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**JOINT NATURE CONSERVATION COMMITTEE**

**THE FUTURE ROLE OF JNCC IN BIOLOGICAL SURVEILLANCE AND MONITORING**

**Paper by Paul Rose and Ian McLean**

**1. Introduction**

- 1.1 During 1996 to 2000, JNCC and the country agencies developed a framework for the surveillance and monitoring of UK terrestrial and freshwater biodiversity. In March 2000, the Joint Committee considered a paper which set out a two-year Work Plan which aimed to make substantial progress on this Surveillance Framework.
- 1.2 Because of resource constraints over the last two years, progress in implementing the Surveillance Framework has been slower than had been hoped, although there have been a number of notable achievements.
- 1.3 At its March 2002 meeting, the Joint Committee, in its discussions on the 2002 Spending Review, requested a paper outlining priorities for surveillance and monitoring within an overall strategic framework.
- 1.4 This paper provides an opportunity to re-examine the Surveillance Framework in the light of JNCC's *Statement of Strategic Direction*, with a view to developing the Framework into a vision (which is shared with the country agencies, Government and other stakeholders) for the surveillance and monitoring of biodiversity in the UK. Such a vision would include the terrestrial, freshwater and marine environments. When implemented, it would enable JNCC to report on the status of, and trends in, the key habitats and species groups, and the linkage between them.
- 1.5 This paper seeks to meet the Joint Committee's request referred to in paragraph 1.3 above, while commencing the process of broader strategic development referred to in paragraph 1.4.
- 1.6 The paper:
  - i. summarises the objectives and drivers for surveillance and monitoring;
  - ii. begins the process of re-examining and broadening the Surveillance Framework for biological surveillance and monitoring in the UK to build a 10 year vision;

- iii. summarises progress made towards implementing the two-year Work Plan agreed in 2000;
- iv. outlines the mechanisms and process for implementing surveillance and monitoring;
- v. identifies JNCC's role within the surveillance framework, and its priorities for 2003/04 to 2005/06, and,
- vi. comments on the resource implications for JNCC.

## 2. Objectives and Drivers for Surveillance and Monitoring

- 2.1 Surveillance and monitoring are tools for assessing the extent and changing condition and status of habitats and species (definitions of surveillance and monitoring are given in Annex 1). They are essential parts of a successful strategy to conserve biodiversity, by measuring changes and revealing some of their causes, as well as giving guidance on the effectiveness of alternative policies and conservation tactics.
- 2.2 In principle, a UK surveillance and monitoring framework should aim to detect changes in the status of UK biodiversity, the impacts of different factors upon biodiversity and the effects of policy and management responses taken to counteract the causes of declines. Recognising that it is impossible to undertake surveillance of all biodiversity directly, those elements that are measured will, wherever possible, be used as indicators for the remainder.

### Objectives

- 2.3 The primary objectives of a UK surveillance and monitoring framework for biodiversity are to:
  - i. detect changes in habitats and species over time, to signal areas where declines are occurring, and to enable hypotheses on the causes of change to be developed;
  - ii. determine the condition of protected (designated) areas and the contribution they make to maintaining the wealth and range of the UK's biodiversity;
  - iii. ensure that national and international obligations for the undertaking of surveillance and monitoring are complied with in the most cost-effective manner;
  - iv. contribute to European and global audits of the state of biodiversity;
  - v. inform the identification of priorities for nature conservation action (whether these be policy, legal, incentive or action-based).

## Drivers

- 2.4 A key driver for surveillance and monitoring is the need to set priorities for nature conservation action, as referred to in paragraph 2.3 v. above.
  - 2.5 It is also important to comply with national and international obligations for surveillance and monitoring. Obligations to detect changes in the status of biodiversity, and the causes of change, arise primarily from the EC Habitats Directive, EC Birds Directive, Convention on Biological Diversity, Ramsar Convention and the requirement by Government to monitor and report on the condition of designated sites. The main obligations are listed in Annex 2.
  - 2.6 In terms of understanding the causes of trends in biodiversity, it is often necessary to be able to set the state of UK biodiversity in a European and Global context. This enables a comparison between what is happening in the UK with changes in other countries, and is a first step towards comparing the effects of human influences in neighbouring countries (including the effect of European policies such as the Common Agricultural and Fisheries Policies). Those migratory species that move between countries (notably birds) need to be surveyed throughout their range to discover where and when factors are affecting their populations. Participating in surveillance activities that involve several countries will also facilitate exchanges of ideas and best practice and hence improve the quality of what is achieved.
3. **Developing a vision for UK surveillance and monitoring of biodiversity over the next decade**
- 3.1 Taking account of the Objectives and Drivers for surveillance and monitoring summarised above, it should be possible to develop a vision and framework for surveillance and monitoring of biodiversity in the UK for implementation over the next decade. JNCC and the country agencies cannot develop such a vision and framework on their own. This will require the engagement of other key partners, most notably the UK Government and Devolved Administrations who have a crucial role in co-ordinating and resourcing surveillance and monitoring. Other key partners will be the statutory environment agencies, the conservation NGOs and the wide constituency of volunteer recorders.
  - 3.2 In developing this vision and framework, the heritage of existing schemes of surveillance and monitoring must be taken fully into account. These schemes have served the nature conservation community well in the past and, with any necessary modification, will continue to be important components of future surveillance and monitoring in the UK.
  - 3.3 The Surveillance Framework developed by JNCC and the country agencies between 1996 and 2000, although centred on terrestrial and freshwater environments, was supported by Defra and can serve as a starting point for the development of a vision and framework. It can also be extended to the marine environment, where Defra is already engaged in a process of developing an integrated marine monitoring system, though this is still in a fairly early stage of development.

- 3.4 The Surveillance Framework, adjusted to include components of the marine environment, is summarised in Figure 1 below. Entries shown in **bold** type relate to areas of the Framework where schemes are already underway. Other entries shown in normal type indicate areas where surveillance and monitoring schemes have not yet been developed.

**Figure 1**

**Surveillance and Monitoring Framework**

<b>SITES</b>	<b>SPECIES</b>	<b>HABITATS</b>
<b>Common standards monitoring of designated sites (SSSIs and Natura Sites)</b>	<b>Breeding Birds (land and sea)</b> <b>Wintering and passage waterfowl</b> <b>Seaduck and divers</b> <b>Butterflies</b> <b>Sea mammals (some)</b> <b>Bats and other land mammals</b> <b>UK BAP Priority Species (few)</b> <b>Threatened higher plants</b>	<b>Land cover types</b> <b>Broad habitats (some)</b> <b>Priority habitats (some)</b>
	Sea mammals (some) Fish Dragonflies Moths UK BAP Priority Species (most) Threatened lower plants	Broad habitats (some) Priority habitats (some)

- 3.5 The above Framework relates primarily to the surveillance and monitoring of biota and we need to build in mechanisms for identifying the impacts of human activities and assessing their relative importance. This aspect is included in Common Standards Monitoring but should be incorporated into the Surveillance Framework more comprehensively. Consideration also needs to be given as to whether information on the effects of response measures taken to mitigate adverse effects can also be incorporated into the Framework.

**4. Progress on developing and implementing the Surveillance Framework**

- 4.1 Progress to date with implementing the work programme agreed by JNCC in March 2000 is given in Annex 3. Progress has been slower than hoped because of the severe constraints on financial resources and staff time. In summary, the work on piloting approaches to mammal and threatened plant monitoring are making progress, and a mammal monitoring scheme is ready for initial implementation. In contrast, work on other species groups and habitats has made virtually no progress, other than in relation to UK Biodiversity Action Plan species and habitats for which some surveillance has been initiated within the Action Plans.
- 4.2 The establishment of ecological relationships between species and habitats or between groups of species has been very slow. This information is essential if indicators are to be utilised effectively, and for interpreting changes in biodiversity, but this work depends heavily on habitat inventory and surveillance and this has been very slow to start.

## 5. Mechanisms and process for implementation of surveillance and monitoring

- 5.1 There are several types of technique available for surveillance and monitoring:
- i. *Remote Sensing* is useful for getting a complete estimate of the extent of some habitats (particularly in relation to terrestrial environment) but is limited to what it can distinguish without field testing and is often of variable and unknown quality. There might be some potential to detect impacts from remote sensing in the near future (eutrophication, sedimentation etc). Countryside Survey 2000 (CS2000) is an excellent example of how much remote sensing can offer to habitat surveillance in the terrestrial environment;
  - ii. *Representative Sample Surveys* are appropriate for widespread biodiversity features such as broad habitats and common or widespread species. Change in status can be detected well by these schemes but results are difficult, although not impossible, to interpret if they cannot be set within the context of a total measure of the biodiversity resource. An initial, and occasionally updated, estimation of the total resource (e.g. a habitat inventory) also makes selection of the representative sample much easier and, when updated, serves to recalibrate the trends detected by sample survey. The Breeding Bird Survey and elements of CS2000 are good examples of sample-based surveys. The recent Seabird 2000 census will enable the value of the much more limited Seabird Monitoring Programme to be assessed - an example of an inventory approach being taken to assess a sample survey for a species group;
  - iii. *Targeted surveillance* of e.g. rare biodiversity is very precise but only covers a very small number of biodiversity features and is relatively costly to undertake. Rare biodiversity features are, however, often the subject of intense action and are virtually impossible to detect through any random sampling techniques so this type of survey is essential. The Butterfly Monitoring Scheme is an example of targeted surveillance (currently operating on about 120 sites nationally);
  - iv. *Biological Recording* is useful because of the huge quantity of available data, extensive coverage of UK species and long time series (for some groups extending back to the Victorian era). The disadvantage is the nature of biological recording for which there is limited consistency of recorder effort, species covered, geographic scope or recording methods. These potential biases can however be estimated by comparing biological records with the results from specifically targeted species monitoring schemes. Biological records also provide a useful independent assessment of interpretations of change made from indicators.

5.2 The Surveillance can be carried out in a number of ways:

- i. *Using professionals* is costly and limits the sample size, but professionals accept precise direction and can be used to undertake relatively arduous and complex surveillance schemes such as those required for the marine environment. The increased control tends to reduce inter-observer variability, but, in general, there is little evidence to indicate that expertise of professionals is greater than that of competent volunteers;
- ii. *Volunteers* are relatively cheap and can provide very large sample sizes, but they require effort to maintain and enthuse and there is a limit to what they can be asked to do, since the activity has to be pleasurable and fit with their interests;
- iii. *Using others (institutions and sectors)* who are undertaking surveillance for their own purposes can be extremely efficient but there is a limit as to how flexible these schemes are to meet our requirements, and the staff time needed to develop and maintain the partnerships necessary for this approach to work can be high. Measurement of human impacts will most likely be delivered in this way; for example, air and water pollution surveillance carried out by the environment agencies. Using others is likely to be a significant component of surveillance in freshwater and marine environment.

5.3 *Indicators*

Indicators are an intrinsic part of our vision for surveillance. Ecological relationships, and associations between biodiversity and those factors that impact on our flora and fauna, will, wherever possible, be employed so as to use the biodiversity features we survey directly also as indicators (proxy measures) of the state of, and trends in, other features. Thus top predators (such as raptors) respond to the abundance of their prey and can be sensitive indicators of the health of their prey populations.

5.4 In the subtidal marine environment there are few volunteers, very few existing long-term monitoring schemes and, generally speaking, the biodiversity is relatively expensive to survey or monitor. For these reasons, it is likely that a representative, sample-based approach will predominate. Because marine surveillance is more difficult, it is even more important to make as much use of indicators as possible. The multiple use of marine biodiversity information is likely to increase the quality of data needed for marine biodiversity compared to terrestrial.

5.5 It is likely that integrated surveillance schemes for the terrestrial and marine environment will consist of components making biodiversity assessments based on three types of approach:

- i. representative sample-based surveillance;

- ii. supplementary surveillance schemes for localized or difficult features of biodiversity;
- iii. surveillance which supports site condition monitoring.

## 6. Potential JNCC roles

- 6.1 The JNCC role in developing and implementing the vision and framework of surveillance and monitoring needs further discussion but is likely to include:
- i. developing, particularly with Government, the overall vision and framework as the basis for surveillance and monitoring in the UK, and facilitating its integration with other relevant surveillance activity;
  - ii. maintaining an overview, understanding and foresight of the drivers for biodiversity surveillance in the UK. This includes wider environment, sustainable development, international context and significance etc;
  - iii. co-ordinating the delivery of key biodiversity monitoring and surveillance programmes, including component schemes run by different funding organisations that need to be linked together at a UK level;
  - iv. setting standards for survey and monitoring (habitat classifications, quality assurance procedures, data management standards, data access standards, appropriate use guidance, etc);
  - v. analysing and interpreting results (statistics and indicators);
  - vi. undertaking thematic analyses across several monitoring schemes, for example to combine results for different species groups within a habitat type;
  - vii. reporting the findings regularly (primarily via the JNCC website);
  - viii. advising Government and others on the significance of the results;
  - ix. advising Government and others on what should be done.
- 6.2 Confirmation of the above roles is only possible in consultation with other stakeholders and players and in light of the direction given by JNCC's overall strategy.

## 7. **Priorities for 2003/04 to 2005/06**

- 7.1 *Agreeing the vision and framework with Government.* During 2003 and 2004 the vision and framework should be further developed in the context of the further development of JNCC's overall strategy, and discussed and agreed with Government. In parallel, JNCC will continue to contribute to the Defra work to integrate environmental monitoring in the marine environment, and we will promote similar co-ordination in the terrestrial and freshwater environments.
- 7.2 *Maintaining existing surveillance and monitoring programmes.* JNCC will continue to support and implement the current surveillance programmes, notably the breeding bird, wintering/passage bird, seaduck/divers, butterflies, and wildlife and pollution programmes, and also complete the development work for site condition monitoring. We will modify the Seabird Monitoring Programme in the light of the Seabird 2000 census. (Ongoing).
- 7.3 *Completing the guidance on Common Standards Monitoring of designated sites.* The work to complete Common Standards Monitoring guidance should be substantially completed during 2003/04. Further refinement and consolidation is likely to be required over the period 2004/06 to 2005/06.
- 7.4 *Completing the development of the mammal and threatened plant schemes.* So far as resources allow, JNCC will complete the work to develop and implement surveillance programmes for terrestrial and freshwater mammals, and for threatened plants (by 2005/06).
- 7.5 *Filling the gaps in the Surveillance Framework.* JNCC will consider with Government, and other stakeholders and partners, how to address the remaining gaps in the Surveillance Framework.

One of the highest priorities for development will be the surveillance of broad and priority habitats. In particular, we will endeavour to develop broad habitat and priority habitat inventories as a basis for selecting and interpreting representative samples of habitat that can be surveyed annually to detect changes in extent and quality. This approach could be piloted using some of the habitat types for which reasonable information already exists. Data from CS2000 and Ordnance Survey are potential contributors to many habitat inventories and the woodland and wetland data, maintained by the Forestry Commission and the Environment Agency respectively, are also potential starting points. The annual sample-based surveillance of heathland and grasslands being undertaken by English Nature should also be considered to help develop standards for the selection of representative samples of habitat. (2003/04 to 2005/06). We will also have to consider the requirements for habitat surveillance in the marine environment.

Depending on the availability of funding, by 2005/06 we will implement pilot surveillance schemes for species groups that are not covered by existing programmes. The priorities are dragonflies, fish, and reptiles and amphibians.

- 7.6 *Assessment of human impacts.* JNCC will discuss further with stakeholders and partners how to assess human impacts on biodiversity in relation to identifying the causes of change detected by our long term biodiversity surveillance schemes. This aspect of the surveillance framework needs to be developed for our existing long-term monitoring schemes (e.g. birds, butterflies) and extended as new pilot schemes are implemented and start to produce consistent results. (2004/05 to 2005/06).
- 7.7 *Setting UK biodiversity in a European and Global context.* JNCC will participate in European initiatives to compare performance of different species groups across Europe (starting with the most tractable groups, such as birds, butterflies and vascular plants). In addition, there is the need to compare the extent and condition of habitats across Europe. These initiatives are essential if we are to be a key player in influencing both European policies and in helping to build up biodiversity conservation across Europe. (Ongoing).
- 7.8 *Facilitating access to data.* JNCC will support and facilitate the National Biodiversity Network (NBN) which will remain the means by which JNCC and its partners will enable data and information about UK biodiversity to be shared and used. Increasing the NBN will take on the role of sharing surveillance and monitoring information, building upon the existing distribution datasets. The role of the NBN in working with the national recording schemes and specialist societies, as well as linking to the local records centres, will remain crucial in delivering UK surveillance. The NBN links together the providers of information (professionals and volunteers) with the customers for biodiversity information that will enable much better sharing of best practice as well as improved co-ordination and more effective information use.
- JNCC will continue its efforts to promote access to data relating to the marine environment (particularly data collected with the use of public funds) held by other organisations. (2003/04 to 2005/06)
- 7.9 *Interpreting and disseminating information.* JNCC will enhance its activity in ensuring that the results of surveillance and monitoring are appropriately interpreted and disseminated. This work will be undertaken incrementally from 2003/04, building on work already initiated through the birds surveillance programmes, and will include the first site condition monitoring report in 2005.
- 7.10 *General.* In order to keep the continuity of effort needed to sustain long-term surveillance schemes, and to retain the loyalty and efforts of the volunteers, stable funding and careful selection and piloting of the methods are essential. JNCC has entered into partnerships with the major organisations who coordinate national surveillance schemes with the intention of creating stability and, where possible, bringing in extra funding from these partners. The existing JNCC-supported schemes represent good value for money and have the necessary long-term approach; they need to evolve over time to improve their coverage and accuracy.

## 8. **Resource implications**

- 8.1 The majority of the priorities identified under Section 7 above can be delivered through the resource provision made in the Corporate Plan for 2003-06, assuming minimum increases in funding for the latter two years. However, exceptions to this, will include:
- i. completing and implementing the mammal and threatened plant surveillance schemes referred to in paragraph 7.4 above;
  - ii. significant development of the habitat surveillance work identified under paragraph 7.5 above;
  - iii. implementation of pilot surveillance programmes for the additional species groups listed in paragraph 7.5 above;
  - iv. setting UK biodiversity in a European and global context (see paragraph 7.7 above).
- 8.2 During 2003, the resources required to carry out the work referred to in paragraph 8.1 i. and ii. above will be assessed and reported to the Joint Committee.
- 8.3 Also during 2003, and subject to the work needed to define the vision and framework further, the wider resource implications of implementing the Framework will be assessed within the context of how best and by whom the various elements might be delivered, and the results of this reported to the Joint Committee.

## 9. **Conclusion**

- 9.1 The Joint Committee is invited to discuss the proposed vision and framework set out in this paper, and agree its further development during 2003.
- 9.2 It is proposed to contribute the thinking outlined in this paper to the further work to develop JNCC's strategy also to be carried out during 2003.
- 9.3 Subject to the outcomes of the process outlined in paragraph 9.1 and 9.2 above, the JNCC Support Unit will further develop the vision and framework, in consultation with the country agencies, Government and other stakeholders, and present a refined paper, including resourcing estimates and recommendations, to the Joint Committee later in 2003.

## ANNEX 1

### Definitions

**Surveillance:** repeated surveys (or counts) designed to detect changes in the abundance of species (or features) with known precision

**Monitoring:** repeated surveys (or counts) carried out in conjunction with other data collections activities designed to discover the causes of changes in abundance, and to assess the effects of conservation or other actions

JNCC funds biological surveillance programmes (although some include the term monitoring in the title), which are less expensive and less detailed than the equivalent monitoring programmes would be.

## **ANNEX 2**

### **National and international obligations for Surveillance and Monitoring in the UK**

#### **EC Habitats Directive**

Article 11 requires Member States to carry out surveillance of habitats and species of Community importance. These include all the habitats listed on Annex I, and the species listed on Annexes II-V.

#### **EC Birds Directive**

Article 10 requires Member States to encourage monitoring required as a basis for the protection, management and use of all naturally occurring wild bird species, with particular emphasis to the subjects listed in Annex 5.

#### **Convention on Migratory Species**

The African-Eurasian Waterbird Agreement requires surveillance on the species of waterbirds listed on its Annex. These include many species of UK waterbirds, including seaduck and divers.

The Eurobats Agreement implies the undertaking of surveillance of bat populations (but the requirement under Article 11 of the Habitats Directive is the stronger obligation).

#### **Ramsar Convention**

Article 4.3 requires Contracting Parties to encourage the monitoring of wetlands and the fauna (particularly waterbirds) and flora they support.

#### **Convention on Biological Diversity**

Article 7 requires Contracting Parties to monitor, through sampling and other techniques, those ecosystems and habitats, and species and communities which require urgent conservation measures and which offer the greatest potential for sustainable use.

Action Plans developed for priority habitats and species, developed under the UK BAP, sometimes include monitoring provisions.

#### **UK Government(s)**

Government requires that monitoring of notified SSSIs and ASSIs to be carried out to assess their condition in terms of the flora, fauna or geological or landform features for which they were notified.

## Annex 3

## March 2000 Committee Paper – Work Plan and progress achieved.

Measure	Current monitoring status	Action needed	Progress made
Common Standards Monitoring of designated sites (SSSIs, Natura etc)	Monitoring being undertaken in England and planned for Scotland, Wales and Northern Ireland.	Guidance on development of conservation objectives for monitoring required, together with advice on implementation.	Guidance on development of conservation objectives well advanced. Advice on implementation under development.
Extent of Broad habitats	Monitoring widespread Broad habitats on land achieved through CS2000. FC Woodland inventory.	Identify and address shortfall in habitat coverage.	None
Extent of priority habitats	EN/RSPB heathland inventory.  EN Grassland inventory and planned coastal and lagoon inventory.	Develop and maintain information on extent of key habitats as part of the BAP process. Reporting through lead partners.	Lead partners have carried out some work that will be assessed through the UK Biodiversity Action Plan reporting exercise that finished in December 2002. Some priority habitat data reported by lead partners is being assessed and delivered through the National biodiversity Network (NBN) to identify priorities for future work.
Quality assessment of Broad habitats	Partly achieved through CS2000 and woodland inventory.	Identify and address shortfall.	None
Quality assessment of priority habitats	Some HAPs require assessment of habitat quality.	Reporting through lead partners. Identify and address shortfall.	Lead partners have carried out some work that will be assessed through the UK Biodiversity Action Plan reporting exercise that finished in December 2002. Some priority habitat data reported by lead partners is being assessed and delivered through the National biodiversity Network (NBN) to identify priorities for future work.
Birds	Nearly all species are being monitored.	DETR/BTO project to relate birds data to CS2000 squares about to start. Waterbirds scheme for linear wet habitats. Feasibility of seaduck monitoring being investigated. Set UK birds in their European context by participating in current initiatives.	Birds continue to be well monitored and are used as indicators but more work could be done to interpret results more extensively.  Seaduck monitoring methodology piloted and initial surveillance undertaken.
Mammals	Pilot bat project underway. Somewhat <i>ad hoc</i> recording of other species and species-specific special surveys.	Integrated mammal monitoring project to be started in 2000; bat monitoring project on permanent footing from 2001.	Pilot work is ready to be implemented. Resources and staff are agreed until 2005/06 but there is a current shortfall in funding.

<b>Measure</b>	<b>Current monitoring status</b>	<b>Action needed</b>	<b>Progress made</b>
Fish	EA/SEPA recording schemes?	Find out the nature of existing fish recording schemes; systematise recording.	Initial investigations only.
Invertebrates	Butterfly Monitoring on sites, river invertebrate monitoring; <i>ad hoc</i> recording of the major invertebrate groups by specialist networks. Rothamstead moths scheme, also aphids.	Rethink butterfly recording and develop a national scheme, as possible pilot for other invertebrate schemes.  Consider a possible scheme for the dragonflies.	Initial work on options for expansion of Lepidoptera surveillance has been started.
Plants	<i>Ad hoc</i> recording.  Threatened higher-plants database being compiled.	Develop systematic recording of threatened plants with BSBI. Preparatory work on threatened lower-plants database. Develop a systematic scheme for plants more generally with PlantLife, possibly using indicator species	Collation of data for many threatened plant species has been completed, a new plant atlas was published in 2002, and work is underway to integrate atlas and threatened plant data and to establish the nature of threatened plant recording long-term based on the results so far.  Threatened bryophyte data is being collated.
Priority species subject to a Species Action Plan	Lead Partner Reporting [?]	Monitoring action is through Action Plan implementation; reporting by Lead Partners.	Lead partners have carried out some work that will be assessed through the UK Biodiversity Action Plan reporting exercise that finished in December 2002. Some priority species data reported by lead partners is being assessed and delivered through the National biodiversity Network (NBN) to identify priorities for future work.