



Marine Monitoring Handbook

March 2001

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Introduction

Aim

To provide guidance on marine Annex II species to assist the selection of appropriate monitoring techniques and their field deployment

Of those Annex II species that occur in the marine environment around the UK,¹ this section only provides advice for three species for which the UK has currently selected sites (November 2000) – namely, grey seal, common (or harbour) seal and bottlenose dolphin. The present section only presents some basic advice on aspects relating to the establishment and implementation of monitoring programmes for these three species. There are many standard texts available that provide more detailed guidance on generic issues relating to species monitoring.²

Each section starts with a basic introduction to the species and some background information on the site selection policy for sites in the UK. It is followed by advice on selecting appropriate techniques for monitoring each generic attribute³ and information specific to monitoring these attributes. Finally, specific advice is given on health and safety issues for monitoring studies.

Under the Conservation of Seals Act 1970, the Natural Environmental Research Council (NERC) has a statutory obligation to provide the UK Government with advice on the size and status of British seal populations. NERC's Sea Mammal Research Unit (SMRU)⁴ regularly monitors grey and common seals using standard techniques. Surveying is mostly restricted to sites in Scotland where over 90% of each species are found. Data from these and other monitoring programmes were used to identify and define candidate SACs and will provide important contextual information against which the results from future SAC monitoring studies may be compared.

A considerable amount of research data is available for aspects of the life cycle and life history of these species at some sites – for example, Aberdeen University⁵ have studied the Moray Firth area; Aberdeen University, the Sea Watch Foundation and Nekton have studied Cardigan Bay. Nevertheless, there are significant gaps in our understanding of the biology and population dynamics of all three species, but particularly the bottlenose dolphin. Consequently the scope of the advice presented below is limited and will be revised, as the results of on-going research become available.

It should be noted therefore that:

- very little information is available for Annex II species, particularly the bottlenose dolphin;
- at present, it is not possible to complete all the sections of the attribute table – more research is required on appropriate attributes to define favourable condition;
- many monitoring techniques are not fully tested or established.

Therefore, the advice provided in this section is based on our present understanding (Spring 2001) and is likely to change as our practical experience of SAC monitoring increases. In particular, the Joint Nature Conservation Committee is developing detailed guidance during 2001 to implement the UK's Common Standards for Monitoring programme that will probably result in a significant revision of this section.

The listing of an attribute in the tables in this section does not imply that it should form part of a monitoring programme for the feature, but it may need to be considered.

1 Grey seal, common seal, bottlenose dolphin, harbour porpoise, otter, twaite shad, allis shad, Atlantic salmon, river lamprey and sea lamprey.

2 For example: Ecoscope (2000c) *A species and habitats monitoring handbook. Volume 3: Species*. Research, Survey and Monitoring Report No. [XX]. Scottish Natural Heritage, Edinburgh; also Sutherland, W J (1996) *Ecological Census Techniques*. Cambridge University Press, Cambridge.

3 See **Section 2** for an explanation.

4 See <http://smub.st-and.ac.uk/>

5 See <http://www.abdn.ac.uk/~nhi104/seals/marmamm.htm>

Grey seal *Halichoerus grypus*



Figure 4.1 Grey seal *Halichoerus grypus* (Paddy Pomeroy, SMRU)

Introduction to the species' interest

The grey seal *Halichoerus grypus* is the larger of the two resident species in the UK, reaching a length of up to 2.45m and weighing up to 310kg (both measurements for adult males)¹ (Figure 4.1). Typically they breed on exposed rocky coasts and in caves but occur in most coastal habitats at other stages of their life cycle. They are predominantly fish feeders taking a variety of species including sandeels, gadoids, salmonids, and flatfish, with cephalopod and crustacean invertebrates occasionally consumed. Their dietary composition varies seasonally and is linked to the availability of prey species. Grey seals form polygynous breeding groups but the size of the groups and the sex ratio varies with the nature of the habitat. Sites with open access may have a ratio of one male to two females but where access is restricted, for example in caves, the ratio may rise to one male for every ten females. The timing of breeding varies but in general, it occurs in September–October in S.W. Britain, October–November in west and north Scotland, and November–December at the Isle of May (Firth of Forth) and the Farne Islands. A single pup is produced and weaned after 16–21 days. Females come into oestrus towards the end of lactation when mating occurs. Females leave the breeding site soon after mating, and so there is no parental care for the pups post-weaning. In the UK, humans are the only major predator of adult grey seals, although potentially, predation by large cetaceans (e.g. killer whales) or sharks may occur in offshore areas. Starvation and infection are established sources of pup mortality.

The Sea Mammal Research Unit (SMRU) of the Natural Environmental Research Council (NERC) has extensively studied grey seal biology and population dynamics in the UK. In particular, they have completed surveys of population size,² diet, movements and foraging behaviour (using Satellite Relay Data Loggers attached to seals)³ and genetic diversity.

Approximately 40% of the world population of grey seals breed at UK sites, which represents 95% of the EC population. There are breeding colonies all round the coast, from the Scilly Isles clockwise to the North Norfolk Coast. These colonies vary greatly in size with the main breeding colonies located in the Inner and Outer Hebrides, Orkney, Shetland, the mainland coast of north and north-east Scotland, the Isle of May, the Farne Islands and west Wales.

The largest breeding colonies, based on pup production, are candidate SACs. Sites were selected using the most up-to-date population information available at the time, although populations at individual sites may fluctuate. Sites were also chosen to reflect the geographical distribution of breeding sites – for example in west Wales, which is the most southerly breeding population.

1 These statistics and the following text are taken from: Bonner, W N and Thompson, P M (1990) Seals, etc.: Order Pinnipedia – Grey seal. In: Harris, S and Corbet, G B (eds) *The Handbook of British Mammals*, Chapter 11, pp. 472–480. Blackwells, Oxford.

2 See http://smub.st-and.ac.uk/ch1_1.html

3 See http://smub.st-and.ac.uk/ch3_2.html

Monitoring requirements and suggested techniques for grey seal

To help implement the UK's Common Standards for Monitoring programme, it is necessary to recommend a small number of techniques that are likely to provide comparable measures for each attribute (Table 4-1). The UK Marine SACs project evaluated the inter-comparability of some of these techniques (for example acoustic versus visual counts of dolphins), but considerable further work is required to establish suitable techniques for many attributes. The advice presented below will be updated when new information becomes available.

Table 4-1 Suggested techniques for measuring the attributes that may be used to define favourable condition of grey seal populations. Guidance will be developed for the techniques listed.

<i>Generic attribute</i>	<i>Feature attribute</i>	<i>Technique</i>
Quantity (abundance)	Population size	Aerial photo-monitoring; Direct counts from boat or shore; Mark-recapture; Photographic mark/recapture
Population dynamics	Recruitment	Pup counts;
	Mortality	Track adult survivorship; Adult and pup carcass recovery
	Emigration	Tracking pups
	Immigration	Tracking pups
Population structure	Age structure	Estimate natural population structure; ID of known individuals
	Sex ratio	
	Fragmentation/isolation	
	Genetic diversity	DNA analysis
Habitat requirements	Area for breeding	Aerial photography; Habitat mapping; Airborne remote sensing; Shore survey
	Area for feeding	Fish census techniques; AGDS; Side scan sonar; Acoustic fish monitoring
	Undisturbed area for breeding	Monitor disturbance events ⁵
	Environmental processes	Measure water quality factors ⁶ ; Debris/litter survey ⁷ ; Survey injury to animals

Specific issues affecting the monitoring of grey seal

Estimating population size

The current surveillance programme undertaken by the SMRU is likely to make a substantial contribution to condition monitoring of SACs. Currently, each discrete breeding site in the Inner and Outer Hebrides, Orkney and the Isle of May is photographed between three and six times at regular intervals every year throughout the breeding season. Aerial surveys are carried out from a light twin-engine aircraft, using a large format aerial camera mounted in a vibration-damped, motion-compensating cradle. At sites in Pembrokeshire, the Farne Islands, Orkney and Lincolnshire, population size is estimated by ground counts from boat and shore. These techniques (aerial or ground) should be

4 See *Grey seals: Status and monitoring in the Irish and Celtic Seas*
<http://www.ucc.ie/ucc/research/crc/pages/research/project1.htm>

5 Disturbance in breeding areas may reduce pup production.

6 To determine levels of nutrients, pollutants and pathogens.

7 For example, discarded monofilament nets and ropes may entangle seals causing lacerations.

used for all other sites not surveyed by these existing programmes. Counting grey seals at breeding or haul-out sites will only provide an *estimate* of the population size and structure because it cannot take account of the proportion of the population at sea.

Seals can travel up to 100km per day, and individual animals have been tracked for 3,000km. Consequently there may be large migrations between breeding and haul-out sites. There is a regular interchange of individuals between sites on the east coasts of Scotland and England, although there remains some genetic differentiation between each population. Some of these movements may be seasonal and linked to seasonal changes in the spatial distribution/availability of prey species. There is limited information on the fidelity of individuals to a particular breeding site but some have been recorded returning to the same location on an annual basis for at least 15 years. These movements must be considered when interpreting the results of condition monitoring studies on population size in an SAC.

Population dynamics

Pup counts are taken at the breeding sites and may provide an estimate of birth rate. Mortality amongst newborn pups can be as much as 15%, with a further mortality rate of between 40 and 60% occurring within 12–18 months.

The main causes of mortality are difficult to quantify as many seals (adults and pups) die at sea, but disease caused by parasites, pollution and entanglement in discarded/lost fishing nets are some of the main causes.

A detailed understanding of the population dynamics needed in order to define favourable condition of the grey seal is not available.

Habitat requirements

Grey seals depend on the sea for their food but also have a need for safe areas of land to haul out to rest, give birth and moult. They require undisturbed areas, usually uninhabited off-shore islands, that afford easy access to the intertidal and adjacent coastal areas above Mean High Water of spring tides. There is increasing evidence that certain habitat features, such as access to shallow freshwater pools, are important.

Studies demonstrated that grey seals can forage widely, although most feeding activity was within 50km of a haul-out site. Typical foraging trips last from two to five days. Nevertheless, satellite telemetry studies show distinct aggregations of animals at offshore locations in the North Sea, often where the seabed comprises coarse sand and gravel. Monitoring attributes in relation to foraging area and prey availability will be difficult for grey seals because of their mobility and ability to switch between prey species.

Health and safety

Grey seal colonies are often located in remote areas that present considerable health and safety risks. Staff must follow all standard procedures, particularly in relation to working alone (to be avoided), working in remote areas and working from small boats. Some specific risks are:

- working in caves;
- working on offshore rocks, where difficulties are associated with landing, wave surges, being stranded by a rising tide;
- attack by adult seals, particularly during the breeding season and/or in confined spaces (caves or gullies);
- infection of wound if bitten;
- bacterial infection from seal faeces at breeding/haul-out sites.

The Wildlife and Countryside Act 1981⁸ and the Animals (Scientific Procedures) Act 1986⁹ control and regulate the study of wild animals that involve the capture and release, handling or remote sampling of individuals. Under this legislation, a licence is required from the UK Government for all activities that require the capture or handling of grey seals.

8 See: <http://www.wildlife-countryside.detr.gov.uk>

9 See: <http://www.homeoffice.gov.uk>

Common seal *Phoca vitulina*



Figure 4.2 Common seal *Phoca vitulina* (Lighthouse Field Station, University of Aberdeen)

Introduction to the species' interest

The common seal *Phoca vitulina* (also known as the harbour seal) is the smaller of the two resident species in the UK, reaching a length of up to 1.85m and weighing up to 130kg (both measurements for adult males).¹ Common seals' habitual haul-out areas are generally found in shallow, sheltered waters, sea lochs and island archipelagos. They are characteristically found on sandbanks, mud flats and estuaries on the east coast of the UK (Wash, Dornoch Firth), or shores of small islands or isolated skerries in west Scotland and the outer islands. Individuals return to favoured haul-out sites and there are no known migratory movements. They are predominantly opportunistic fish feeders taking a variety of species that are locally abundant, and also invertebrates such as cephalopods, gastropods and crustaceans. Adult females bear a single pup in June or early July with no obvious regional differences around the UK. Pups are weaned after about 4–5 weeks and normally complete by late July at most colonies. Mating occurs soon after weaning. Common seals are top predators in the UK and there are few known sources of mortality. In 1988, populations were reduced by about 50% following a phocine distemper virus epizootic. Common seals are often perceived as having a great impact on fisheries, particularly those using set nets and cages, although their actual impact on fish populations is estimated to be very low. Pups were hunted for their skin in north and west Scotland and the Wash until the passing of the Conservation of Seals Act in 1970. In order to protect their catch, fishermen may kill seals if they are interfering with fishing gear.

The Sea Mammal Research Unit (SMRU) of the Natural Environmental Research Council (NERC) and Aberdeen University² have extensively studied common seal biology, population dynamics and diet on the east coast of Scotland. SMRU undertake annual surveys to estimate population size.³

The UK holds approximately 5% of the world population of common seals, and approximately 50% of the EC population. The biogeographical distribution in UK waters ranges from Strangford Lough, Northern Ireland to the south shores of the Clyde and then clockwise round the coast to the Thames estuary. The common seal is widespread, but population density varies greatly from place to place, with low numbers at many sites. This means it can be difficult to define the boundaries of specific sites. The census of the common seal population is based on numbers hauling out in coastal locations during the moulting period in August. Such haul-out areas are thought to be very important for the conservation of the species, as are the most important breeding colonies. Sites were selected using the most up-to-date population information available at the time, although populations at individual sites may fluctuate.

1 These statistics and the following text are taken from: Bonner, W N and Thompson, P M (1990) Seals, etc.: Order Pinnipedia – common seal, in: Harris, S and Corbet, G B (eds) *The Handbook of British Mammals*, Chapter 11, pp. 462–471. Blackwells, Oxford.

2 See <http://www.abdn.ac.uk/~nhi519/lighthse/seals/seals.htm>

3 See http://smub.st-and.ac.uk/ch1_1.html

Monitoring requirements and suggested techniques for common seal

To help implement the UK's Common Standards for Monitoring programme, it is necessary to recommend a small number of techniques that are likely to provide comparable measures for each of attribute (Table 4-2). The UK Marine SACs project evaluated the inter-comparability of some of these techniques (for example acoustic versus visual counts of dolphins), but considerable further work is required to establish suitable techniques for many attributes. The advice presented below will be updated when new information becomes available.

Table 4-2 Suggested techniques for measuring the attributes that may be used to define favourable condition of common seal populations. Guidance will be developed for the techniques listed.

<i>Generic attribute</i>	<i>Feature attribute</i>	<i>Technique</i>
Quantity (Abundance)	Population size	Thermal aerial photography; Colour aerial photography; Direct counts from boat or shore
Population dynamics	Recruitment	Pup counts
	Mortality	Pup carcass counts; Adult carcass recovery; Tagging individuals
	Emigration	Satellite telemetry
	Immigration	Satellite telemetry
Population structure	Age structure	ID of known individuals
	Sex ratio	
	Fragmentation/isolation	Count haul-out sites
	Genetic diversity	DNA techniques
Habitat requirements	Area for breeding	Aerial photography; airborne remote sensing; Habitat mapping
	Area for feeding	Habitat mapping (AGDS; Side scan sonar); Fish census techniques; Acoustic fish monitoring
	Environmental processes	Measure water quality factors ⁴ ; Debris/litter survey ⁵ ; Survey injury to animals ⁶

Specific issues affecting the monitoring of common seal

Estimating population size

The current surveillance programme undertaken by the SMRU is likely to make a substantial contribution to condition monitoring of SACs. Currently, SMRU surveys common seals every five years in Scotland and annually in Lincolnshire and Norfolk. Surveys are carried out in August during the moult within two hours of low tides occurring between 13:00 and 19:00 hours. For rocky or seaweed dominated sites, seals are surveyed using a thermal-imaging camera mounted on a helicopter to discriminate the well-camouflaged seals from the background (Figure 4.3). Helicopters are preferred to fixed-wing aircraft because they can carefully follow the shore along a complex coastline. Conventional aerial photography is used for the east coast sandbank sites where those seals hauled out are conspicuous against the background sediment.

⁴ To determine levels of nutrients, pollutants and pathogens.

⁵ For example, discarded monofilament nets and ropes may entangle seals causing lacerations.



Figure 4.3 A conventional photograph (left) and a thermal image (right) of common seals on a skerry in Scotland (from SMRU Internet site)

Although these surveys coincide with the period when the maximum number of seals are likely to be ashore, there will be an unknown number of animals in the water at the time of survey. Research studies in Orkney, the Moray Firth and the Wadden Sea developed ‘correction factors’. In the Moray Firth, the proportion of seals hauled out was estimated to be 0.5–0.75 of the total population.^b It is important to establish the activity patterns of the seals when planning any census as the habitat can strongly influence the animal’s behaviour. For example, common seals on rocky shores in Orkney had diurnal patterns of activity, whereas in the Moray Firth the availability of haul-out sites on sandbanks depended on the tidal cycle. Census techniques must minimise within-year variation by investigating activity patterns at a local level. The study in the Moray Firth concluded that population trends may be detected over 4–6 years using annual counts based on 2–3 visits per year; >5–6 visits per year were found to be inefficient.

Population dynamics

Common seal movements can be investigated by VHF or satellite-linked telemetry. Individuals are captured at the haul-out site and the telemetry device, which usually includes a data logger, glued to the fur on the top of the seal’s neck.^{c,d} These tags detach from the body during the annual moult. Common seal movements are strongly influenced by local food availability, and most movements are considered ‘local’ compared with grey seals. Individuals may travel up to 45km on trips lasting six days, but then return to their ‘home’ site. Most mass movements are associated with the dispersal of young animals, although seasonal movements between haul-out sites are known.^e

Population structure

Sex ratio may be an important attribute, although any change may not manifest as a problem for several generations. It is necessary to investigate sex ratio at least twice during the annual life cycle because the sex of animals at a haul-out is biased toward female during the pupping season, and toward male during the annual moult.^b

Common seals require suitable haul-out sites throughout their life cycle. Studies have shown that this species forms discrete populations with little interchange of individuals between populations. Any loss of haul-out sites within an SAC will affect the local common seal population. It may be necessary to monitor the number of haul-out sites with the SAC.

Habitat requirements

Common seals are coastal feeders, rarely occurring further than a few kilometres offshore. Populations appear to remain within an area throughout the year, although the number of individuals at a haul-out site will change throughout the year. Studies have shown that seasonal changes in site use may be linked to a site’s physical characteristics, because they may be suitable for breeding females during pupping, or groups undergoing the annual moult, or because there are seasonal patterns in the abundance of the seal’s prey near a site.^c Maintenance of viable populations within SACs is therefore clearly linked to the availability of suitable haul-out sites with foraging areas nearby (<60km) throughout the life cycle.

Monitoring the availability of suitable feeding areas must be linked to contemporary analyses of the seal’s diet because common seals switch their preferred prey in relation to its local abundance both within and between years.^f Diet composition can be ascertained by analysing faecal material from samples collected at haul-out sites. The location of feeding areas can be determined by telemetry studies. The type of prey consumed will determine the technique required for monitoring prey abundance within these areas.

Health and safety

Common seal colonies are often located in remote areas that present considerable health and safety risks. Staff must follow all standard procedures, particularly in relation to working alone (to be avoided), working in remote areas and working from small boats. Some specific risks include:

- working on sandbanks: getting stuck in the sediment, being trapped by rising tide;
- working on offshore rocks: difficulties associated with landing, wave surges, being stranded by a rising tide;
- attack by adult seals, particularly during the breeding season;
- infection of a wound if bitten;
- bacterial infection from seal faeces at breeding/haul-out sites.

The Wildlife and Countryside Act 1981⁶ and the Animals (Scientific Procedures) Act 1986⁷ control and regulate the study of wild animals that involve the capture and release, handling or remote sampling of individuals. Under this legislation, a licence is required from the UK Government for all activities that require the capture or handling of common seals.

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6 See: <http://www.wildlife-countryside.detr.gov.uk>

7 See: <http://www.homeoffice.gov.uk>

Bottlenose dolphin *Tursiops truncatus*



Figure 4.4 Bottlenose dolphin *Tursiops truncatus* (from Lighthouse Field Station, University of Aberdeen Internet site)

Introduction to the species' interest

Bottlenose dolphins may attain a length of 2.7m and weigh up to 275kg (both measurements for adult males).¹ They are long-lived marine mammals living up to 50 years of age. Females reach sexual maturity at 5–12 years of age and may produce a calf every 2–3 years throughout their 40–50 year life span. Births occur over an extended period with a peak in March to May, and possibly during August and September. This species is widely distributed in the North Atlantic, West African, Mediterranean and UK coastal waters, with most sightings within 10km of land. Two predominant populations occur in UK inshore waters – Cardigan Bay and the Moray Firth. In addition, small groups appear to be resident or near-resident in waters off Cornwall and Dorset. The total population in the inshore waters of the UK is probably between 300 and 500 individuals. The species used to be more widespread, especially in the southern North Sea and English Channel, and has certainly declined in range. Their diet is predominantly fish, although cephalopod invertebrates (squid and cuttlefish) are consumed.

Aberdeen University² and the SMRU³ have studied the dolphin population in the Moray Firth since 1988. Since 1989 they started a joint project to develop photo-identification techniques in an attempt to study the size and dynamics of the Moray Firth population.

In order for site designation under the Directive to be an appropriate mechanism for protection of Annex II species, it is expected that clearly identifiable areas can be defined that have the physical and biological factors essential to the life and reproduction of a population of the species. Only two areas in UK waters have been identified that meet this criterion for bottlenose dolphins; both these localities have been selected holding the only two substantial resident populations of the species in UK waters. While the individuals using the two sites may range further afield for part of the year, dolphins are present throughout the year and easily recognised individuals have been seen over periods of several years. This repeated occurrence and continual presence indicates that the sites are critical for the maintenance of these populations.

Monitoring requirements and suggested techniques for bottlenose dolphin

To help implement the UK's Common Standards for Monitoring programme, it is necessary to recommend a small number of techniques that are likely to provide comparable measures for each of attribute (Table 4-3). The UK Marine SACs project evaluated the inter-comparability of some of these techniques (for example, acoustic versus visual counts of dolphins), but considerable further work is required to establish suitable techniques for many attributes. The advice presented below will be updated when new information becomes available.

1 These statistics and the following text are taken from: Evans, P G H (1990) Whales, Dolphins and Porpoises: Order Cetacea – Bottlenose dolphin, in: Harris, S and Corbet, G B (eds) *The Handbook of British Mammals*, Chapter 9, pp. 331–333. Blackwells, Oxford.

2 See <http://www.abdn.ac.uk/~nhi519/lighthse/dolphins/dolphins.htm>

3 See http://smub.st-and.ac.uk/ch4_5.html

Table 4-3 Suggested techniques for measuring the attributes that may be used to define favourable condition of bottlenose dolphin populations. Guidance will be developed for the techniques listed.

<i>Generic attribute</i>	<i>Feature attribute</i>	<i>Technique</i>
Quantity (Abundance)	Population size	Counts; Mark/recapture by photo-ID; Acoustic techniques
Population dynamics	Recruitment	Count juveniles
	Mortality	Fishery by-catch survey; Stranded carcass returns;
	Immigration	Photo-ID of individuals
Population structure	Age structure	
	Sex ratio	
	Fragmentation/isolation	
	Genetic diversity	
Habitat requirements	Area for breeding	
	Area for feeding	Habitat mapping (AGDS; side scan sonar); Prey census techniques
	Environmental processes	Measure water quality factors; ⁴ Debris/litter survey in relation to injury to animals; ⁵ Incidence of skin lesions

Specific issues affecting the monitoring of bottlenose dolphin

Population size

For the Moray Firth population, the estimate of population size was derived from a mark-recapture model using the proportion of photographed individuals in several separate samples. It is important to standardise the recording period (using time) to avoid any bias in the results; that is, the counts are effort-limited. Consistent identification of an individual relies on markings that persist between surveys (Figure 4.5). This may require more regular surveillance visits than condition monitoring events (perhaps every six years). In the Moray Firth, there is a photo-archive of over 395 'individuals'. Some animals occur more than once either because their identifying marks were lost between photographs, or because the photographs represent left and right views that it had not been possible to link together.

⁴ To determine levels of nutrients, pollutants and pathogens.

⁵ For example, discarded monofilament nets and ropes may entangle seals causing lacerations.



Figure 4.5 Examples of some of the main types of natural markings used to identify individual bottlenose dolphins in the Moray Firth population. Clockwise from the top left: dorsal fin nicks, depigmented areas, rake marks; and skin lesions (after Lighthouse Field Station, University of Aberdeen⁶)

Shore or boat-based counting techniques that do not involve any identification of individual animals are prone to error due to the mobility of the animals both within and between counting periods. Individual dolphins can move rapidly throughout their range; for example, one individual in the Moray Firth was sighted at locations 190km apart within a 5-day period.^a Nevertheless, visual counts at stations known to be regularly frequented by dolphins may be important for assessing the effectiveness of any management actions, and if undertaken regularly may act as a regular ‘health check’ between monitoring events.

Passive acoustic monitoring of dolphin vocalisations may be useful for estimating the abundance of individuals within an SAC, particularly for monitoring changes in distribution and abundance in small, localised areas^b. This technique has the advantages of time/weather independence and it can detect dolphins over much greater ranges than visual census techniques^c. However, it is not possible to assess the proportion of individuals calling at any one time. Acoustic monitoring can provide a valuable adjunct to a visual census, and may provide a valuable tool for the long-term surveillance of dolphin activity patterns within an SAC. Photo-identification techniques are considered to be the more appropriate method for estimating changes in dolphin abundance over a wider area (whole SAC).^b

None of these counting techniques provides an absolute population size, rather a minimum estimate of population size for a defined period.

Population dynamics

It is possible to compile an inventory of individual dolphins within an area using photographic identification. From repeated observations it should be possible to track an individual dolphin through time. Aggregating the results for many individuals may provide a basic understanding of a population’s dynamics over time.

Analysis of stranded animals or corpses may provide surveillance data to support an assessment of the ‘health’ of dolphin populations. The UK Government funds schemes to report and collect stranded carcasses for post-mortem analysis.⁷

6 See: <http://www.abdn.ac.uk/~nhi519/lighthse/dolphins/mfdolfhid.htm>

7 For example, the Natural History Museum operates a stranding project (Tel: +44 (0)20 7938 8861); also the Collaborative Celtic Marine Strandings Project operates in Wales and Ireland.

Habitat requirements

The precise habitat requirement of bottlenose dolphins is poorly understood. Dolphins used different areas in the Moray Firth through the year^a and their distribution showed distinct geographical stratification. This stratification may restrict the animal's movements in confined sites such as firths and they may not be able to move away from localised disturbance or pollution.

Unless the entire SAC is being investigated, monitoring the extent and quality of prey habitats must be linked to contemporary surveys of the geographical location of dolphin populations rather than simply returning to the same area at each monitoring event. Dolphins can forage widely and therefore a decline in prey abundance in one area may not impact the population.

Incidence of skin lesions (Figure 4.5) has been tenuously linked to environmental factors (low water temperature and low salinity) and may be linked to anthropogenic contamination.³ At present there is no conclusive evidence for the latter although clearly a precautionary approach to SAC management would be advisable. Populations have only been studied for a proportion of an individual's likely life cycle (~12 out of 40–50 years) and chronic effects may yet materialise.

Health and safety

Bottlenose dolphins may occur in offshore and potentially remote areas. Staff must follow all standard procedures, particularly in relation to working alone (to be avoided), working in remote areas and working from small boats. Some specific risks include:

- using boats in offshore areas: it is imperative that suitable vessels are used in offshore locations; weather and sea conditions can deteriorate rapidly creating very hazardous conditions;
- working on isolated beaches/offshore rocks: difficulties associated with landing, wave surges, being stranded by a rising tide.

Swimming with dolphins is strongly discouraged – there is a potential risk of attack.

It is important to avoid disturbing or harassing dolphins with the survey vessel. Guidance is available on the Whale & Dolphin Conservation Society Internet site,⁸ and the Department for the Environment, Transport and the Regions (DETR) Internet site.⁹ DETR have recently published guidelines on minimising disturbance from whale watching operations under ASCOBANS.¹⁰

The Wildlife and Countryside Act 1981¹¹ (dolphins are a Schedule 5 species) and the Animals (Scientific Procedures) Act 1986¹² control and regulate the study of wild animals that involves the capture and release, handling or remote sampling of individuals. Under this legislation, a licence is required from the UK Government for all activities that require the capture or handling of bottlenose dolphins.

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8 See: <http://www.wdcs.co.uk/>

9 See: <http://www.wildlife-countryside.detr.gov.uk/whales/index.htm>

10 Agreement on the Conservation of Small Cetaceans of the Baltic and North Sea.

11 See: <http://www.wildlife-countryside.detr.gov.uk>

12 See: <http://www.homeoffice.gov.uk>