



**JNCC Report 765**

**The U.K. Marine Biodiversity Monitoring Programme:  
Development of advice on future monitoring (2019)**

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**September 2024**

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ISSN 0963 8091

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**This report should be cited as:**

Webb, K.<sup>1</sup>, Griffiths, Y.<sup>1</sup> & Proudfoot, R.<sup>2</sup> 2024. The U.K. Marine Biodiversity Monitoring Programme: Development of advice on future monitoring (2019). *JNCC Report 765*, JNCC, Peterborough, ISSN 0963-8091.

<https://hub.jncc.gov.uk/assets/5db2e26e-b98d-4a49-9293-76a62a25d6f7>

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**Acknowledgments:**

We would like to recognise the marine monitoring team at JNCC for all their work to deliver advice on monitoring, with particular thanks to Hayley Hinchin who led on the development of the options process. Thank you to Steve Gibson who was instrumental in the origination of the UK Marine Biodiversity monitoring programme and guided its direction. In addition to the marine monitoring team at JNCC, we would like to acknowledge the large number of individuals who have contributed towards the review of evidence and supported this process.

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## Summary

This paper presents a risk-based approach for advising UK Governments on how to focus marine biodiversity monitoring to fulfil national and international obligations on the health and biological diversity of the UK's seas, while delivering value for money. The approach finds a balance between environmental risk, political risk, and cost. At its core is a review of UK public sector monitoring of marine biodiversity, led by the Joint Nature Conservation Committee (JNCC) on behalf of the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG), one of four evidence groups working on the UK Marine Monitoring and Assessment Strategy (UKMMAS) ([Marine Strategy Part One](#)).

The outcomes of a 2016–2017 review of marine biodiversity monitoring in the UK, was used to develop a series of options for focusing monitoring of key biodiversity components of the marine ecosystem under different cost scenarios. These options for monitoring were evaluated by scientific experts and policy representatives at a series of workshops. Recommendations were developed on the level of monitoring needed to cost-effectively provide evidence on the ecological status of the UK's marine biodiversity, while maintaining an acceptable level of environmental and political risk.

Advice on monitoring was submitted to the UK Government's Department of Environment, Food and Rural Affairs (Defra) and used to inform biodiversity proposals in Spending Reviews between 2019 and 2021 and more recently to inform the England-wide Natural Capital Ecosystem Assessment Programme (NCEA). The advice on key evidence gaps and deficiencies is continuing to be used to strengthen and improve the functioning of individual monitoring programmes. However, to fully realise the value of the monitoring, it is essential to establish a fully operational and functional long-term UK programme that reflects the breadth of biodiversity across boundaries and addresses the rapidly changing environment.

## Contents

Summary .....	c
1 Background.....	1
2 Why a UK marine biodiversity monitoring programme is needed .....	2
3 Development of advice on future monitoring .....	3
4 Progress toward implementation of the advice .....	7
5 In summary .....	8
References .....	9
Appendix 1: List of Annexes.....	10

# 1 Background

In 2005, the four Governments of the UK published [Charting Progress](#), the first overall assessment of the state of UK seas. This report concluded that monitoring of the marine environment was not fit for purpose and highlighted evidence gaps and actions to improve future monitoring. In response, the UK Marine Monitoring and Assessment Strategy (UKMMAS) was set up to provide a more structured and coordinated approach to the monitoring and assessment of our seas, and in 2010, a follow up assessment; [Charting Progress 2](#), was published. This report and others since (for example, Marine Strategy Part One ([2012](#) and [2019](#))), have highlighted deficiencies in monitoring of the impacts of pressures caused by human activities and in many instances, indicated increasing trends in marine biodiversity loss. Inadequate monitoring compromises our ability to understand what measures are needed to reverse this trend in biodiversity loss and to enhance the ecosystem services that provide a wide range of benefits to society.

Within the UK, governance and funding-streams for monitoring programmes are disjointed and complex, with much of the crucial marine evidence collected from disparate country-level or localised programmes which do their best to meet multiple legislative drivers. The devolved nature of the UK Government and its funding-streams presents challenges for achieving an adequately funded and coordinated UK programme.

At the core of statutory marine biodiversity monitoring is the need to assess whether our seas are [healthy and biologically diverse](#). This requires a comprehensive programme of evidence to inform status assessments, and any measures needed for the sustainable management of our marine ecosystem. An understanding of ecosystem functioning and monitoring of its key components is integral to early detection of environmental changes and effective conservation and management strategies.

To develop advice on achieving a fully functioning UK programme of monitoring, JNCC completed a review of UK marine biodiversity monitoring, on behalf of the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG) of UKMMAS. Options were developed for monitoring the key components of our marine ecosystem: cetaceans, seals, birds, fish, pelagic habitats and benthic habitats (inshore, offshore and deep sea). Each of these components is interdependent and critical to a well-functioning and productive marine ecosystem. The outcomes of this review are presented as a series of reports in Annexes 1 to 8.

In 2018 this work reached a major milestone, bringing together advice from policy and scientific advisors on costed options for a UK approach to monitoring our marine ecosystem and their associated risks and benefits.

## 2 Why a UK marine biodiversity monitoring programme is needed

A vast range of oceanographic, climatic, and geomorphological conditions have contributed to the unique diversity of marine life around the British Isles, with many regions recognised as biodiversity hotspots (Hiscock & Breckels 2007). Monitoring of marine biodiversity is of paramount importance for the sustainable management and conservation of marine life and the ecosystem services they provide. It enables scientists and policymakers to detect and understand changes in species distribution, abundance, and health, providing valuable insights into the impact of human activities, climate change, and other environmental stressors.

Having monitoring and management programmes that are coordinated at a national and international level is crucial, as many marine species have mobile life stages or migrate across political boundaries during their life cycles. As each habitat supports a unique assemblage of species adapted to specific environmental conditions, having a coordinated programme allows a comprehensive approach to monitoring that considers all examples of habitats and species within each biogeographic (rather than political) region.

JNCC and HBDSEG acknowledge the importance of a UK coordinated programme of marine biodiversity monitoring. Without a coordinated approach, it is challenging to prioritise monitoring effectively and to implement integrated, adaptive management plans which consider the cumulative impacts of human activities on marine ecosystems. Vitally, any uplift in long-term marine biodiversity monitoring (and funding) would need to be proportioned across each of the four countries to ensure balance and representation of monitoring evidence across the marine biogeographic regions of the UK.

### 3 Development of advice on future monitoring

In the UK, marine biodiversity monitoring conducted by the Statutory Nature Conservation Bodies (SNCBs) and their key partners is orientated around five key biodiversity components of the marine ecosystem (mammals, fish, birds, pelagic habitats, seabed habitats (deep sea, offshore and inshore)), reflecting different policy and statutory obligations. In 2017, specialist scientists and monitoring experts followed a process designed by JNCC to develop sets of options for monitoring each marine biodiversity component in UK seas. Development of the options for monitoring followed a risk-based approach which focused monitoring in those areas where risk of damage to biodiversity from human activities was greatest, and where crucial evidence gaps could be filled. Each monitoring option represented a different evidence, risk and cost scenario, with each sequential option increasing in evidence provision from a reduced to a robust level of monitoring. The comprehensive option represented the monitoring required to provide a robust evidence base which supports confident decision making with minimal environmental risk.

The development of costed options for monitoring was overseen by a Programme Board which included managers from each of the SNCBs and policy representatives from Defra, Marine Scotland, Welsh Government and DAERA-NI. Technical review of the monitoring options was conducted by the Chief Scientists Group (CSG) which includes chief scientists from across the SNCBs, as well as by scientific experts within the Health and Biologically Diverse Sea evidence group (HBDSEG).

The options for monitoring each biodiversity component were reviewed and evaluated by policy representatives from each of the four Governments of the UK, at a series of individual workshops. Policy experts reached a consensus on an appropriate level of monitoring for each biodiversity component following evaluation of the evidence provision, risks and costs associated with each option.

The levels of monitoring suggested by policy representatives for each biodiversity component were reviewed together by the UK marine biodiversity monitoring community, at a facilitated two-day HBDSEG workshop. Science and policy experts appraised the level of evidence that would be delivered by the package of monitoring and its ability to fulfil specific evidence requirements. Review of all the biodiversity components together also provided an opportunity to review the balance of monitoring across the marine ecosystem.

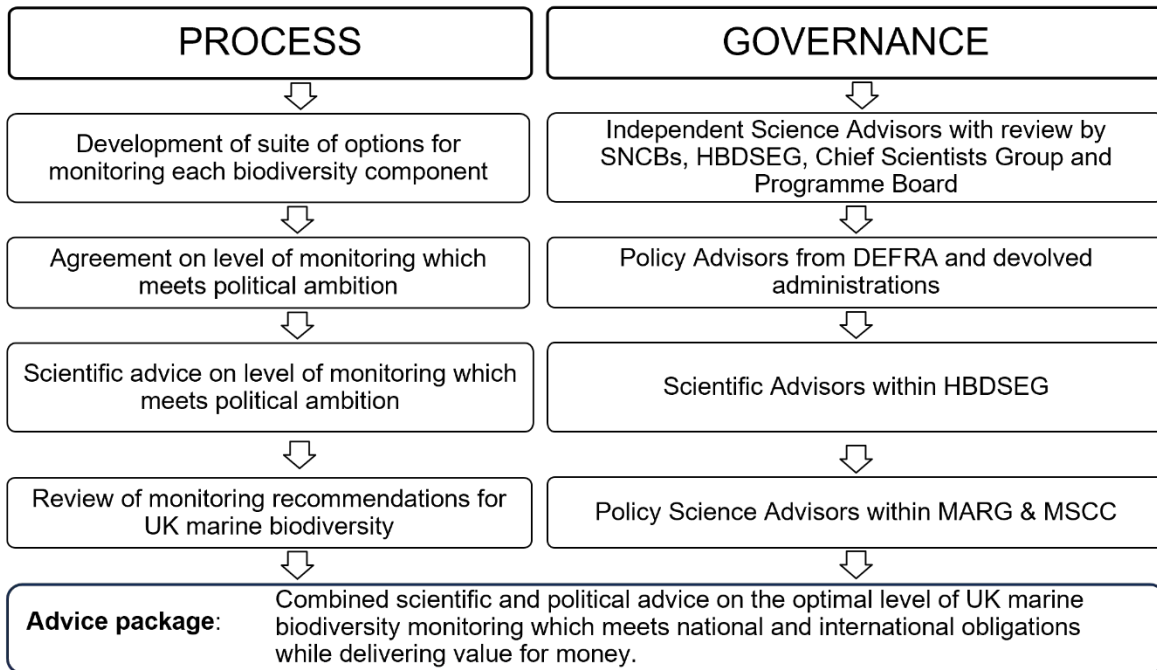
The HBDSEG community concluded that the level of monitoring suggested by policy representatives would require continuation of the existing programmes and additional monitoring focused in specific areas to meet the evidence needs for all UK marine biodiversity obligations. They advised on the specific monitoring needed to meet the minimum evidence threshold for each biodiversity component. A summary of the initial level of monitoring suggested by policy representatives and the additional monitoring advised by HBDSEG, is provided in Table 1.

The outcomes of the HBDSEG workshop formed the basis of an advice package on conducting monitoring of UK marine biodiversity. The proposed programme of monitoring was endorsed by the UKMMAS Marine Assessment Reporting Group (MARG) and Marine Science Coordination Committee (MSCC) and formed the recommendations presented in a business case to Defra.

The process and governance for developing advice on monitoring UK marine biodiversity, is summarised in Box 1.

The monitoring options developed for each biodiversity component and a summary of the individual workshop outcomes, are included in a report series in Annexes 1 to 8.

**Box 1:** Summary of process for identifying the level of marine biodiversity monitoring which maintains the optimal balance between environmental risk, political risk and cost.



**Footnote:**

UKMMAS: UK Marine Monitoring and Assessment Strategy  
HBDSEG: Healthy and Biologically Diverse Seas Evidence Group of UKMMAS  
MARG: Marine Assessment and Reporting Group of UKMMAS  
MSCC: Marine Science Coordination Committee



**Table 1.** A summary of the monitoring suggested by policy representatives and the additional monitoring advised by HBDSEG, for each biodiversity component (2018).

Biodiversity component	Level of monitoring suggested by policy representatives (2018)	Additional monitoring advised by HBDSEG for meeting the basic evidence needs (2018)
Pelagic habitats	<ul style="list-style-type: none"> <li>• Continuation of current monitoring activities.</li> <li>• Investment in data infrastructure to optimise all existing datasets for monitoring and assessment obligations.</li> </ul>	<ul style="list-style-type: none"> <li>• The inclusion of zooplankton sampling and recommencement of historic Continuous Plankton Recorder (CPR) routes. These developments will enable a consolidated assessment of plankton health with respect to human and climatic impacts across ecosystem components.</li> </ul>
Marine birds	<ul style="list-style-type: none"> <li>• Continuation of current monitoring activities.</li> <li>• Improved monitoring of non-breeding gulls and cormorants on land.</li> <li>• Inclusion of targeted offshore surveys for monitoring of waterbird species.</li> <li>• Implementation of recommendations to increase reporting power and accuracy.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased frequency of census monitoring and the Seabird Monitoring Programme to allow earlier detection of trends for all breeding seabirds and improved ability to understand impacts of pressures on marine waterbird populations.</li> <li>• Focused R&amp;D monitoring to understand the role of fish data in interpreting trends in marine bird populations.</li> </ul>
Cetaceans	<ul style="list-style-type: none"> <li>• Continuation of current monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased frequency of monitoring for small cetaceans from a decadal interval to every six years.</li> <li>• Investment in making better use of NGO data that is currently not included in assessments.</li> </ul>
Seals	<ul style="list-style-type: none"> <li>• Continuation of current monitoring.</li> <li>• UK Protected Species monitoring scheme upgraded to provide more robust data for seals.</li> <li>• The UK Cetaceans Strandings Programme (CSIP) expanded to include seals in England and Wales.</li> </ul>	<ul style="list-style-type: none"> <li>• Agreed level of required monitoring considered adequate; no additional monitoring advised by HBDSEG.</li> </ul>
Fish	<ul style="list-style-type: none"> <li>• Continuation of current monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Dedicated R&amp;D monitoring focused on critical data deficient areas of the inshore environment.</li> </ul>

Biodiversity component	Level of monitoring suggested by policy representatives (2018)	Additional monitoring advised by HBDSEG for meeting the basic evidence needs (2018)
(English) inshore benthic habitats	<ul style="list-style-type: none"> <li>• An increase in current monitoring effort to ensure representation of a subset of high-priority benthic habitats located in Marine Protected Areas (32% of MPA features within 28% of MPAs).</li> <li>• Inclusion of monitoring in representative areas of the wider environment.</li> </ul>	<ul style="list-style-type: none"> <li>• An increase in the spatial spread of monitoring to 43% of feature locations and 37% of MPA to enable improved understanding of trends and advise on management at regional scales.</li> </ul>
Offshore (excluding deep sea) benthic habitats	<ul style="list-style-type: none"> <li>• Monitoring of a representative subset of high priority benthic habitats within 60% of MPAs.</li> <li>• Inclusion of monitoring in representative areas of wider environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Inclusion of environmental data sampling and analysis to contextualise benthic habitats monitoring.</li> <li>• Improved access and optimisation of industry data and facilitate join-up in monitoring protocols to enable better understanding of impacts of human pressures.</li> </ul>
Deep sea benthic habitats	<ul style="list-style-type: none"> <li>• Monitoring of a representative subset of high priority benthic habitats within ~35% of MPAs.</li> <li>• Inclusion of monitoring in representative areas of wider environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring is conducted at an ecologically relevant frequency to improve ability to attribute variability in condition to natural variability of anthropogenic impacts.</li> <li>• Improved access and optimisation of industry data and facilitate join-up in monitoring protocols to enable better understanding of impacts of human pressures.</li> </ul>

## 4 Progress toward implementation of the advice

The advice aimed to secure sufficient funding for an adequate long-term monitoring programme and was dependent on the assumption that core UK monitoring would continue. However, for many aspects of marine biodiversity, this has not been the case. Core programmes are experiencing yearly erosion due to reduced budget allocations resulting in cessation of monitoring activities (e.g. reduction in sea days for benthic monitoring and cutting of historic continuous plankton recorder routes). This is against a backdrop of annually increasing costs for undertaking monitoring activities. Some monitoring programmes are largely supported by volunteer effort (e.g. birds) and research institutions (e.g. plankton) which are themselves under threat from funding cuts. If the staff and budget needed to support this volunteer effort is lost, the cost of replacing it would be significant.

There continues to be a need for investment in sustained monitoring over long-term timescales and to ensure adequate levels of monitoring are achieved across the key ecosystem components at a UK scale. Repeat long-term monitoring is needed to detect early changes in the health of the marine ecosystem and to determine if our management measures are effective in maintaining valuable ecosystem stocks and services. Without this knowledge, it is impossible to make informed decisions about conservation strategies and policy implementations.

Since submission of the advice, additional funding has been provided to fill specific evidence gaps and to make improvements to certain programmes. These short to medium term funding streams are valuable in enabling the design of specific research and development studies to answer key questions and develop new methods and techniques for efficient and strategic monitoring. However, an increase in long-term funding has not been achieved.

At the centre of the advice, was a review of UK public sector marine biodiversity monitoring. This information (included in report series Annexes 1 to 8) continues to be enormously useful in providing an overview of monitoring at that time and identifying where to focus additional monitoring when future opportunities arise. An audit of ongoing marine biodiversity monitoring programmes is maintained by the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG - the HBDSEG Stabilisation Review is available to member organisations). This audit provides information on the status of individual monitoring programmes and evidence gaps and is used to coordinate bids and focus additional (short-term) resources on improving their stability and functioning.

## 5 In summary

This paper and the supporting series of annex papers, represents a huge amount of work undertaken by JNCC and partner organisations via the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG). The underpinning review and options developed for monitoring UK marine biodiversity continue to be integral in identifying key evidence gaps and shaping current approaches for prioritising monitoring.

The risk-based approach to developing and reviewing monitoring options and the process for bringing together scientists, stakeholders and policy makers in the development of advice, provides a framework to assist others developing monitoring programmes. Publication of this framework alongside the underpinning evidence, provides an important reference point for future development of UK public sector marine biodiversity monitoring.

The advice highlighted by this process back in 2019, still stands today. Our marine environment is undergoing rapid transformation. It is imperative to understand these changes, to enable development of adaptive and sustainable management strategies that protect and enhance the ecosystem services upon which we rely. It is essential to embrace a unified UK approach to address the unique challenges of marine biodiversity loss so that we can understand changes that transcend administrative boundaries. To achieve this, it is essential to secure adequate long-term funding and committed governance operating at a UK level, supported by Devolved Administrations, Government organisations, industry, academia and the wider monitoring community.

## References

Hiscock, K & Breckels, M. 2007. Marine Biodiversity Hotspots in the UK. A report identifying and protecting areas for marine biodiversity. WWF UK.

## Appendix 1: List of Annexes

[Annex 1: 2018 options for monitoring UK cetaceans](#) (Kelly MacLeod 2024)

[Annex 2: 2018 options for monitoring UK seals](#) (Ailsa Hall 2024)

[Annex 3: 2018 options for monitoring UK marine birds](#) (Timothy E. Dunn 2024)

[Annex 4: 2018 options for monitoring UK fish](#) (Bill Turrell & HBDSEG fish subgroup 2024)

[Annex 5: 2018 options for monitoring UK pelagic habitats](#) (Abigail McQuatters-Gollop & Mike Best 2024)

[Annex 6: 2018 options for monitoring UK deep sea benthic habitats](#) (Hayley Hinchin & Simone Pfeifer 2024)

[Annex 7: 2018 options for monitoring UK offshore benthic habitats](#) (Hayley Hinchin 2024)

[Annex 8: 2018 options for monitoring English inshore benthic habitats](#) (Mike Young 2024)