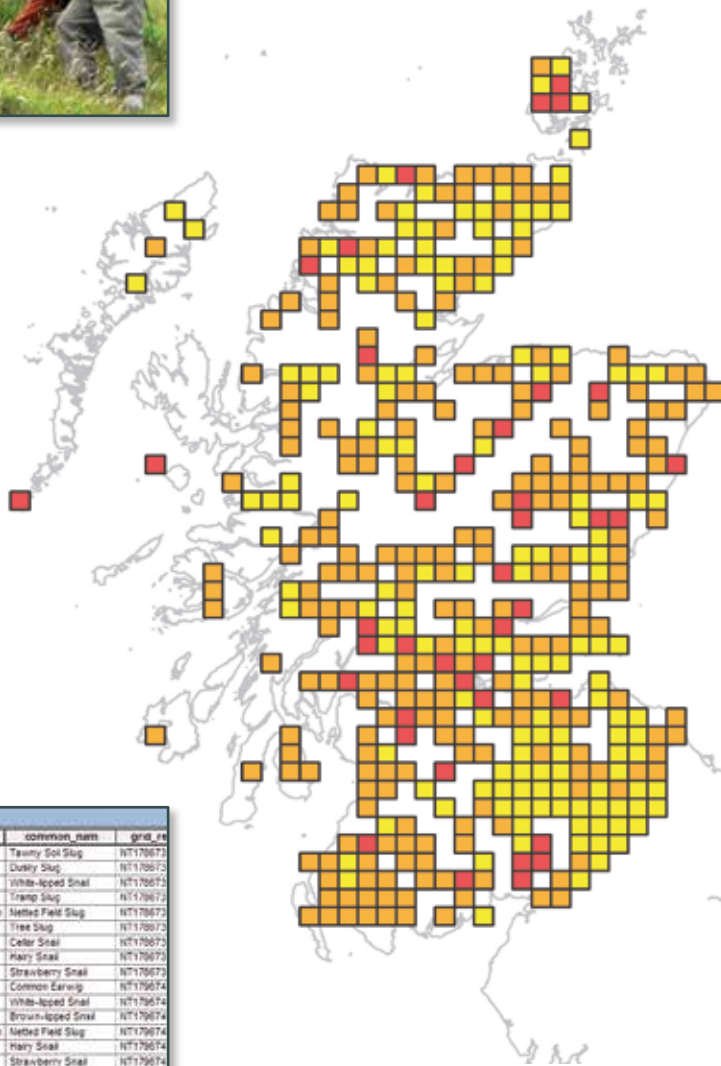
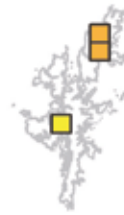


Making the Most of Biodiversity Data



date	scientific	common name	grid ref
01/0012	Aren (Koeella) oventi	Tawny Soli Slug	NT179673
01/0012	Aren (Mesanotis) sub-fasciatus	Dusky Slug	NT179673
01/0012	Cepaea (Cepaea) hortensis	White-lipped Snail	NT179673
01/0012	Deroceras invadens	Tramp Slug	NT179673
01/0012	Deroceras (Deroceras) reticulatum	Netted Field Slug	NT179673
01/0012	Litmanina marginata	Tree Slug	NT179673
01/0012	Oxychilus (Oxychilus) celtarum	Celtar Snail	NT179673
01/0012	Trochulus (Trochulus) hepaticus	Hairy Snail	NT179673
01/0012	Trochulus (Trochulus) striolatus	Strawberry Snail	NT179673
01/0012	Forficula auricularia	Common Earwig	NT179674
01/0012	Cepaea (Cepaea) hortensis	White-lipped Snail	NT179674
01/0012	Cepaea (Cepaea) nemoralis	Brown-lipped Snail	NT179674
01/0012	Deroceras (Deroceras) reticulatum	Netted Field Slug	NT179674
01/0012	Trochulus (Trochulus) hepaticus	Hairy Snail	NT179674
01/0012	Trochulus (Trochulus) striolatus	Strawberry Snail	NT179674
01/0012	Zenobella subreflexens	Brown Snail	NT179674
01/0012	Cepaea (Cepaea) hortensis	White-lipped Snail	NT179674
01/0012	Cepaea (Cepaea) nemoralis	Brown-lipped Snail	NT179674
01/0012	Deroceras (Deroceras) reticulatum	Netted Field Slug	NT179674
01/0004	Elipsoicus pumila	Elipsoicus pumila	NT266716
08/0002	Anisylus fluviatilis	River Impers	NT187720
05/0003	Anisylus fluviatilis	River Impers	NT186720
08/0007	Succinea asper	Brown-Rim-Snail	NT179674

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Introduction

The topics covered in *Making the Most of Biodiversity Data*, published by the Scottish Biodiversity Information Forum (SBIF), have been chosen to demonstrate some of the ways that biodiversity data are currently used. They illustrate the value of biodiversity data to researchers and decision-makers, highlight the need for a strong community of recorders and demonstrate the need for data to be shared and be readily available. The publication of *Making the Most of Biodiversity Data* is contributing to the fulfilment of the Forum’s Vision:

High quality species and habitat data will be collected and managed through a sustainable, co-ordinated and integrated local and national framework of organisations, partnerships and initiatives. These data will be available to ensure that Scotland's biodiversity, ecosystems and people benefit.

It is also contributing to the delivery of the SBIF’s Action Plan; further information about the SBIF and its Action Plan can be found on page 14 and at www.sbif.org.uk.

Copies of this publication can be ordered from coordinator@sbif.org.uk.

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Foreword

“Facts are like people: they may be dull as individuals but they become interesting when you can look at a long procession of them and compare one with another.” Aldo Leopold in *Farm Phenology - A New Sport*

Of the thousands of people in Scotland that meticulously record biodiversity data, I doubt if many would realise the varied applications of this data. People pursue wildlife and habitat knowledge for many reasons, from wanting to learn about nature in their neighbourhood, to making new species discoveries, to knowing what bird or butterfly visits their garden, to contributing to national mapping exercises for particular habitats or species or developing control programmes for invasive non-native species. Each species or habitat observation at a particular place in time is a record that on its own may be interesting but when collated and shared with all others becomes increasingly valuable in improving our knowledge about our environment.

Biodiversity data may be used in environmental decision-making, in understanding environmental change and in risk assessments about the status and health of species and habitats and the overall state of the Scottish environment. New applications are on the horizon, including assessments of nature’s services and natural capital and work to map the distribution of Scottish habitats and to determine their health is already underway. This publication brings together examples of how valuable biological data can be for a wide range of uses, from informing day-to-day planning decisions to assessing the risk of the spread of plant disease, amongst many others. It provides a vital step in increasing understanding of the importance of long-term observation, biological recording and habitat mapping in Scotland.

John Sawyer
Chief Executive, NBN Trust



Acknowledgements

We would like to thank our contributors: John Baxter (Scottish Natural Heritage (SNH)); Dan Chapman (Centre for Ecology & Hydrology (CEH)); Joanna Drewitt (Scottish Government); Calum Duncan (Marine Conservation Society); Ed Mackey (SNH); Carmen Mayo (SNH); Colin McLeod (SNH); Beth Purse (CEH); John Sawyer (NBN Trust); Kate Searle (CEH); Susie Turpie (Scottish Government); Graeme Wilson (The Wildlife Information Centre)

Scotland's Rural Development Programme 2014-2020: the use of biodiversity data in spatial targeting

Measures that seek to enhance biodiversity through Scotland's Rural Development Programme (SRDP)-funded agri-environment options vary geographically (spatial targeting) for best effect.

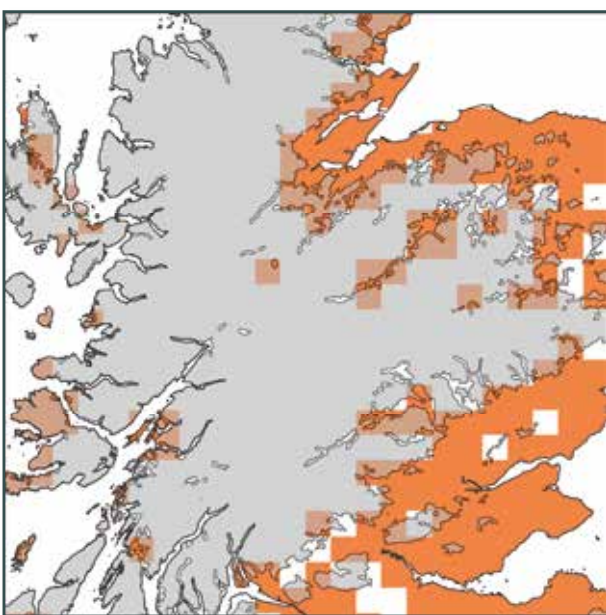
Introduction

Scotland's Rural Development Programme (SRDP 2007-2013 and 2014-2020) delivers funding support to improve the environment and the countryside. Habitat and species distributions are used to optimise the geographical targeting of 38 SRDP agri-environment management options in 2014-2020 to benefit biodiversity, climate change, water quality and flood management.

Species

Around 115 species were selected from the Scottish Biodiversity List on the basis

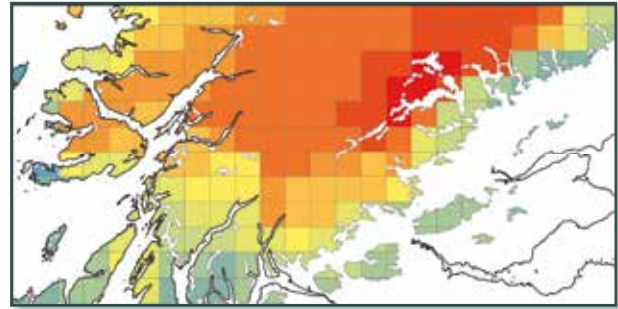
of: their presence on the Annexes of the Birds and Habitats Directives or the UK BAP list; or that they have declined in Scotland by more than 25%; and that they are sufficiently widespread to benefit from SRDP management options. Some options are available for individual species of restricted-range but spatial targeting is based mainly on groups of more widespread species. Species distribution records from 1950 onwards were sourced primarily through the National Biodiversity Network (NBN)¹. The overlapping species distributions for each option are then represented spatially as 'heat maps' of species richness on a 10 km grid. Species



◀ Potential spatial targeting of a 2014-2020 management option based on a species richness threshold. Part of the map of the *Enclosed Farmland Option—Wild Bird Seed for Farmland Birds* showing 10x10 km squares with 18 or more species present (orange) and upland areas delineated by the SNH Upland HAP context mask (grey)². Species records sourced through the NBN Gateway. © Crown Copyright and database rights 2014. SNH Ordnance Survey Licence 100017908.



▲ The extent and range of an upland habitat using data from the 2013 Habitats Directive report, Scotland assessment. Extract shows grey 10x10 km squares, known to contain the Annex I habitat H6170; blue is the habitat range (provided by JNCC). Both datasets were clipped to the SNH Upland HAP context mask². © Crown Copyright and database rights 2014. SNH Ordnance Survey Licence 100017908.



▲ A combined habitat heat map for the upland habitats of European importance. Extract shows 10x10 km squares indicating the number of coincident upland habitat ranges, numbering from 12 (red) to 1 (blue) habitats. Data provided by JNCC. Dataset was clipped to the SNH Upland HAP context mask². © Crown Copyright and database rights 2014. SNH Ordnance Survey Licence 100017908.

distribution and heat maps can be used individually, amalgamated, combined with other relevant information, or confined to the lowlands or uplands by means of an ecological mask. In this way, maps that guide the spatial targeting of management options are supported by explicit reasoning and evidence.

Habitats

Habitats, including machair and hedgerows, are also targeted for SRDP support. For example, in the uplands 12 habitats of European importance were mapped from 10 km grid maps of extent

and range in the Habitats Directive 2013 report. These are components of a new map which is being developed for Scotland's Biodiversity Strategy, based on the pan-European EUNIS-Annex I classification.

Spatial targeting

The mapping approach isn't a blunt instrument. It helps applicants to focus in on options that are locally relevant, and it provides supporting evidence in the assessment of applications. Importantly, it puts wildlife at the forefront of policy delivery.

Footnotes

¹ More than 7 million species records, mostly from the Botanical Society of Britain & Ireland, were accessed from 22 organisations through the NBN (plus from BTO directly).

² Upland HAP context mask (© Crown Copyright all rights reserved. Scottish Natural Heritage © JHI © CEH)

A risk map for spread of tree disease

Biological Recording data are invaluable for scientific research. Here we highlight an example where data from several sources was combined to map the risk of an invasive plant transmitting disease to local ecosystems and tree plantations.

Introduction

Emerging diseases are major threats to Scotland's forests. Two worrying new arrivals are the pathogens *Phytophthora ramorum*, the cause of "Sudden Oak Death" in North America, and *Phytophthora kernoviae*. In Scotland, *Phytophthora* is harboured by Rhododendron (*Rhododendron ponticum*) – an invasive tree that has escaped from cultivation and transmits *Phytophthora* to woodland and heathland plants including bilberry (*Vaccinium myrtillus*).

Under a project funded by the Scottish Government¹ scientists from the Centre for Ecology & Hydrology, Forest Research and the University of St Andrews aimed to develop a risk map for spread of *Phytophthora* by Rhododendron².

Biological Records of Rhododendron were critical to the success of this research.

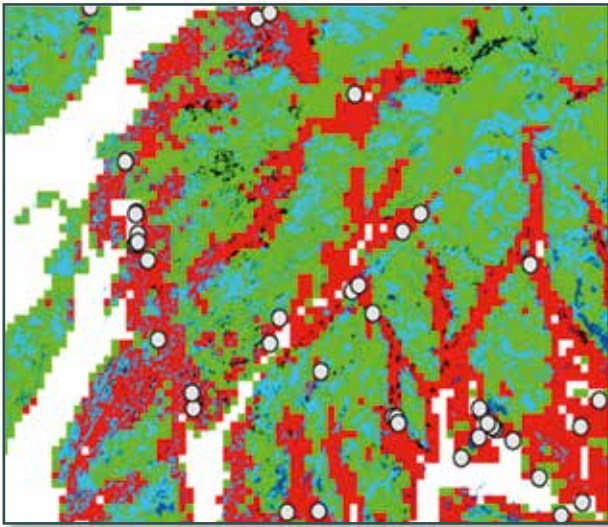
Phytophthora

Phytophthora ramorum was probably accidentally imported to the UK by the horticultural industry. The earliest detections date from 2002 and were from nurseries and garden centres. By 2010, *Phytophthora* had spread to larch trees in the Craignish, Argyll. Recent surveys reveal a rapid expansion of the disease across western Scotland.

Phytophthora kernoviae's principal host is Rhododendron. Although it was only discovered in 2003, at least two outbreaks have been detected in Scotland.

Invasive *Rhododendron ponticum* in woodland. Courtesy of the GB non-native species secretariat. © Crown Copyright 2009.





Part of the risk map for spread of *Phytophthora* by Rhododendron. Areas suitable for Rhododendron invasion are red, adjacent heathland is blue and the dots are large gardens.

Creating a risk map

The researchers' aim was to overlay three contributory factors causing risk for spread of *Phytophthora* by Rhododendron:

1. Large gardens, where *Phytophthora* could be accidentally introduced.
2. Rhododendron invasion.
3. Vulnerable woodland, heathland and larch plantations.

Rhododendron's distribution was assembled from 11 databases, 70% coming from Local Records Centres. However, this only provided a partial picture of the invasion – most of Scotland was outside the coverage of the surveys.

The importance of Biological Recording data

Success of the risk map relied on accurate Biological Records for Rhododendron. The scientists used new statistical techniques for dealing with patchy database coverage and the fact that Rhododendron's distribution may not yet be stable at this stage of its invasion of Scotland. These techniques are widely applicable to other such studies into distributions of diseases and invasive species.

Footnotes

¹ Scottish Government project grant code: CR/2008/55.

² Purse, B.V., Graeser, P., Searle, K., Edwards, C., Harris, C. (2013) *Challenges in predicting invasive reservoir hosts of emerging pathogens: mapping Rhododendron ponticum as a foliar host for Phytophthora ramorum and Phytophthora kernoviae in the UK*. Biological Invasions 15, 529-545.

Scotland's Marine Atlas: information for the National Marine Plan

The greatest challenge with respect to the wealth of data on the Scottish marine environment has always been finding a medium to bring it all together in an accessible format. Scotland's Marine Atlas was the first attempt to do this in order to help inform the development of the National Marine Plan. The atlas remains work in progress with the publication of the award-winning e-book version and the on-going development of the National Marine Plan interactive.

Introduction

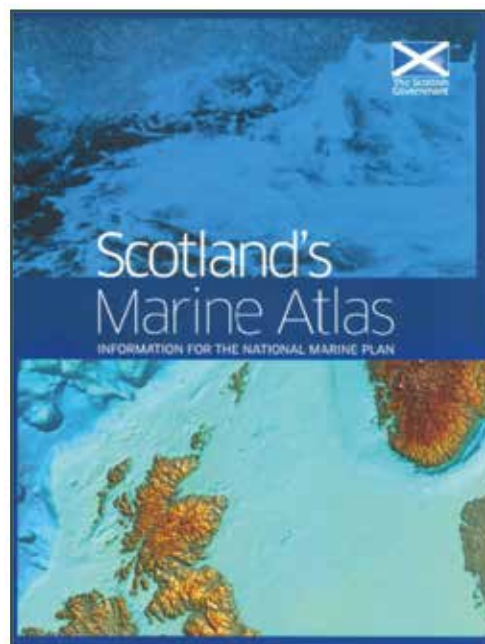
The *Marine (Scotland) Act 2010* and the *Marine and Coastal Access Act 2009* provide for marine planning in Scottish seas out to 200 nautical miles and give wide ranging marine conservation responsibilities. Delivering a more integrated approach to the sustainable development and protection of Scotland's seas is dependent on having ready access to the most up-to-date and comprehensive data set possible.

Scotland's Marine Atlas brings together that wealth of information in an easily accessible standardised form.

Atlas content

The atlas is built around the government's vision for the sea: clean and safe, healthy and biologically diverse, and productive. The compilation of the atlas was a collaborative effort led by Marine Scotland and Marine Scotland Science (MSS), involving Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), the Joint Nature Conservation Committee (JNCC), and the Marine Alliance for Science and Technology Scotland (MASTS).

The atlas was compiled from a variety of data sources. The key data sets are from the range of established monitoring programmes undertaken by MSS, SNH and SEPA, and from regularly published government statistics. These various data have been collected at different scales and the atlas has standardised this by defining 15 sea areas that enable the data to be presented regionally but also aggregated to give a national picture.



▲ Scotland's Marine Atlas.

Chapter 4, *Healthy and Biologically Diverse*, seeks to describe the distribution and character of the range of habitat types and key species groups in Scotland's seas. In particular it highlights the Priority Marine Features which represent those habitats and species considered of conservation importance in Scotland. The information presented draws on many data sources including SNH/JNCC, the Marine Life Information Network (MarLIN), the Shark Trust, the British Trust for Ornithology (BTO), the Scottish Association for Marine Science (SAMS), the Sea Mammal Research Unit (SMRU), the International Council for the Exploration of the Sea (ICES), and MSS. Topics covered range from broad-scale habitats and individual species, through plankton, commercial and demersal fish, sharks and rays, to marine mammals and birds as well as non-native species.

The principal aim of the atlas is to help inform the development of the National Marine Plan (NMP) and the associated Regional Marine Plans. This is an on-going process of which the publication of the atlas was a key early stage, but in

order to ensure the greatest possible accessibility to the information, and that the very latest data are available from the most recent surveys, other innovations have been developed.

As well as being available in hard copy and as a pdf on the web¹, the atlas has also been produced as an award-winning e-book². Furthermore the atlas has been linked to the National Marine Plan interactive (NMPi)³ which is a web-based interactive tool designed to assist in the development of the NMP. The NMPi is evolving all the time; new data points are added to the maps as they become available thus ensuring that decisions and discussions are always based on the best and most up-to-date information.

Collating all these data and maintaining them as up-to-date as possible is a major challenge that the NMPi is addressing by providing links to all relevant data sources including SNH, JNCC, Mapping European Seabed Habitats (MESH), MarLIN, the Data Archive of Seabed Species and Habitats (DASSH), Seasearch, SMRU and the Shark Trust.

Links

¹ Hard copy and pdf: www.scotland.gov.uk/Topics/marine/science/atlas/hbd

² E-book: www.scotgov.ehublibrary.co.uk/marine-scotland/marine-atlas

³ NMPi: www.scotland.gov.uk/Topics/marine/seamanagement/nmpihome

Biodiversity data and its role in local authority planning decision-making

Local Records Centres can supply biodiversity data to local planning authorities, consultants and other statutory bodies to aid in planning decisions and ensure that statutory bodies carry out their biodiversity duty.

Introduction

Biodiversity data is instrumental in making planning decisions to ensure that local planning authorities are not only carrying out their biodiversity duty but also that they are not going against any national or international legislation. Consultants working on planning proposals should also gather biodiversity data before carrying out on-the-ground work.

Gathering and processing the data

Local Records Centres (LRCs) gather data from a great number of sources, ranging from individual records from members of the public to large datasets from national recording schemes, and once gathered the data are processed and added to the LRC's database. LRCs can also play a vital role in the verification of data.

Supplying data for planning decisions

LRCs can either supply a local planning authority with protected species and habitat data so that the local authority can screen all planning applications against the data supplied themselves, or the local authority can enter an

agreement with the LRC to screen planning applications against a set list of criteria and supply reports identifying potential biodiversity constraints.

Interpreting biodiversity data

Correct interpretation of the data, once sent to the local planning authority, is vital. The data do not decree if survey work prior to determining an application is needed or not, but the interpretation of the data does. A qualified individual needs to assess the data and use it to determine any survey requirements. The screening of an application may have highlighted two or three issues but if the work proposed in the application is not going to affect these issues then there is no need to request further survey work. However, if suitable habitat for a protected species is highlighted, even though there are no protected species



▲ Badgers and their sett. © Chris Sydes.

records, the person doing the interpretation should request further survey work.

Consultants' desktop studies

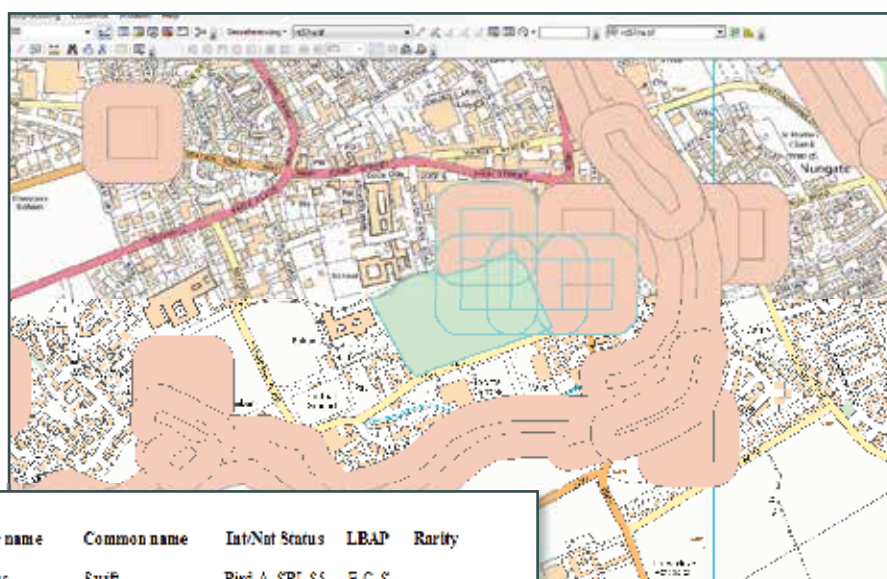
When undertaking survey work consultants should carry out a desktop survey prior to any fieldwork so that they can gain a better understanding of the site and any potential issues that they need to address in their report. A data request to an LRC can supply them with species, habitat and statutory and non-statutory protected sites data. Many best

practice guidelines make it clear that desktop studies should include a request to the LRC if one is present.

Statutory bodies

Many statutory bodies carry out projects, some of which need planning permission and some don't, and all statutory bodies have a biodiversity duty. By consulting with an LRC for biodiversity data at the planning stage of projects, potential biodiversity impacts may be identified and the statutory body can ensure they are carrying out their biodiversity duty.

An example of the use of GIS to screen a fictional planning application (green) against species and habitat data (brown). The results are picked out by pale blue lines.



Buffer	Grid Ref	Date	Scientific name	Common name	Int/Not Status	LEAD	Rarity
	NT516736	April 1999 - August 1999	<i>Apus apus</i>	Swift	Bird-A, SBL S5	E C S	
	NT516736	June 1995 - August 1995	<i>Larus argentatus</i>	Herring Gull	Bird R, CMS WB, SBL S5	E S	
	NT516736	March 1999 - December 1999	<i>Larus argentatus</i>	Herring Gull	Bird-R, CMS-WB, SBL S5	E S	
	NT516736	June 1995 - August 1995	<i>Muscicapa striata</i>	Spotted Flycatcher	DC-2, Bird-R, CMS-2, DS, SBL	E C S WFI	

The map contains Ordnance Survey data. © Crown copyright and database right 2015. OS Licence number 100040574.

▲ The resulting planning screening report.

Seasearch: citizen science underwater

Seasearch is an underwater citizen science project for volunteer sports divers who have an interest in what they're seeing under water, want to learn more and want to help protect the marine environment around the coasts of Britain and Ireland. The main aim is to map out the various seabed habitats found in the near-shore zone. By recording what lives in each area, we are hoping to identify the richest sites for marine life, the sites where there are problems and the sites which need protection. The Marine Conservation Society (MCS) co-ordinates www.seasearch.org.uk across the UK.

How does Seasearch work in Scotland?

In Scotland, with support from Scottish Natural Heritage, the MCS Scotland Programme Manager and Seasearch Scotland co-ordinator has co-ordinated the project since April 2000. Part-time regional Seasearch co-ordinators in Argyll and Northeast Scotland have provided additional capacity, where available, since 2005.

Since April 2000, over 50 Seasearch expeditions and weekends have been organised throughout Scotland, from Isle



▲ Scarp—Mike Bramham. Courtesy of Calum Duncan.

of Whithorn, Wigtownshire to Herma Ness, Shetland, and from Fife Ness to St Kilda. Over 2,000 Seasearch underwater records (Observer, Surveyor, pipefish, sea fan and fireworks anemone forms) have been submitted, which, assuming two divers and 40 minutes per dive, amounts to over 2,667 hours of voluntary survey time. All this data is quality assured then entered into the Marine Recorder database and merged by JNCC into the National Biodiversity Network database. The data is available at www.searchnbn.net for everybody to access.

What has Seasearch achieved in Scotland?

Most significantly, Seasearch information supported the search for new nature conservation MPAs required under the Marine (Scotland) Act 2010 that MCS helped secure. MCS submitted seven third party MPA proposals supported with Seasearch data (and social data gathered through Your Seas Your Voice) and two community groups submitted proposals which included Seasearch data as evidence of vulnerable features



▲ Flameshell in Loch Sunart. Courtesy of Calum Duncan.

needing protected. Six of these proposed MPAs were included in the 33 consulted on in Autumn 2013: Loch Fyne, Loch Sween, Loch Sunart, and Lochs Duich, Long and Alsh from MCS, which may have made the grade anyway though Seasearch bolstered the case for, and South Arran, proposed by Community of Arran Seabed Trust (COAST), and Small Isles by Small Isles Community Council.

Seasearch data has also helped map the sea life on historic wrecks in an exciting project in Scapa Flow (www.scapaflowwrecks.com); contributed to the Loch Torridon dive guide and marine planning pilot projects in the Firth of Clyde, Shetland and the Sound of Mull; informed regulatory advice on fish-farming and other activities; increased our knowledge of existing European Special Areas of Conservation (SACs) such as Isle of May, Firth of Lorn and Luce Bay; and, following Seasearch training, supported the scientific case for

COAST in their successful campaign for a No-Take Zone in Lamlash Bay, Isle of Arran and subsequent South Arran MPA proposal.

Seasearch has also increased our understanding of the distribution of a range of important marine species and habitats, including Priority Marine Features such as maerl, seagrass, horse mussel and flameshell beds, crayfish (*Palinurus elephas*), fireworks anemones (*Pachycerianthus multiplacatus*), fan mussels (*Atrina fragilis*) and northern sea fans (*Swiftia pallida*) in Scotland and helped plug gaps in our knowledge, particularly of the northeast coast of Scotland and parts of the Firth of Clyde.

Seasearch activity will continue in order to help map the inshore seabed around Scotland and generate scientific information to help identify those places meriting protection in MPAs and through the new marine planning system. Seasearch data is often the only data available for areas of inshore seabed, so with ever more scrutiny needed of how our seas are protected and managed, there has never been a more important time for any dive to be a Seasearch dive.

Scottish Biodiversity Information Forum

The Scottish Biodiversity Information Forum (SBIF) was established in June 2012 with the aim of benefitting biodiversity by improving the flow of biological information between organisations and individuals that collect data, and users of that data.

There are many issues that can inhibit the flow of biodiversity data through and between the components of this data pathway, and the Forum has developed an Action Plan containing eight Actions (outlined below) to address some of these issues. The Actions will be delivered by the Forum's groups and sub-groups.

Action No.	Action	Delivery group/sub-group	Stakeholders	Outcome
1	Finalise the SBIF vision	Steering group	The data community	Provide a focus for the SBIF Action Plan
2	Pilot a model data pathway	Data flow & data sharing sub-group	Data collectors, managers, sharers and users	Improve data quality and availability
3	Survey the data needs of the SBIF community and consider the information	Steering group	Data managers and users	Understand data requirements
4	Prepare and promote statements of best practice on data sharing	Commercial interests sub-group	Data collectors, managers and sharers	Increase amount of data shared by all sectors
5	Produce and promote standardised data collection and sharing protocols	Commercial interests sub-group	Data collectors and sharers	Improve data quality and increase data sharing
6	Compile and disseminate case studies that illustrate good practice and the value of data gathering and sharing	Data flow & data sharing sub-group	Data users	Increase awareness of the availability, value and use of biodiversity data
7	Encourage LRCs to carry out a gap analysis on their data holdings and to identify if data available through the NBN Gateway can fill the gaps	Data flow & data sharing sub-group	Data managers and users	Increase availability and usage of data locally
8	Encourage audit of training needs and opportunities for training and skills sharing	Steering group	Data collectors, managers, sharers and users	Secure skills for the future

Front cover images: credits

Map of Scotland: distribution of *Baetis rhodani*. Contains Ordnance Survey data © Crown copyright and database right 2015. Species data courtesy of the NBN Gateway with thanks to all the data contributors (https://data.nbn.org.uk/Taxa/NHMSYS0000066962/Grid_Map). Crown copyright and database rights 2011 Ordnance Survey [100017955].

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