common seal *Phoca vitulina*
Faray and Holm of Faray	1960	On-going	Continuous	Annually	Reviewed by Scientific Committee on Seals	SMRU	Habitats Directive	Clean, Healthy, Safe, Biologically Diverse	Grey seal *Halichoerus grypus*

Note: SSSIs with a marine or coastal element that are not associated with a SAC are not included in the above listing

Shetland Oil Terminal Environmental Advisory Group (SOTEAG)

Has extensive marine monitoring data, some programmes covering more than thirty years, for Sullom Voe in Shetland, and reference sites nearby. The main programmes which continue are chemical and macrobenthic monitoring of the seabed, rocky shores and ornithology. We have considerable data on other programmes also which no longer continue.

Monitoring Programme	**Date Started**	**Date**	**Continuous**	**Periodicity**	**Data quality**	**Data storage**	**Basis of**	**UKMMAS**	**Comments**

		stopped or on-going	or broken (with dates)		assured		monitoring	Relevant area	
North Atlantic Fisheries College –Shetland									
Physical and biological data	Jan 2003	Jan 2005		Varied but approx. twice per month	No	NAFC	Sampling for EU EUROGEL project		Two Years of sample data similar to FRS Stonehaven CTD, Chlorophyll, Phyto and Zooplankton. Collected approximately 2x /month at stations in Sandsound Voe,