



Goose monitoring at key Natura 2000 sites in Bulgaria

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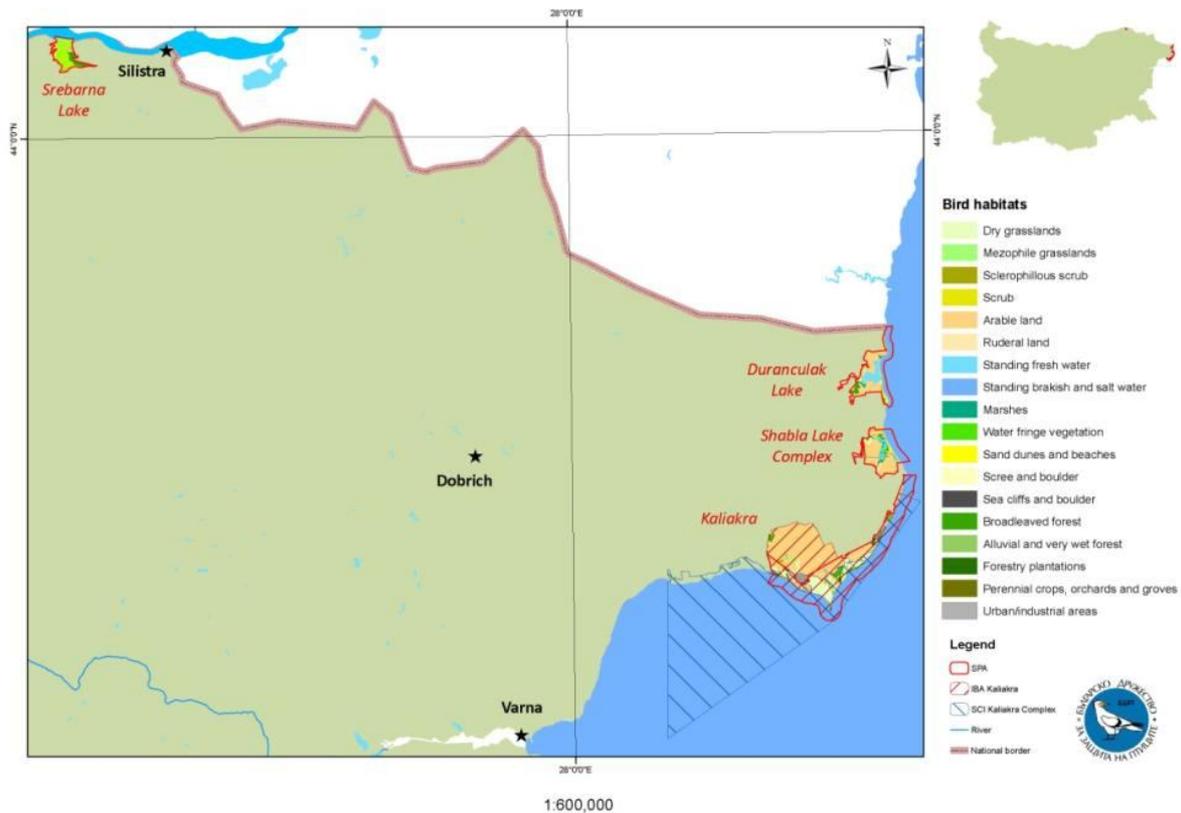
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Aim

Co-ordinated, locally managed monitoring system focused (as a demonstration) on the Red-breasted goose, as a Natura 2000 trigger species common to all of the project sites.

Geographical scope

Four SPAs are target of this monitoring scheme, including their surrounding areas: Kaliakra (both the SPA and IBA area), Shabla lake Complex, Durankulak Lake and Srebarna Lake.



IBA designations for goose species at key sites

Durankulak

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Greater White-fronted Goose <i>Anser albifrons</i>	winter	1997	5,657-73,531 individuals	good	A4i, B1i, C3	Least Concern
Lesser White-fronted Goose <i>Anser erythropus</i>	winter	1998	15-50 individuals	poor	A1, C1	Vulnerable
Greylag Goose <i>Anser anser</i>	winter	2004	311 individuals	good	B1i, C3	Least Concern
Red-breasted Goose <i>Branta ruficollis</i>	winter	1997	3,020-39,233 individuals	good	A1, A4i, B1i, C1, C2	Endangered

Shabla Lake Complex

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Greater White-fronted Goose <i>Anser albifrons</i>	winter	1997	61,900-177,335 individuals	good	A4i, B1i, C3	Least Concern
Lesser White-fronted Goose <i>Anser erythropus</i>	winter	1998	15-50 individuals	poor	A1, C1	Vulnerable
Greylag Goose <i>Anser anser</i>	winter	2003	3,273 individuals	good	B1i, C3	Least Concern
Red-breasted Goose <i>Branta ruficollis</i>	winter	1997	20,000-55,845 individuals	good	A1, A4i, B1i, C1, C2	Endangered

Srebarna

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Greater White-fronted Goose <i>Anser albifrons</i>	winter	1996	1,000-50,550 individuals	good	A4i, B1i, C3	Least Concern
Greylag Goose <i>Anser anser</i>	winter	1996	17-505 individuals	medium	B1i, C3	Least Concern
Red-breasted Goose <i>Branta ruficollis</i>	winter	2001	60 individuals	unknown	A1, C1	Endangered

Kaliakra

Species	Season	Period	Population estimate	Quality of estimate	IBA Criteria	IUCN Category
Greater White-fronted Goose <i>Anser albifrons</i>	winter	1997	6,003-15,034 individuals	good	A4i, B1i, C3	Least Concern
Red-breasted Goose <i>Branta ruficollis</i>	winter	1997	5-157 individuals	good	A1, C1	Endangered

Source <http://www.birdlife.org/datazone/sitefactsheet.php?id=401>

Site evaluations for goose species present at each of the key SPAs (Source ec.europa.eu)

SPA name	Site code	Species code	Species name	Protection level ^{1/2}	Migratory ³			SITE ASSESSMENT ⁴		
					Breeding	Wintering	Staging	% of national population	Conservation status of site	Global Assessment of site value for species
Durankulak lake	BG0002050	A042	Anser erythropus	1		33i/15-50i	3i/1-5i	>15%	Excellent condition	Excellent
		A396	Branta ruficollis	1		300-39233i	2-15000i	>15%	Excellent condition	Excellent
		A041	Anser albifrons	2		5657-104837i	520-19500i	>15%	Excellent condition	Excellent
		A043	Anser anser	2	1p/1-2p	64i/6-2002i	8i/1-15i	>15%	Excellent condition	Excellent
Shabla Lake Complex	BG0000156	A042	Anser erythropus	1		33i/15-50i	1i/0-1i	>15%	Excellent condition	Excellent
		A396	Branta ruficollis	1		2237-55845i	7-9080i	>15%	Excellent condition	Excellent
		A041	Anser albifrons	2		10000-193872i	70-64305i	>15%	Excellent condition	Excellent
		A043	Anser anser	2		1620i/3-3237i	16i/1-28i	>15%	Excellent condition	Excellent
Kaliakra	BG0002051	A396	Branta ruficollis	1		81i/5-157i		0-2%	Excellent condition	Good
		A041	Anser albifrons	2		6003-15034i	100i	3-15%	Excellent condition	Excellent
		A043	Anser anser	2		16i/8-18i	10i	3-15%	Excellent condition	Excellent
Srebarna	BG0000241	A396	Branta ruficollis	1		4i/0-60i		0-2%	Excellent condition	Good
		A041	Anser albifrons	2		574i	25775i	>15%	Excellent condition	Excellent
		A043	Anser anser	2	3p/2-5p	43i/20-800i	<500i	>15%	Excellent condition	Excellent

¹ Annex I species

² Regularly occurring migratory species not listed on Annex I

³ i = individuals; p = pairs; numbers are population estimates or a range from min to max estimate

⁴ Last updated September 2011

Reporting requirements

[to be completed]

For migratory waterbirds including Red-breasted Geese, the trends seen at the site level may differ from the trends seen for the species over the whole wintering range. Changes in global and national population sizes have an effect on the thresholds for international and national importance, which can in turn affect the conservation value of an individual site. Consequently, trends need to be assessed at a number of scales to allow a species' status to be assessed in context. Individual countries are required to report on a regular basis on the status of protected species and habitats, such that conservation status can be assessed at a global level. Governments also need to assess the successes of particular conservation measures such as site management, which may require more detailed monitoring at a higher frequency.

This monitoring scheme, while designed for specific Natura sites, aims to allow assessment of the species' status within the key part of its biogeographical range in Bulgaria.

Global

The BirdLife Secretariat, as the Red List Authority for birds, is committed to providing IUCN with updates on the status of all the world's birds once **every four years**. The IBA monitoring guidelines recommend that countries report at least every four years, preferably following the same cycle as their updates to IUCN.

European

Article 17 of the Habitats Directive requires Member States to report **every six years** about the progress made with the implementation of the Directive. Monitoring & reporting under the directive is focussed on assessment of the conservation status of all habitats (as listed in Annex I) and species (as listed in Annex II, IV and V) of community interest within the biogeographical territory within a member state.

Consequently, this provision is not restricted to Natura 2000 sites and data need to be collected both inside and outside the Natura 2000 network to achieve a full appreciation of conservation status.

Article 12 of the Birds Directive requires member states to report on the implementation of the national provisions of this Directive every three years. The timings should coincide with Habitats Directive reporting, with detailed reports submitted **every six years**.

National

Bulgaria holds between 20 to 90% and in short periods of time up to 100% of the wintering population with the EU of the globally threatened Red-breasted Goose, which elevates its responsibility in regard to the conservation of the species both as EU member state and globally.

Use monitoring to inform national conservation priorities and for reporting at the EU and global level. Evaluate data in relation to national conservation objectives. Use for planning and strategic development.

Site-based

[BSPB to add any specific site-based requirements for geese]

Use monitoring to inform management in order to achieve conservation objectives for the site, which relate to those criteria for which the site was designated. Used to inform the success of management/protection.

General principles

Frequency of monitoring

The frequency at which monitoring is undertaken depends on the questions being asked and the specific variable being assessed. Generally, monitoring should be done often enough to track changes and obtain an understanding of natural fluctuations, but not so often that it becomes a hugely expensive and time-consuming exercise, and takes away resources for conservation action [from IBA monitoring guidelines].

Criteria

Practical limitations will often make an ideal sampling design impossible. However, some aspects cannot be compromised if the data are to be meaningful. Where necessary, this scheme is designed to ensure that a number of key criteria are addressed, namely that sampling must be:

- Unbiased;
- Sensibly stratified; and
- Adequately replicated.

Assessing the success of SPA protection

BirdLife stresses the importance of maintaining all SPAs at a “favourable conservation status”. This means that the populations of all bird species for which the site was designated in the first place (called “qualifying” or “trigger” species) should be able to maintain themselves at the site in good numbers. To assess whether a site is in a favourable status or not, it is necessary to define for each qualifying species what these “good numbers” might be (in scientific terms they are called specific conservation objectives or “favourable reference values”).

State Variables

[To be completed]

State indicators refer to the *condition* of the site, with respect to its important bird populations. State indicators might be population counts of the birds themselves, or may be measures of the extent and quality of the habitat required by these birds.

Specific variable	Method of assessment	Minimum frequency/timing
Numbers	Roost counts	Bi-monthly Nov-Mar
Phenology	Roost counts	Bi-monthly Nov-Mar
Roost sites	Roost counts	Monthly Nov-Mar
Age structure	Flock scans using standard method	February
Body condition	API standard method	February
Survival	Re-sightings and reporting of marked birds	Whenever observed
Feeding range	Transect survey	<i>Monthly??</i>
Quality of feeding habitat	Assessment of ortho-photos and payment agency reports	Annual; mid-winter
Weather	Web data downloaded and summarised	Daily for winter period

Numbers, phenology and roost locations of geese

Background

Surveys of numbers are needed to determine species and site status, by assessing population size and trends at relevant scales – international, regional and site. The extent and frequency of survey is tailored to ensure sufficiently precise and robust assessments at the relevant scale. For example, international assessments may require a coordinated survey every three or six years, while site assessments may require an annual count at the time of year when peak numbers of the species in question occur.

For many goose species, which feed in open (often non-wetland) landscapes by day, surveys are undertaken at the roost sites, when birds are predictably concentrated at relatively few locations. Counts are undertaken as birds fly into or, more usually, as they depart the roost.

Monitoring of Red-breasted Goose numbers is undertaken primarily on the wintering grounds. Since the first counts in the 1960s, surveys have become increasingly comprehensive and extensive and by the 2000s there were frequent coordinated counts across Bulgaria, Romania and Ukraine to estimate the global population size. Since the late 2000s, counts have also been undertaken during some winter months at Manych Gudilo, Russia, and during autumn migration across the Kostanai and North Kazakhstan regions of Kazakhstan.

By the end of the 1967, with the start of the International Waterbird Census (IWC), many key wintering sites around the Black Sea were covered in January, with the aid of sporadic expeditions by western ornithologists. Monitoring throughout the winter period began in the 1990s and, in Bulgaria, monthly counts were undertaken for three years at Shabla and Durankulak lakes.

From 1995/96 coordinated counts of wintering geese throughout the Dobrudzha trans-boundary region of Bulgaria and Romania were undertaken by BSPB, the Romanian Ornithological Society and

the Danube Delta Biosphere Reserve Authority. In 1995, BSPB also began fortnightly counts between November and March. Counts from the Odessa region of Ukraine were also undertaken from [when?].

In 2003/04, the RbG IWG launched the Red-breasted Goose Common Monitoring and Research Programme. Coordinated by BSPB, this conducts co-ordinated (usually simultaneous) counts each month from autumn to spring at key sites throughout the flyway. Fortnightly counts are undertaken in Bulgaria and were also undertaken in Romania in the mid to late 2000s. Irregular counts are also made at the Manych-Gudilo complex. The extent of coverage internationally tends to decrease moving west from Bulgaria, owing the greater number of roost sites in Romania and Ukraine, and difficulties of access during extreme winter weather.

In the majority of winters, Bulgarian Dobrudzha is the limit of the non-breeding distribution. Once or twice a decade, under extreme weather conditions, significant numbers (a few thousands) of Red-breasted Geese may move south from Dobrudzha to Burgas (mid way along the Bulgarian coast of the Black Sea) and smaller numbers may reach Greece and Turkey.

At some point in most winters, at least half the global population of Red-breasted Geese is concentrated in the small area of coastal Dobrudzha, and large numbers may be present for up to two months (from late December to mid February). In some winters, under appropriate conditions, almost the entire global population may occur in Dobrudzha.

The distribution of geese in Dobrudzha is often more predictable at the start of the winter and after the end of January. At these times, roosting geese favour Shabla and Durankulak lakes, and most Red-breasted Geese can be found at these two locations (and at Srebarna before the end of December). From mid December to the start of January, probably as a result of severe weather and hunting pressure, goose distribution is much more varied and dynamic. Large numbers may roost on the sea, in many locations from the Romanian border to Zelenka Bay, and the distribution may change to a great extent between even consecutive nights.

National and international requirements

- The statutory requirement for site condition monitoring (SCM) of Special Protection Areas (SPAs) is a minimum of one count every six years
- The International Waterbird Census (IWC) winter count occurs annually on the middle weekend of January
- Counts for the Red-breasted Geese international census (coordinated with Romania, Ukraine and southwest Russia) are undertaken monthly from October to March

[This section simply lists requirements, not activities. IBA PSR monitoring needs are omitted as these are discussed in the following sections – including recommendations made on the basis of rationale, practicalities etc – and then incorporated into the final monitoring methodology, including extent and frequency of coverage]

Current activity and existing data

Roost counts in Bulgaria take place at fortnightly intervals from November to the first decade of March. Dates are set by the RbG IWG coordinator to be synchronous, where relevant, with the IWC and international Red-breasted Goose census (see above). All goose species are counted, with Red-breasted and White-fronted Geese the primary targets.

As a minimum, counts have taken place at Durankulak Lake and Shabla Lakes Complex, the sites that generally hold the majority of Red-breasted Geese in Bulgaria. Up to nine count positions spaced at intervals along the coast from the Romanian border to Zelenka Bay have also been used on some occasions, when large numbers of birds have roosted on the sea. The level of coverage relates to the conditions and numbers of geese predicted to be in the area, or when large numbers are thought to be roosting on the sea. Srebarna Lake is also used by significant numbers (low thousands) of Red-breasted Geese in early winter, but the site is usually abandoned at the end of December when weather conditions forces birds to the coast.

Counts undertaken during the Life+ project Safe Grounds for Red-breasts have generally been more comprehensive, covering coastal sites more frequently.

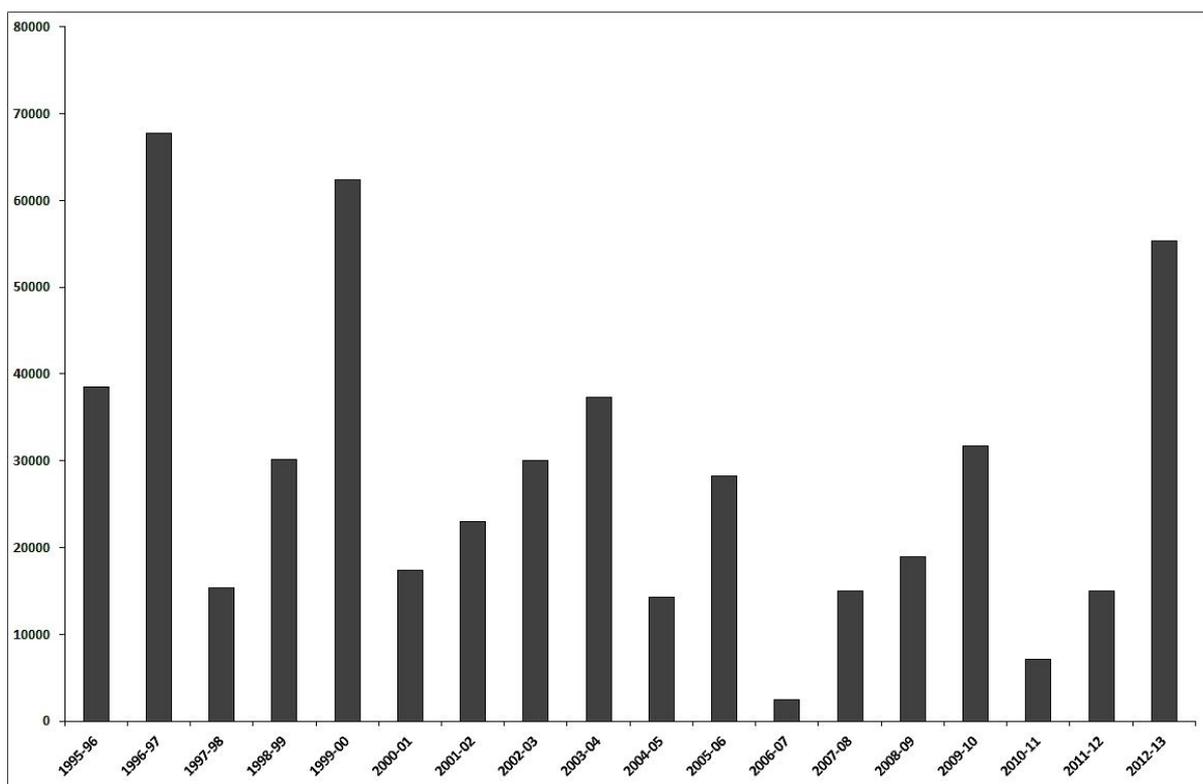
Count teams usually comprise trained BSPB volunteers and staff. The whole count team normally meets in Shabla early on the morning of the count, around one hour before counting starts. The coordinator splits the observers into teams, assigns their count location and gives them the recording forms. Observers aim to be at their count locations while it is still dark, before the first birds start to leave the roost.

The count methods have been largely unchanged since 1995. Counters record the numbers and species (where identification possible) of all geese seen flying from the roosts at dawn in sequential 15-minute windows. Where possible, observers are required to separate geese flying from the lakes from those flying from the sea or elsewhere. Care is taken not to include birds that are likely to have been counted by observers at another count location. All other waterbirds and other species of interest (especially raptors) are counted during the roost.

At the busy count points, there may be one or two observers (counting birds departing in different directions) and a scribe to complete the count form. Data are entered into the BSPB database by a single person.

These methods and the standard data forms are outlined in the Terms of Reference for the Life+ Safe Grounds for Red-breasts project (Annex [x]).

[Insert a table summarising the regularity of counts (since, say, 2000?). To show over how many months/years data have been consistently collected. Also indicate how frequently the different count positions have been used (three 'columns' – Durankulak & Shabla combined; Srebarna; the coast south of Shabla, whether complete or incomplete). Also present a graph showing peak coordinated counts in BG since 2000 and another showing peak count at each SPA over that time. Anne – can you do this from your spreadsheet? If it's a pain, then I don't think it matters not to have these.]



Peak counts in Bulgaria since 1995

General principles and recommendations

Roost counts provide some of the most fundamental data. The potential for error, however – especially for double-counting or missing birds – is relatively high. A relatively precise and prescriptive protocol is therefore needed.

Frequency of surveys

International censuses are undertaken normally every four weeks from late October to mid March. However, the period of large numbers of Red-breasts in Dobrudzha may be short-lived, so more frequent counts are needed to assess the importance of the region. As such, additional counts (in between the international censuses) have been undertaken in Bulgaria from mid October to late March for the last ten years, *ie* 12 co-ordinated counts each winter.

Given the need for comprehensive coverage of all roost locations in Dobrudzha (see below) there are significant resource implications for undertaking fortnightly surveys from October to March. The peak occurrence of Red-breasts in Bulgaria is usually between mid/late December and early/mid February, so efforts should be concentrated on five priority count occasions: mid and late December, mid and late January, and mid February. Numbers in mid December and mid February may be low or high depending on conditions, but those counts are part of the international census so need to be undertaken regardless.

Except for the international censuses, coordinated counts in Dobrudzha are of low priority in October, November and March as very few Red-breasted Geese are present. Given the large resources required for these surveys, and the need for resources for the additional monitoring needs, these additional counts are not required as part of the monitoring strategy.

Coverage and completeness

Coverage of all potential roosting areas requires counts positions at Durankulak, Shabla and Srebarna lakes (some sites require several more than one count point), and along the coast from Durankulak to Zelenka Bay – 12 count positions in total. Given the variability in where geese may roost, observers are therefore needed at all count points to have confidence that the count is representative of numbers in Dobrudzha.

Outside mid winter, the roosting distribution is usually much more localised and can be quite predictable. Before mid December and after mid February, birds are usually concentrated at Durankulak and Shabla because of the lack of hunting. Therefore, if resources are limited, international censuses in October, November and March can be undertaken solely at lakes Durankulak and Shabla, as these sites can be covered with a small count team. These would have to be considered partial counts (unless there is some means of verifying that significant numbers of birds are not roosting on the sea and at Srebarna). Nevertheless, such partial coverage at this time would, on most occasions, still include the large majority of Red-breasts in Dobrudzha, and thus the data would usefully contribute to the compilation of international count totals, even with the caveat of their being incomplete.

Double-counting

There is a high risk of counting the same birds twice (or more) since the geese may fly a long distance from their roost location to their feeding site, passing several count positions on the way. For example, in January 2013, birds roosting in Zelenka Bay fed in Romania, passing five or more different count positions during the dawn flight.

Count methods, the information recorded during the count, and the compilation of the count total for Dobrudzha all need to minimise the chances of double-counting. In particular, information recorded about flocks of birds needs to identify with sufficient unambiguity birds which may have passed from one count section to another.

Count sections need to be defined precisely and clearly, so that observers do not count birds in an adjoining count area or miss birds that pass between them. Information gathered during the survey needs to indicate which count section the birds originated from, *ie* to specify their roosting location.

Species

Currently, all geese that are not Red-breasts are assumed to be White-fronts. It is therefore important that any geese that cannot be identified to species level, are recorded as 'unknown'.

Other species may be recorded during roost counts providing this does not compromise recording sufficient and accurate information on the two target species, Red-breasts and White-fronts. Numbers of other species (Greylags, pelicans, cormorants, harriers *etc*) that leave the roosts are relatively small but counting these may distract observers from the target species. Many of these other species will be recorded by International Waterfowl Census methods later in the day (when all species on the lakes are counted). If it is felt that non-target species are best recorded at roosts (*eg* harriers leave the roosts to hunt over fields by day so are missed by IWC methods), these should be counted on alternative dates (the day after or before the goose count). The additional survey would only require two or three observers in total at the two lakes for just the dawn flight period to count these other roosting species.

The need to stop counting additional species in order to ensure all information is recorded for target species will need to be impressed upon all observers. This position should be reinforced by the co-ordinator at regular intervals to continue the appropriate culture.

Observers and logistics

Careful coordination is required in advance of the count. Consideration is given to conditions on the day, such as access to count locations when conditions may be difficult because of snow or mud or the presence of large numbers of hunters.

New counters should be given the instructions and recording forms to read in advance of their first count, and join an existing count team as a practice session before being responsible for counting.

Summary of recommendations based on the above principles

- Ensure complete coverage of Shabla, Durankulak, Srebarna and all coastal points during mid winter counts, between Mid December and Mid February by ensuring sufficient observers available
- Ensure count sections clearly defined
- Record information about movements of flocks in sufficient detail
- Careful consideration of potential double-counting when compiling the count total
- Consider additional surveys, when needed, to record other roosting species
- Instructions given to observers in advance, and training provided where necessary

Roost count survey methodology

Printed instructions will be provided for counters (Annex [x]) along with the recording form (Annex [x]). See the instructions for much of the specific detail of the counting methods. General and additional aspects of the methodology are provided below.

Count dates

- Counts in Dobrudzha are undertaken on the Red-breasted Goose international census dates between November and beginning of March
- The precise dates are set by the RbGIWG co-ordinator each autumn (the mid January date is chosen to correspond with the International Waterbird Census)
- Goose roost counts are normally undertaken on a Saturday morning

Date	Purpose	Coverage	Assumption
Mid Oct	International Census	Shabla & Durankulak	Incomplete, but probably representative for RbG
Mid Nov	International Census	Shabla, Durankulak & Srebarna	Incomplete, but probably representative for RbG
Mid Dec	International Census	Complete (Shabla, Durankulak, Srebarna, all coastal points)	Complete
End Dec	BG Dobrudzha RbGs	Complete	Complete
Mid Jan	International Census	Complete	Complete
End Jan	BG Dobrudzha RbGs	Complete	Complete
Mid Feb	International Census	Complete	Complete
Mid Mar	International Census	Shabla & Durankulak	Incomplete, but probably representative for RbG

Count sections and count positions

Standardised count points are used during each count. Observers record birds within their particular count section. Maps of count points and count sections are provided to all observers in advance of the count.

The count sections for goose roosts are:

[Give a list of these, including the brief descriptive details listed (not simply 'Durankulak Lake'). To include all count positions, not just those along the coast.]

1. Name of section. Covers from location a to location b. Count location is c [give grid ref]
2. Etc
- 3.

[The section boundaries and count locations need to be recommended by BSPB.]

Maps showing the count position and the extent of the counting section for each are given in Annex [x].

Count protocol

The details of the counting protocol are given in the document 'instructions for counters' (Annex [x]).

Additional data

Roost counts provide the opportunity to record other key information for the monitoring scheme, particularly the levels of hunting. It will be necessary to assess whether it is possible to record information for these several purposes without compromising each aspect of the recording. Recording forms may be adapted to facilitate recording this information at the same time.

Resources required

Equipment:

- Binoculars
- Spotting scope
- At least two 4X4 vehicles to cover Shabla and Durankulak Lake complexes

Counters must have appropriate equipment (bins, appropriate clothing etc).

Personnel

The majority of observers are experienced in counting large numbers of and identifying geese. Many of the volunteers may lack understanding of monitoring principles and standardised recording, and may require further training in this area and better tools to aid systematic data collection. Efforts are usually made to ensure less experienced observers are positioned with a more experienced observer, and this practice should continue.

To achieve full coverage of all count points 15-20 observers are required, with multiple observers at some locations likely to hold large numbers of geese.

Storage/analysis/presentation of data

[to be completed]

Demography and body condition

Background

The Abdominal Profile Index (API) was developed to estimate the body condition of individual birds. By giving a value to the profile of the abdomen, it is possible to estimate the fat storage of the bird. The close correlation between API and mass is a useful tool for providing information about the condition of individuals as well as the general 'condition' at a population or flock level. This information can be vital to determine the management requirements of both the species and their habitat. Low API scores on the wintering grounds may indicate that feeding habitat is scarce or of poor quality, which could directly influence migration and subsequent breeding success.

[Owen (1981) first described the field method of scoring goose abdominal profiles as a non-consumptive method of assessing fat deposits accumulated by individuals. It has been demonstrated that fat stored in the abdomen is a reliable index of general fat stores accumulated throughout the body of geese (Thomas et al., 1983; Madsen and Klaassen, 2006), and that the level of abdominal fat storage can be assessed using a predetermined visual scoring system.]

Assessing the percentage of young birds in a population gives a measure of the productivity of birds. Annual counts of the ratio of adult to young (first winter) birds on the wintering grounds, when large flocks of geese are relatively settled in feeding areas, presents an ideal opportunity to assess annual breeding success.

In most species of goose, young birds can be easily separated from adults by their plumage characteristics, for at least part of the non-breeding season (autumn and winter), as young birds generally begin their moult and growth of adult feathers in late-winter. Plumage differences and timing of moult differs between species: Red-breasted Geese are relatively straightforward to age throughout the winter, providing it is done by experienced observers, though European White-fronted Geese, however, become difficult to age beyond January.

[estimating survival...to be completed]

Current activity and existing data

The great majority of the winter goose monitoring in Bulgaria focuses on counts only. Information on aspects of demography and ecology (eg productivity, survival and body condition), which are frequently gathered in northwest European goose populations, are not yet systematically monitored.

Ad hoc assessments of age ratios and body condition observations have taken place on a number of occasions within Coastal Dobrudzha, when experienced observers have been present. Data collection is opportunistic due to the difficulties of getting close enough to geese

The proportion of young observed in the wintering areas (from assessments made over seven years between 1996 and 2008, mainly in Bulgaria) has been found to vary between 6% and 45%, with a mean of 22%. [from International Action Plan]

No data are available on adult survival or generation length due to the practical absence of marked birds within the population.

Monitoring recommendations - API and Age sampling

Timing, frequency and coverage

Ideally, age counts should commence only when the majority of the population has arrived, to take into account differences in arrival dates for adults with and without young (Gilbert et al 1998⁵). In Bulgaria, goose numbers are unpredictable and often low during November and December, with numbers steadily increasing. Peak numbers usually occur in mid to late January, though geese are exposed to high levels of disturbance from hunting activity throughout the month. During this time geese are highly vigilant and opportunities to get close enough to flocks for aging are scarce. While the ideal would be to examine body condition throughout the winter, it is recommended that both aging and API sampling efforts are concentrated in **February**, when the hunting season is over and geese are relatively more settled in their feeding grounds.

Monitoring the status of European White-fronted Goose populations also is important, not only due to their protected status within the SPAs, but additionally, their large numbers and similar habitat use to Red-breasted Geese may serve as useful indicators of habitat change. However, the species is notoriously difficult to age past mid-winter due to the earlier moulting of young birds. For the reasons given above, dedicating resources to systematic monitoring of age ratios for European White-fronts could be wasteful, so only ad-hoc observations may be possible. API sampling can be done systematically in February, alongside scans of Red-breasted Goose flocks.

Sampling area

Searches for suitable sampling flocks should be undertaken in the key feeding areas known to be favoured by red-breasts, bearing in mind recent knowledge of numbers using the main roost sites. This should include areas both within and outside the SPA, so as to increase the chances of encountering flocks and to reduce bias from sampling only flocks feeding close to lakes.

Methods

Abdominal Profile Index (API)

API's are taken using the full lateral view of the goose and assessing the shape of the abdomen against a predefined template. The species are assessed against the 8-point scale developed for Barnacle Geese *Branta leucopsis* (Owen et al. 1981⁶)

API's for European White-fronted Geese use the 9-point scale used for White-fronted Geese, with the goose in a head-up posture [insert reference].

Ageing

Young red-breasted geese can be distinguished from adults using several plumage features, to account for different stages of moulting. Young birds generally have smaller, more diffuse red patches on the cheeks, surrounded by a wide white band relative to the amount of red. They generally have a lighter, mottled neck and breast, and pale, more greyish feathers on the body. Later moulting stages can very closely resemble the adult, with the only reliable distinguishing trait being the wing. The wing feathers are greyish-brown in colour, with more diffuse) white wing-bars.

⁵ Gilbert, G., Gibbons, D.W., and Evans, J. (1998). Bird Monitoring Methods—a manual of techniques for key UK species. RSPB, Sandy.

⁶ Owen M, 1981. Abdominal profile: A condition index for wild geese in the field. J. Wildl. Manage. 45: 227–230.

Adult red-breasted geese have larger red cheek patches with only a thin white outline. The breast is a brighter, bolder red, and the body feathers are more uniformly black. The two white wing-bars are distinct, with the white appearing bold and bright on a black wing.

[BSPB to develop an image library with examples of birds in the field showing key features for each variable]

Sampling bias and sample size

The aim is to get an optimum number of individuals sampled for age and body condition, bearing in mind:

1. The trade-off between obtaining a more precise estimate vs. the time-cost implications of obtaining more samples.
2. Non-independence among samples: Samples taken from the same flock or from the same site on successive days are non-independent. Samples from different parts of the area may also be variably non-independent.
3. Biases relating to flock size: flocks of different sizes might tend to have differing average age ratios or API's.
4. Biases relating to position in flock: As a result of dominance and fitness patterns, age ratios and API's might differ between different parts of the flock *eg* periphery, core, leading and trailing edge. Some parts of flocks might be harder to observe than others.

Sampling bias can be minimised by:

1. Attempting to sample a range of places, flock sizes and positions in flock;
2. Sampling a large number of flocks and dates;
3. Using a linear modeling approach to account for the influence of variables such as flock size, date, and position in flock.

It is recommended that sampling aims to achieve 95% confidence limits for age ratios of $\pm 2.5\%$. In a Bootstrap trial sample of 1000 independent birds, with a ratio of young of 0.25, the 95% confidence limits produced were 23% and 27% young, which is seen as an acceptable level of confidence. Note, however, that these limits would be substantially wider with non-independent sampling, so larger sample sizes are better, together with efforts to minimise independence.

The minimum recommended number of birds sampled on an annual basis is **1000 individuals**.

The minimum recommended number of flocks sampled on an annual basis is **10 flocks**.

Selecting a flock for sampling:

1. Obtain a list/map of current/recent known goose feeding locations for the entire study area. This does not have to be precise, or strictly quantitative. A short list of areas where there is a good chance of a good number of geese should be produced – sites for which the available data indicate brief/intermittent use, and/or low numbers can be discarded. Areas which are difficult to access can be discarded. The aim is simply to allow selection of the range of sites that could be visited to search for flocks, so that we can avoid biases caused by searching in one particular area only.
1. Pick an initial area at random from the shortlist. DO NOT pick the best area or the nearest area preferentially. Make the shortlist only include viable places, and then pick at random.

2. Drive to the selected area. When a viewable flock of RBG is first encountered, it should be sampled. Do not keep moving around until a bigger (or otherwise preferred) flock is found – sample the first one you find. This reduces flock selection biases.

On encountering a flock for sampling:

3. Once a flock is selected for sampling, record the basic details about that flock:
 - *Date and time*
 - *Observer name*
 - *Position of observers (GPS coordinates)*
 - *Approximate distance to birds*
 - *Location of flock (compartment code)*
 - *Crop type*
 - *Flock size (estimate number of birds of each goose species in field, to nearest 10%)*
 - *A unique ID number for the flock for that date*
4. Randomly select a sector of the flock to sample eg the leading edge, trailing edge, the core and the sides. Record the chosen sector on the form.
5. In the chosen sector, scan systematically with a telescope, sampling every bird as you come to it, until you have a sample of 50 birds. If a bird is obscured from view for more than a few seconds (eg by other birds), ignore it and move to the next bird. If sampling a leading edge block, start with the foremost bird and work back in. Same for sides or trailing edge.
6. Single observers should ideally record data into a digital voice recorder (DVR) and keep a tally of birds sampled using a click-counter. If no DVR is available, the observer should use a click-counter to keep a tally of adult birds, and keep a count of the number of young in their head. APIs should not be attempted unless using a DVR or an additional observer is available to keep a tally of the scores.
7. When a block of 50 birds has been sampled, move to a different sector of the flock and sample another block of 50. Try to get a sample of all sectors of the flock before moving on to another flock.

Moving on to different flocks/areas, increases the independence of sampling. However, if it is clear that a large amount of time would be spent finding another flock, it may be worth continuing to sample the same flock and/or different flocks in the same area.
8. If the flock is smaller than about 300 birds, try to sample the whole flock.
9. For each flock that is sampled, record the following:
 - *Species being sampled*
 - *Approximate sector of flock (leading, trailing, side, core)*
10. For each bird that is sampled, record the following:
 - *Age (adult or young bird)*
 - *API (using appropriate scale)*
11. In all flocks, different species need to be block-sampled separately. Where it is a mixed flock, both species can be sampled in sequence (or by different observers).

Ad-hoc data gathering opportunities:

On occasion, opportunities to gather further useful data may be presented, outside periods of systematic sampling. For example, when capturing birds for x-ray, shot levels (etc). The same method as above should be used to record data. It is important to note that the data were gathered during catch attempts, rather than systematic age/API sampling.

Monitoring recommendations –Re-sightings of marked birds

To date, very few Red-breasted Geese have been marked so systematic searching of marked birds is not recommended at this stage. However, occasional sightings of marked individuals may occur, for example, during flock scans for age ratio and API sampling. In such cases special attention should be paid to recording the markings and reading the codes and colours.

Red-breasted Geese may have:

- Metal leg rings
- Plastic colour leg rings
- Satellite/radio transmitters
- [Anything else??]

European White-fronted Geese may have:

- Metal leg rings
- Plastic colour leg rings
- Colour plastic neck collars
- [Anything else??]

For each marked bird observed, both legs should be checked and the codes of colour rings or neck collars read and recorded (from the top down).

The following international standard codes should be used:

- R = Red
- W = White
- O = Orange
- Y = Yellow
- G = Dark Green
- L = Light Green
- N = Black
- P = Pale Blue
- ? = uncertain colour
- M = Scheme metal ring
- - = no rings
- R (in the end) = right
- L (in the end) = left

(see http://www.btoipmr.f9.co.uk/cm/cm_codes.htm for examples)

Codes for which a reading is incomplete or not possible should also be recorded.

Where possible, colour rings should be documented by photographing and/or recording them on video. However, never rely on the photographic documents only, and always note down the relevant information at the time of the observation.

Resources required

Equipment

- Good quality, preferably HD scope, tripod and window mount
- Coded map of the field compartments
- GPS
- Click-counter
- Digital voice recorder (DVR) for a 1-person team.

[If using a DVR, a crib sheet of instructions and required data is needed]

- Data recording sheets (unless using DVR)
- Crib sheet of API scores for both species
- Crib sheet of re-sightings codes.

Personnel

People participating in the data collection should all pass through assessment of abilities. Training should be part of the start of the data collection where all fieldworkers to be participating should come together and tune up and calibrate their perception of API and aging.

[One- or two-person team required. When and for how long? Who?]

Analysis/presentation of data

[To be completed]

Foraging distribution and habitat preferences

Background

Cropped habitats which are of high importance to geese as a foraging habitat, have largely been excluded from the SPA designation process to date, as the EU Birds Directive does not preclude the designation of SPAs in what are considered artificial habitats. Thus the majority of SPAs designated for the goose populations they support only include roosting sites and a small buffer of surrounding feeding areas. However, SPA regulations refer to the need to avoid adverse impact on the protected interest even when the development is outwith the designated area.

In Bulgaria, large numbers of wintering Red-breasted Geese regularly spend the majority of their daylight hours feeding in agricultural areas outside the SPA boundaries. Birds can travel over ten kilometres from their roosts each day to find suitable disturbance-free fields. As such, the number of geese using protected sites may be heavily influenced by factors occurring in the wider area. Though there is no legal requirement to monitor a species outside the SPAs, this information is key to understanding the overall status of Red-breasted Geese across their biogeographic range. It is recommended that feeding distribution is monitored both within and around Natura 2000 sites, alongside efforts to record numbers at roosts, levels of threat etc.

Foraging distribution surveys for such mobile and wide-ranging species as geese can be particularly resource heavy, and monitoring activities should be carefully designed as a trade-off between collecting sufficient meaningful and comparable data and achieving a sustainable level of resourcing.

Current activity and existing data

Over the last decade or so, a number of efforts have been made to map feeding distribution of Red-breasted and European White-fronted Geese in Bulgaria. Most of the early observations were made on an ad-hoc basis, whereby geese counted on roosts were followed and subsequently counted on their feeding grounds, with locations and coarse habitat variables noted.

Only in recent years has recording of foraging distribution data become systematic, particularly with the commencing of the 'Safe Grounds for Red-breasts' project. This project aimed to identify key foraging areas and model habitat suitability variables. It involved resource-heavy systematic data collection in agricultural areas around the Black Sea Coast in Dobrudzha, covering approximately 70% of potential feeding areas up to 20 km from the major roosts (Durankulak, Shabla and the Black Sea coast). Surveys followed pre-defined transect routes, mainly along surfaced roads, where in each potential feeding plot (plots planted with winter cereals or stubbles), data on geese and a number of habitat parameters were recorded, regardless of goose presence or absence. The data will allow analysis of the most important habitat parameters for geese in the area, and will inform the target areas and key variables for inclusion in this monitoring scheme.

These surveys were designed to provide a large-enough dataset on goose presence/absence and parameters of habitat suitability. While they answered a different set of questions to those important for the long-term monitoring of goose feeding areas, such standardised recording of feeding geese – noting the presence/absence of geese on set routes - is extremely valuable in assessing the true distribution of birds across landscapes.

The aim of this monitoring scheme is therefore to provide a snapshot of goose feeding distribution once every few years, to allow long-term significant changes to be detected and assessed in relation to the other variables measured.

Monitoring recommendations

Timing, frequency and coverage

In Dobrudzha, transect surveys for feeding geese will be designed to sample a standard route around accessible parts of the SPAs and the area up to 10 km from the coastline which geese are known to use most frequently (in the Life+ surveys, over 90% of goose observations occurred within a band of c.9km from the coast). The method is designed to cover a large area relatively quickly, recording only the essential information on numbers and locations of geese.

Some remote areas may be missed, some of which are known to support large numbers of geese on occasion. However, it is unlikely that missing such areas will affect the overall pattern of distribution observed across the area. Feeding areas within the SPA will be surveyed wherever possible.

No systematic surveys have previously been undertaken to cover this area, with previous sampling covered a larger area over three consecutive days. This presents difficulties for calculating the frequency and coverage required to provide a reasonable picture of the distribution of the majority of geese roosting in the area, particularly due to the high degree of mobility in the population. The following design suggests sampling at a higher frequency than may not be sustainable long-term, with the aim of further assessing the frequency required to achieve meaningful data.

[Suggested frequencies for winter 2013/14 monitoring are as follows, and warrant further discussion:

- Two passes on roost count weekends (sat and sun bi-monthly) – two consecutive hunting days = best chance of getting two similar replicates;
- Two passes on the Friday and Saturday of roost count weekends - includes a hunting and non-hunting day; or
- One pass on roost count days (bi-monthly) – we risk having too few replicates to detect a large proportion of birds, but this may be a more realistic option for long-term monitoring. Winter 2013/14 monitoring should aim to test whether this is appropriate.]

Surveys should be conducted **between January and February**, for two consecutive years. This should be repeated every four years such that **two out of every six years** are sampled.

It is important that transects are undertaken as close to roost count days as possible, to give an indication of the detection rate of feeding flocks, and due to the presence of observers already visiting the area for roost counts.

[BSPB to come up with a transect route that covers the main areas within c.10km of the coast. Note that the transect will be completed much quicker than usual, as observers do not need to spend time recording characteristics in fields without geese]

Methods

Observers are provided with a map, a standard data form (Appendix X) and a standard list of plots to be covered (Appendix X). Each plot should be assessed for presence/absence of geese, and marked as **observed** or **not observed**.

In any season, only around 50% of the plots will be seeded and the rest will remain fallow. Observers do not need to record which plots are fallow and which are not, as the aim is to assess the general distribution of feeding geese rather than the precise location. The crop type should only be recorded for plots with geese.

When recording crop type, the previous crop type in the exact location on which the flock is observed should also be noted, if known. This will be apparent from the dead vegetation matter - maize cobs and sunflower heads - left in the field following the autumn harvest. Note that crop types and previous crops can differ within a field boundary, so observers should not rely on the part of the field immediately adjacent to the road. If the flock is spread across different crops, record the crop type on which most of the flock is found.

The start and end points and direction of travel should be varied between surveys in order to avoid bias caused by always sampling specific plots at the same time of day. Prior to the survey the observer should check the route and start point of the last survey, and choose a different start point.

It is important that a GPS is used to track the survey route, which will also log the time at which each plot was passed. In addition, observers should make a note of all plots on the list that could not be visited, *eg* due to poor access. This allows goose distribution to be assessed in relation to the area covered. If there is no record of the route, but certain areas were missed, this may result in false negatives being recorded i.e. records of no geese, where in fact the area was not checked.

At the start of the survey, record:

- Date
- Start time
- Observer name(s)
- Start point and route taken
- The GPS should be turned on and set to log the transect route

For plots with geese, record:

- Unique plot number in which geese observed
- Number and species composition of flock – accurate to nearest 10%.
- Crop type and previous crop, in the location of the flock (see above)
- GPS position of observers (Lat and Long)
- Time of observation (HH:MM)
- If there is time, and depending on their level of experience, observers should undertake API and age sampling on the flock using the methods described above.

Resources required

Equipment

- GPS capable of logging the transect route
- Standard survey form and list of plots to be surveyed
- Good basemap required, on which fields to be surveyed are clearly defined and labeled with unique numbers.
- Binoculars
- Good quality spotting-scope and window-mount
- Vehicle

Personnel

Surveys are ideally undertaken by a two-person team – one dedicated as a driver and one to look for and record information on geese. At least one observer should be experienced in identifying and counting geese, and ideally, though not essential, in ageing and assessing APIs scores.

Analysis/presentation of data

Observers should be given access to a simple database for inputting their data. This should be fool-proof, allow quick data input and be easy to interrogate.

Winter distribution maps, inclusive of survey effort, should be produced **after each two-year cycle of transects**.

Habitat availability

[To be completed]

Background

In the wintering areas, Red-breasted Geese feed primarily on arable crops and agricultural grasslands. In particular, they favour the shoots or early growth of winter wheat, barley, maize, rape, pasture grasses and spilt grain. Changes in agricultural regimes, together with hunting pressure are believed to have been the primary reasons for the shift in winter distribution from the western coast of the Caspian Sea to the Black Sea coast in the late 1960s, so it is evident that the species can be highly mobile in response to habitat change.

In recent years there has been a general increase in the extent of non-arable crops grown around the key wintering roosts in Bulgaria, Romania and Ukraine. Such crops include grapes, vegetables and sunflowers, which are unsuitable for geese. This switch is likely to intensify, driven by climate change and consequent changes in agricultural policy, and by the financial rewards from 'cash crops', particularly in Bulgaria and Romania, following their accession to the EU.

The extent of crops required to support feeding Red-breasted Geese in the wintering areas has not been quantified, but given the significant proportion of the population potentially affected and the small number of roost sites used, changes over a relatively small part of the region may have a large effect, forcing large-scale shifts in distribution or utilization of sub-optimal habitat.

Increasing conflict between geese and farmers can also be expected, particularly with increasing agricultural privatisation and intensification in wintering range countries. Agri-environment schemes designed to encourage goose-sympathetic farming in Bulgaria and Romania have recently been implemented for the first time. Such schemes, though in their early stages, will hopefully discourage the conversion from arable to cash-crops into the future and reduce conflicts.

For these reasons, the ability to detect and react to potential large-scale habitat alteration, a key threat to wintering Red-breasted Geese is crucial, allowing conservationists and government bodies to react through adapting agri-environment schemes changing policy and increasing the level of site protection.

Satellite imagery is well suited to monitoring habitat (vegetation) condition and change through time, due to its ability to achieve large scale, uniform and simultaneous coverage that is repeatable over time.

Current activity

Methods for assessment of remotely sensed imagery are being developed under the Life+ 'Safe Grounds for Red-breasts project. A simplified methodology for image analysis to be used for long-term monitoring will be available over the coming months.

Existing data

Monitoring recommendations

Timing, frequency and coverage

Landsat images should be obtained bi-annually – once during late winter-early Spring when winter cereals are established sufficiently to allow vegetation to be separated from

Methods

[to be developed]

[Notes:

- Landsat imagery. Spring image = winter cereal availability. Autumn image = amount of maize (which would give stubble).
- Government agricultural data – ball is in BSPB's court. Can it be obtained? Is it fit for purpose?
- How to distinguish wheat over multiple years...will signature be the same or affected by other factors? *Soil colour and wetness... contribute to spectral response.*
- *Many plant species have overlapping signatures making identification impossible or of poor accuracy.*
- Use % area of wheat in last 3 years as baseline?
- *Supervised and unsupervised classification*
- Remotely sensed imagery for calculating area of wheat – use Landsat imagery on annual basis?
- Regular contact with farmers/standardised field checks of sample area? Number of agri-environment uptakes?
- We don't know how much geese need!]

Resources required

[Availability and cost of images – Landsat best as free, though limited by cloudiness – should be good enough but may miss some years due to availability of good quality image.

Use of Landsat:

- Medium resolution
- Free
- Multi-spectral
- Frequently used for classifying vegetation types based on spectral reflectance of individual pixels – each pixel assigns a particular vegetation type (spectral signature).]

Analysis/presentation of data

Weather data

Background

Goose movements in Bulgaria and across the wintering range appear to be largely governed by weather, namely temperature and degree of snow cover. Geese require daily access to agricultural crops, and hence tend to avoid areas with deep snow cover, namely in more northern and eastern parts of their range. For this reason the numbers of red-breasts wintering in Bulgaria, at the south western limit of their range, can vary dramatically, in response to climate and weather effects. In addition it has also been suggested that warmer winters in the eastern part of the range may result in birds 'short-stopping' in these areas, as less frequent deep snow cover allows easier access to winter crops, and reduced ice cover will increase the availability of open water for roosting. As a result numbers Bulgaria and Romania could be expected to decline.

In addition to monitoring trends in numbers it is therefore crucial to collect weather data alongside, so that goose numbers can be assessed against the longer term averages.

Current activity

At the time of writing there is no regular and systematic collection of weather data specifically in relation to goose monitoring. Weather data collection occurs on an ad-hoc, individual project basis. Many fieldwork activities undertaken by BSPB require fieldworkers to estimate weather variables, which are input into the BSPB database in a standard way.

Existing data

The existing roost count methodology requires weather variables to be estimated by observers at the time of the count. Data are then input into the BSPB database in the standard way used for all BSPB field surveys. For specific studies and analyzing trends, daily weather averages can also be obtained online in a standard format, from some weather stations.

Data provided on Freemeteo include:

- Daily max temperature
- Daily min temperature
- Maximum sustained wind speed
- Maximum wind gust
- Total daily precipitation
- Snow depth
- Weather event reported
- Latitude, Longitude and name of weather station

Monitoring recommendations

Timing, frequency and coverage

Daily weather data should be downloaded from the website on an annual basis for November to March inclusive. Downloads should be taken after 31 March following the winter period.

Data should be obtained for the following weather stations:

- Shabla

- Kaliakra
- [Silistra?]

Methods

Initial data requirements:

Calculate long-term monthly average values for temperature and precipitation for the last global standard climate normal reference period 1961-1990 (WMO), if sufficient data. *Or take 30 year average from given year and update on an annual basis?*

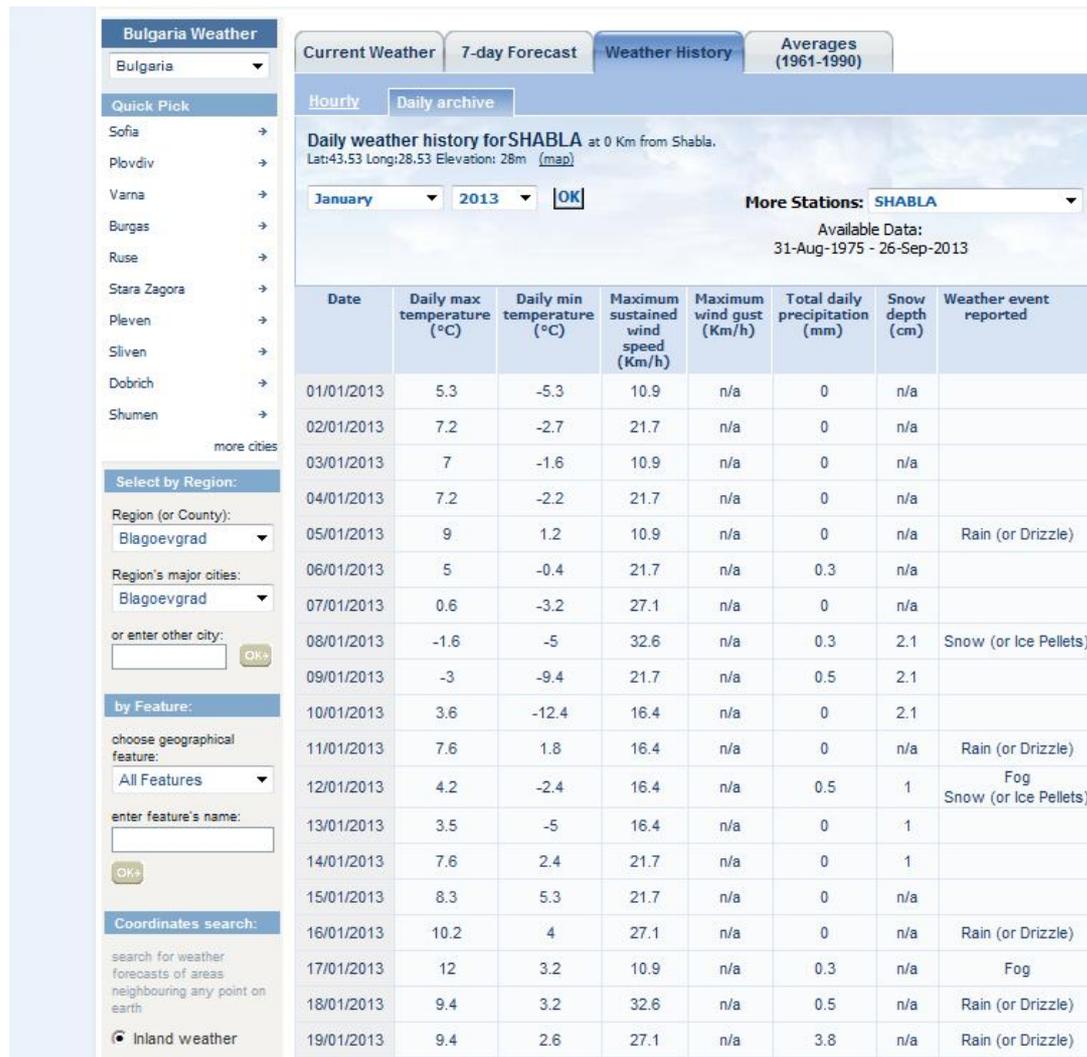
It is recommended (WMO 1989) to apply the “3/5 rule”, whereby if there are more than five daily values in total in a given month are missing, or more than three in succession, the monthly mean should not be computed and the year-month mean should be considered as missing.

Data should be stored in a secure location.

Required on an annual basis: [Remove instructions to annexes]

1. Create a new Excel document and create five worksheets, one for each month from November to March. Save the document by the winter for which the data will refer eg 2011/12, NOT by year.
2. Weather data should be downloaded from the Freemeteeo website at the following links:
3. For Shabla weather station:
<http://freemeteo.com/default.asp?pid=155&la=1&gid=727329&monthFrom=1&yearFrom=2013&sid=155610>
4. For Silistra weather station:
<http://freemeteo.com/default.asp?pid=155&la=1&gid=727329&monthFrom=1&yearFrom=2013&sid=155500>
5. For Kaliakra weather station:
<http://freemeteo.co.uk/weather/kaliakra/history/daily-history/?gid=730765&station=4878&date=2008-07-27&language=english&country=bulgaria>
6. Make sure the correct weather station is selected in the ‘More Stations’ box (see Figure 1). To do this, locate the required month and year from the dropdown menus in ‘Daily Archive’ tab and select OK.
7. Using the cursor, highlight all of the text in the monthly table, including the headers.
8. Right click the mouse and select Copy
9. In the Excel spreadsheet created for the relevant winter, right click in the first cell and select Paste. This should paste the whole table from the website. Check the table is complete, copy and paste all monthly tables from November to March and save the document.

Figure 1 – Extract from Freemeteo website used for downloading monthly weather data



1. Calculate monthly averages for the following variables:
 - Daily max temperature
 - Daily min temperature
 - Total daily precipitation
 - Snow depth
2. Copy and paste average values for each month into master spreadsheet, where one row contains average data for one month in a given year.

Resources required

Weather data is freely available online, though availability and cost could change in future. Complete daily averages for each month cannot be guaranteed, and as such the completeness of the data should be monitored on an annual basis.

[Who will do this?]

Analysis/presentation of data

After each season, produce summary graphs after each season using a standard template [to be produced], comparing monthly averages over the winter with the 30-year normals.

Pressure variables

Pressure indicators identify and track the major *threats* to important bird populations at IBAs

Pressure variable	Specific variable	Method of assessment
Disturbance	Hunting pressure	Sightings records/ Shots recorded at roost counts Hunting permits and bag data
	Tourism	Sightings records
	Agricultural	Sightings records
	Fisheries	Sightings records
Mortality	Condition of live birds	Live capture
	Anthropogenic causes of death	Recovery and PM of dead birds
	Lead poisoning	Lead in the environment
Habitat loss	Wind farm development	Database of development activities
	Other renewable energy development eg solar farms	Database of development activities
	Tourism development	Database of development activities
	Other built infrastructure	Database of development activities

Disturbance

Background

In addition to threats which result in direct mortality to Red-breasted Geese, those causing prolonged disturbance are also of considerable concern. Disturbance causes both increased energy expenditure in geese and reduced energy intake, caused by increased time spent flying and distances flown, increased time spent alert, and as a result, less time spent feeding. At an individual level, this may result in poorer body condition, increasing the risk of mortality due to starvation and general poor health. It can also have knock-on effects by delaying or prolonging migration due to insufficient energy reserves, or reducing breeding productivity if birds arrive at the breeding grounds too late or in too poor condition.

There are no quantitative data available on the impact of disturbance on Red-breasted Geese specifically, though research on related goose species show significant reductions in site use, energy intake, body condition and subsequent breeding effort eg Madsen (1998)⁷; Klaassen et al. (2006)⁸, Mini & Black (2009)⁹ and subsequent breeding effort Mainguy et al. (2002)¹⁰. Such data are labour intensive to gather and require significant experimental design. However, long-term, simple

⁷ Madsen, J. (1998), Experimental refuges for migratory waterfowl in Danish wetlands. II. Tests of hunting disturbance effects. *Journal of Applied Ecology*, **35**: 398–417

⁸ KLAASSEN, M and BAUER, S and MADSEN, J and et al., (2006). "Modelling behavioural and fitness consequences of disturbance for geese along their spring flyway", *JOURNAL OF APPLIED ECOLOGY*, vol. 43, no. 1, pp. 92-100

⁹ Mini A & Black JM 2009. Expensive traditions: energy expenditure of Aleutian geese in traditional and recently colonized habitats. *Journal of Wildlife Management* 73, 385-391.

¹⁰ Mainguy J, Bety J, Gauthier G, Giroux J.-F. Are body condition and reproductive effort of laying greater snow geese affected by the spring hunt? *Condor*. 2002;104:156–161.

monitoring designed to assess the relative levels of key disturbance activities will aid detection of future problems and add to the available knowledge for this species.

Several key threats were identified for Red-breasted Goose in the AEWA Single Species Action Plan¹¹. Many of these relate to disturbance effects, primarily from hunting, agricultural and development activities.

Hunting pressure

Current activity and existing data

Although the Red-breasted Goose is protected, its habit of forming mixed flocks with legal quarry species may cause high levels of disturbance during the hunting season. In Bulgaria, although hunting is prohibited within 100m of the shores of Durankluak and Shabla Lakes, shooting still occurs as geese fly to and from roost sites, as well as by pursuit of flocks feeding in fields (which are mostly outside the protected areas), causing considerable disruption and loss of feeding time.

The current regulations in Bulgaria restrict hunting to three days per week (weekends and mid-week) throughout January. The season ends on 31 January after which hunting is prohibited. Despite these restrictions a proportion of hunters (thought to be primarily foreign or from outside the area) are either unaware of regulations or choose to ignore them, further increasing the pressure on geese during non-hunting days.

Studies are ongoing as to the extent of the effects of hunting disturbance on geese wintering in Bulgaria. Early evidence and observations suggest that the behaviour and distribution of geese changes dramatically in February following the end of the hunting season. In some years, they appear to spread more widely from the roosts during the hunting season, with a higher proportion also roosting on the Black Sea, and adopt a highly vigilant behaviour. During February, the geese spend more time feeding in areas close to the roosts, and are generally more approachable.

At present there is no systematic recording of hunting disturbance activities in and around the key SPAs for Red-breasted Geese. Hunting patrols are in place at Shabla and Durankulak Lakes with the task of preventing illegal activity and raising awareness of the regulations. These patrols, together with the other recommended monitoring activities present a good opportunity to monitor the degree of disturbance more closely.

Monitoring recommendations

Timing, frequency and coverage

Systematic monitoring of hunting disturbance is challenging due to the sporadic and wide-ranging nature of the disturbance. Surveys targeted specifically at recording such activities would demand a high degree of time and resources. It is therefore recommended that monitoring is better combined with other systematic monitoring activities, specifically during transect (feeding distribution) surveys, roost counts and flock scans for ageing and API assessment. See sections XXX for specific details of these methodologies.

¹¹ Cranswick, PA, L Raducescu, GM Hilton & N Petkov. 2010. *International Single Species Action Plan for the conservation of the Red-breasted Goose Branta ruficollis*, 2011–2020. Wildfowl & Wetlands Trust/BirdLife International.

Monitoring should be carried out both outside as well as within the SPAs, allowing assessment of the degree of disturbance caused by pursuing geese into their wider feeding areas, as well as around roosts, which can be monitored within the SPA.

Monitoring should occur throughout the winter period, including non-hunting days and periods where hunting is prohibited, in order to give an indication of the level of illegal hunting activity.

Methods

Recording during fieldwork activities

In order to ensure systematic recording and even coverage, the duration of observations must be recorded i.e. the start and end times of periods during which the observer is actively recording hunting events. For each survey undertaken, disturbance monitoring should be undertaken at the following times and locations, making a clear note of the start and end times on the recording form:

- *During roost counts* – record all hunting activities for the duration of the roost count at the observation point.
- *IWC counts around lakes* - record the number of vehicles and hunters along route taken. Note the start and end times of the count. Ensure GPS is recording the track and observers follow system for downloading tracks with full date-time stamp.
- *On transect surveys* - record all hunting activities for the duration of the transect. Ensure GPS is recording the track and observers follow system for downloading tracks with full date-time stamp.
- *On flock scans* - record all hunting activities for duration of the watch at each location. There is no need to record while travelling between fields - only for time spent at a particular site. Record unique field number/ Lat-Long coordinates for location.
- *On patrols* Include specific methods for patrol wardens

The following variables should be record using a standard form. See full instructions on data form:

- Date;
- Observer names;
- Time for start and end of recording period (see above);
- Monitoring activity on which observations are being made (roost count; IWC lake counts; transect survey; flock scans; or transect surveys);
- Location of observer/area being checked/GPS track of route taken;
- Time event recorded, to nearest minute. Important for identifying duplicate records between observers;
- Number of gun-shots heard in each hunting round;
- Number of gun-shots heard known to be due to deliberate agricultural scaring;
- Number and location of hunting vehicles seen;
- Number and location of hunters seen;
- Effects of hunter/hunting vehicles presence on geese (for feeding geese only).

Double-counting

For roost counts in particular, where there are multiple observers near to one another, a system is needed for checking time-stamps for disturbance events against locations of observers, and removing records thought to be duplicates of the same events.

Hunting regulations

On an annual basis (post-winter) the hunting regulations for that winter should be checked and noted, specifically:

- Start and end dates of the hunting season (for geese and other wildlife *eg* wild boar);
- Days of week when hunting is permitted/prohibited; and
- Locations/boundaries of any prohibited hunting areas.

Hunting permits and bag data

The number of hunting permits issued and hunting bags collected provide a useful indirect indicator of the relative level of hunting activity between monitoring years. On an annual basis (post-winter) the Hunting Associations in [XXX] municipalities should be approached for this information summarised for the entire season, and/or for each month. It is not necessary to record bags for each species, though ideally number of 'goose bags' should be specified.

[BSPB to expand this section and confirm whether this is achievable, and if so, what level of detail we could realistically request?]

Resources required

Equipment

- GPS –observers undertaking transects and IWC lake counts should carry a GPS and should be trained in how to record survey tracks and locate GPS coordinates;
- Standard 'Goose disturbance data form', including instructions, attached to data forms, for roost count, IWC surveys and transect and flock scan surveys;
- Map of survey plots (for transect and flock scan observers).

Personnel

All roost count observers should collect data for the duration of the count. Counters at particular roosts *eg* Durankulak and Shabla will then be required to complete a separate form when undertaking IWC counts around lakes.

After each roost count one person should be responsible for checking and removing duplicate records.

All observers require training in the protocols and use of the data forms. Any induction of new recruits should incorporate this training.

One person should be assigned responsibility for obtaining hunting bag, license and regulations data on an annual (post-winter) basis.

Analysis/presentation of data

[To be completed]

Database for inputting and storing hunting data is required.

Outputs: summary data on shots/vehicles per unit effort. Possibly maps showing where disturbance events occur. Breakdown of 'known to be illegal' (i.e. on a non-hunting day) vs 'presumed legal' activities.

Non-hunting disturbance activities

Current activity and existing data

At present there is no systematic recording of other disturbance activities in and around the key SPAs for Red-breasted Geese.

Tourism

The number of tourist groups visiting the SPAs and surrounding areas during winter, primarily for wildlife watching and photography, appears to be steadily increasing. While eco-tourism may well, indirectly, have positive effects on geese due to economic benefits and more positive attitudes of local communities, it may also contribute additively to overall disturbance levels. For example, inexperienced birdwatchers and photographers often disturb flocks of grazing geese simply by getting out of their vehicles; leading to flushing of flocks and reduced feeding times.

Farming operations

Agricultural disturbance also occurs, through general farming operations such as ploughing of winter stubbles adjacent to feeding areas. While it is currently thought that deliberate scaring of geese from fields in an attempt to protect crops occurs at a relatively low scale in Dobrudzha (unlike in many other countries where geese rely heavily on agricultural fields), it may be anticipated to increase as a result of increasing intensification of farming and demands for higher yields, particularly in Bulgaria and Romania following accession to the EU.

Fishing at roost sites

Red-breasted Geese favour relatively large waterbodies as roost sites, which they may also use during the day to drink, wash or rest. Regular disturbance at these sites may result in increased energy expenditure by the birds and, in extreme cases, the site may be abandoned. While fishing is regulated by permits at Shabla and Durankulak Lakes and limited to certain areas and times of day, illegal poaching, particularly net-fishing from boats at dawn and dusk, is known to occur. New patrol systems and fishing areas now help to enforce the restrictions, though illegal activities should still be monitored.

Despite the low occurrence of disturbance events from the agriculture and fishermen in recent years, such issues should nevertheless be monitored and managed. It is especially important that this monitoring continues after the Life+ project, when there is less of a presence of fieldworkers and NGO personnel in the area, which may lead to locals returning to their 'old ways'.

Monitoring recommendations

Fisheries

Make roost counters count the number of nets in the lakes. Likely to be zero but should try to persuade them to keep recording in case it stops being zero at some point in the future.

Check fisheries legislation on SPA each year as a response variable.

Timing, frequency and coverage

As with hunting disturbances, it is recommended that monitoring of tourism, farming and fishing activities is undertaken alongside other monitoring activities involving systematic recording protocols, specifically during transect (feeding distribution) surveys, roost counts, IWC counts

around SPA lakes and flock scans for ageing and API assessment. See sections XXX for specific details of these methodologies.

Methods

Methods for recording tourism, farming and fishing activities should follow those described above for recording hunting activities. Specifically:

Recording during fieldwork activities

In order to ensure systematic recording and even coverage, the duration of observations must be recorded i.e. the timing and duration of periods during which the observer is actively recording activities. For each survey undertaken, monitoring should be undertaken at the following times, making a clear note of the start and end times on the recording form:

- *During roost counts* – record all tourism and farming activities (variables listed below and on ‘Goose disturbance data form’) for the duration of the roost count at the observation point.
- *IWC counts around lakes* – count the number of fishing nets and boats in the lakes, for counters at Shabla, Durankulak and Srebarna lakes.
- *On transect surveys* - record all tourism activities for the duration of the transect. Record all occasions where geese are disturbed by farmers and tourists. Ensure GPS is recording the track and observers follow system for downloading tracks with full date-time stamp.
- *On flock scans* - record all tourism activities for the duration of a watch at each location. Record all occasions where geese are disturbed by farmers and tourists. There is no need to record while travelling between fields - only for time spent at a particular sampling site. Record unique field number/ Lat-Long coordinates for location.
- *On patrols* Include specific methods for patrol wardens

Variables to record include:

- Date;
- Observer names;
- Time for start and end of recording period (see above);
- Monitoring activity on which observations are being made (roost count; IWC lake counts; transect survey; flock scans; or transect surveys);
- Location of observer/area being checked/GPS track of route taken;
- Type of activity *eg* tourists in vehicle/on foot;
- Time event recorded, to nearest minute - important for identifying duplicate records between observers;
- Number of farming vehicles in field (only when geese also present)
- Number of boats and fishing nets in lake (only on IWC counts);
- Number of tourists in vehicle/on foot;
- Approximate location of tourists/farming vehicles;
- Effects of activity on geese (for feeding geese only);

Double-counting

For roost counts in particular, where there are multiple observers near to one another, a system is needed for checking time-stamps for disturbance events against locations of observers/activity, and removing records thought to be duplicates of the same events.

Numbers of tourists

On an annual basis (post-winter) the approximate number of wildlife tours to the area during winter should be determined and logged in the monitoring database.

[BSPB to add how they will do this - extract from websites etc?]

Resources required

Equipment

- GPS –observers undertaking transects and IWC lake counts should carry a GPS and should be trained in how to record survey tracks and locate GPS coordinates;
- Standard 'Goose distribution data form', including instructions, attached to data forms, for roost count, IWC surveys and transect and flock scan surveys.
- Map of predefined areas to check following roost counts
- Map of survey plots (for transect and flock scan observers)

All roost count observers should collect data for the duration of the count. Counters at particular roosts eg Durankulak and Shabla will then be required to complete a separate form when undertaking IWC counts around lakes.

After each roost count one person should be responsible for checking and removing duplicate records.

All observers require training in the protocols and use of the data forms. Any induction of new recruits should incorporate this training.

One person should be assigned responsibility for obtaining data on number of tourists using the area.

Analysis/presentation of data

Database for inputting and storing disturbance activities data is required.

Outputs: summary data on disturbance activities seen/heard per unit effort. Possibly maps showing where they occurred.

Mortality

Background

Being a relatively long-lived, slow-breeding species (like all geese), having only a relatively small population and being highly aggregated into large flocks, Red-breasted geese may be particularly sensitive to direct adult mortality caused by human factors.

Main causes of death are assumed to be from hunting and collision with human infrastructure. Though there is little quantitative information on the scale of mortality and no population model to evaluate population level impacts, evidence from other goose species in Western Europe and the Lesser White-fronted Goose, which share a similar range and threats, strongly suggest that anthropogenic mortality is additive, such that the cumulative effect of even low level mortality may have a significant effect on the population as a whole.

In Bulgaria, while some of the biggest threats faced by Red-breasts are disturbance and agricultural change, the species faces multiple existing and potential sources of direct mortality. Sources of direct mortality identified in the Single Species Action Plan for Red-breasts and thought to be of known or potential significance in Bulgaria are:

- **Hunting**
Despite its protected status in Bulgaria, direct mortality from hunting is still a threat. Birds may be shot in error by hunters who misidentify it, are unaware of its presence and status, or choose to ignore regulations. These problems are exacerbated by the species tendency to flock among more common and legal quarry species.
- **Collision with human infrastructure**
Mortality of goose species as a result of collision with structures such as wind turbines, power lines, masts and other buildings is of considerable conservation concern. While most evidence suggests that geese are able to detect and avoid turbines most of the time, there are instances where high mortality has occurred due to poor siting of turbines [(see Drewitt & Langston (2006)]. Given the increasing pressure to site wind farms in Dobrudzha and the cumulative impacts of multiple other sources of anthropogenic mortality, there is a clear need for monitoring of future developments alongside goose monitoring.

Barrier effects on energetic? Not something we can monitor for?

- **Rodenticides, disease and lead poisoning (potential)**
The use of rodenticides in particular has caused poisoning events in geese, with die-offs seen in Bulgaria, Romania and Ukraine, either due to inappropriate application or deliberate targeting of geese by farmers. EU legislation imposes restrictions on the sale and use of pesticides, and new laws prohibit the production and use of several very toxic substances. Concern remains, however, that some farmers may have remaining stocks of unused substances and may continue to use them illegitimately, and that there is poor enforcement of the regulations.

Following detection of highly pathogenic avian influenza (HPAI) H5N1 in dead Red-breasted Geese found in Greece in 2006, the Convention of Migratory Species and UN Food and Agriculture Organisation's Scientific Task Force on Avian Influenza and Wild Birds highlighted

Red-breasted Geese as one of two globally threatened species for which (HPAI) H5N1 posed a conservation concern. Though outbreaks of this disease have been fewer and less severe than anticipated, the nature of Red-breasted Geese to form large, dense flocks, both at roosts and feeding sites, there is potential for rapid spread of diseases and large die-offs.

Lead shot, preferred ammunition used by hunters, is highly toxic and causes high mortality in many wildfowl, including non target species, which accidentally ingest spent shot pellets along with grit, used to aid digestion. The use of lead shot around wetlands and for waterfowl shooting is prohibited within 200m of the wetland shore in Bulgaria as in many other European countries. However, many hunters in countries where lead is banned continue to use lead shot in wetland areas contrary to the legislation. Whether lead poisoning is an issue for Red-breasted Geese is currently unknown, as is the level of lead in the environment of the Bulgarian wintering grounds.

Assessing the degree of mortality of Red-breasted Geese on the wintering grounds is challenging for a number of reasons: the chances of recovering of dead birds is considered to be very low given the high degree of predator activity and the vast openness and inaccessibility of the landscape. Recovery of birds shot either accidentally or intentionally is rare due to the protected status of the species. Opportunistic data collection, rather than systematic, targeted efforts to survey for dead birds represents the only realistic and sustainable monitoring strategy. The proposed monitoring recommendations therefore aim to obtain data in a standard and systematic way, when the opportunity arises. Recommended protocols for assessing condition of live-caught birds, cause of death in recovered dead birds and for monitoring of lead in the environment are provided below.

Condition of live birds

[to be completed]

Current activity and existing data

Small numbers of live Red-breasted Geese are recovered annually by locals, visiting ornithologists etc, often sustaining injuries from collisions, gunshot wounds, predators, or birds in generally poor health. Injured birds are cared for by locals, or taken to a captive rescue centre by members of the Bulgarian Ministry of Environment. There are no existing protocols for recording information on the condition/nature of sustained injuries of recovered geese for conservation purposes.

Catching of live geese for marking and attaching tracking devices has been undertaken by Wildfowl and Wetlands Trust (WWT) and BSPB, and has thus far resulted in two successful catches. Capture is by use of cannon nets, an established method used for catching geese used successfully in other countries. Catching presents an ideal opportunity to collect data on live bird condition. General practice is to take biometric measurements, which can be useful in determining the condition of individuals – bill length, tarsus length, wing length and body weight.

In February 2013 a portable x-ray machine was also used to assess the occurrence of pellets from gun cartridges embedded in the tissues of caught Red-breasted Geese. A gunshot fires a scatter of many small pellets. When a goose is fired at it quite often survives, but a few pellets may remain embedded in its tissues. These pellets can be easily detected on x-rays of shot birds and used to monitor the proportion of the birds carrying shot, as an index of the amount of hunting pressure the

birds are under. Though this method cannot be directly related to hunting pressure on the wintering grounds, it can be used to monitoring the status of the population as a whole.

Blood and feather samples could be taken from live birds to allow analysis of lead content of the tissues

Monitoring recommendations

Timing, frequency and coverage

Data should be collected for all live birds recovered, both on an opportunistic basis and during planned catches, from both within and outside the SPAs.

Methods

- RbGs and WfGs?
- Prepare x-ray protocol
- Protocols for taking feathers, blood etc. Send to lab. What to test for?
- Biometrics - bill length, tarsus length, wing length and body weight.

Resources required

See specific equipment lists under each methodology in Annex. Include all PPE.

Number of people required depends on the number of birds to be sampled/x-rayed. If sampling many birds *eg* caught using canon nets, it is important to assign at least one person to x-raying birds, with one person being in charge of setting up and taking x-rays, and depending on the number of birds, extra people for carrying birds to and from the x-ray area, and for wrapping geese in Velcro jackets.

The person assigned to take x-rays should be fully trained in the safe use of the machine and including how to ensure the safety of people in the area.

Training in taking blood and feather samples...

In cases where birds are recovered incidentally, it is recommended that one local person is available throughout the winter (or at least in the main periods of goose activity) to conduct the required monitoring when necessary. This person should be the point of contact for any live or dead birds found. Ideally, a suitable location should be found in which x-rays can be taken safely with minimal risk, rather than relying on finding a suitable location at short-notice. This could subject a bird to unnecessary disturbance induced stress. The chosen should be trained in the safe use of the x-ray machine and have experience in handling birds.

Need access to laboratory facilities/lab. Who can test samples – what are the costs? Can the field station be used?

Analysis/presentation of data

Need standard database for recording information. Annual (?) summaries of number of recoveries, proportion of x-rayed birds carrying shot. Average levels of lead in blood/feather samples.

Biometrics data

Who will analyse the data?

Causes of death

[To be completed]

Current activity and existing data

[What currently happens to dead birds?]

Small numbers of Red-breasted Geese are found dead in the area on an annual basis, often sustaining injuries from collisions, gunshot wounds, predators etc. There are no existing protocols for recording information on the likely causes of death, specifically for conservation monitoring purposes. A portable x-ray machine held by BSPB is currently available for use on dead recoveries (see above for details), and a small number of BSPB staff has been trained in its use. More thorough training and written protocols are recommended.

Monitoring recommendations

Timing, frequency and coverage

Data should be collected for all incidental recoveries of dead Red-breasted Geese [EWfGs as well?] found within and outside the SPA boundaries, depending on the quality and age of the carcass.

Methods

- X-ray
- Post-mortem examination
- Biometrics

Resources required

See specific equipment lists under each methodology in Annex. Include all PPE.

Due to the infrequent recovery of dead geese in the area, x-ray and post-mortems could be carried out by one trained individual. They should be fully trained in the safe use of the x-ray machine and all of the post-mortem procedures.

It is recommended that one local person is available throughout the winter (or at least in the main periods of goose activity) to conduct the required examinations when necessary. This person would be the point of contact for any live (see above) or dead birds found. Ideally, a suitable location should be found in which x-rays and PMs can be undertaken safely with minimal risk, rather than relying on finding a suitable location at short-notice.

[Need access to laboratory facilities/lab. Who can test samples – what are the costs? Can the field station be used?]

Analysis/presentation of data

Need standard database for recording information. Summaries of number of recoveries **prepared every 5 years**, proportion of x-rayed birds carrying shot. Average levels of lead in blood/feather samples etc.

[Who will analyse the data? Do we need to do anything more eg relate to population?]

Lead in the environment

Despite the recent ban on the use of lead shot around wetlands and for hunting waterbirds in Bulgaria, little is known about the extent of illegal shooting using lead, or the level of lead remaining in the environment which could be ingested by geese in this area.

Current activity and existing data

Methodology and results of the pilot assessment of lead content

Monitoring recommendations

Expand to other areas and make survey once every 3-4 years

Habitat loss

[To be completed]

Background

The degree of the impact of habitat loss on goose populations wintering in and around the key SPAs in Bulgaria directly relates to the availability of sufficient area of suitable feeding areas required to sustain the population i.e. the state variable *Habitat Availability* discussed above.

Habitat loss may be direct, as a result of replacement of suitable with unsuitable habitat such as tourist resorts and other infrastructure; or indirect, in which otherwise suitable habitat is effectively made unavailable/ less suitable as a consequence of developments or increased disturbance.

Whilst sympathetic planning can alleviate potential conflict with wildlife, spatial planning in the region of Bulgarian Dobrudzha currently appears not to be undertaken strategically or to have little regard for biodiversity (as evidenced by ongoing infringement procedures undertaken by the EC), and many proposals, particularly for wind farms are close to or within Natura 2000 sites and other protected areas, including key roosts and feeding areas for Red-breasted Geese.

The Black Sea coastal zone favoured by wintering geese is an area of rapid infrastructure development. Though the coastal zone of Bulgarian Dobrudzha is generally sparsely populated, there has been a significant increase in developments, particularly associated with tourism – such as hotels and golf courses – and a large number of proposals have been submitted for further developments in recent years.

The most serious consequence of wind farm development is considered to be displacement from, or reduced use, of feeding areas that would otherwise be suitable in the absence of turbines. Geese may avoid feeding in areas with turbines due to perceiving the structures a threat/unfamiliar landmark, or they may act as physical barriers. Whilst some species of geese are known to habituate to the turbines, and may even feed among them, it may take several years or decade for this change in behaviour to occur.

Close monitoring of the status of proposals for new wind farms within and around Natura 2000 sites, and the cumulative impacts of additive numbers of turbines in these areas is critical to inform conservation actions.

Current activity and existing data

There is a distinct knowledge gap concerning the amount of suitable habitat required to sustain Red-breasted Geese on their wintering grounds. The PhD study by Hulea (2002) calculated the area of winter wheat required by Red-breasts wintering in Romania, based on the calculation that one goose feeding entirely on winter wheat consumes 203g of dry biomass per goose day. Further research is required to estimate such figures for geese wintering in Bulgaria, so that threshold values for habitat availability can be calculated. In the absence of such data, monitoring should be aimed at detecting trends in the amount of suitable foraging area available – a rapid reduction in area over short periods, for example, may highlight this as a cause for conservation action. In addition, records of investment proposals, development and agricultural change should be kept to allow the degree of threat to be assessed. Currently, BSPB closely monitor the addition of and status of such proposals, and store information in a central database.]

Monitoring recommendations

Timing, frequency and coverage

Interrogate government websites and other sourced eg once per month. Cover the territory of the potential foraging habitat identified by the habitat model.

One per week review for investment proposals at the RIEW offices. A monthly review of the announced investment proposals and decisions on EIA, AA and EIAs by RIEW and MoEW.

Methods

Use official sources of information on land property and land processing - i.e. Regional Agricultural Service.

Collect data on crops on municipality level from official state/regional authorities and regional structures of state agencies.

A sampling effort should be made once every two years to verify information obtained from official sources on the ground.

For monitoring of investment proposals a weekly monitoring of investment proposals announced at the respective RIEW would be required. A once per month check of the website of the RIEWs and MoEW on issued approvals of investment proposals , decisions on EIA, AA and EIAs would be implemented.

Resources required

Data should be collected once per year. Collection of data could be implemented by one staff personnel supported by local volunteers. The effort involved could cover one to two months staff time.

Field verification and sampling would involve two months field work of two people in winter period. Trained fieldworkers to collect data on field following a predetermined protocol and equipped with vehicle to cross winter terrain would be required.

Analysis/presentation of data

A summary of the results would be done every 5 years. It would include histograms with numbers of proposals/developments in each sector (wind/other renewables/tourism/other development etc), compared between years.

Map showing locations of all developments (classified by sector) summarized over last 5 years.

Graphs showing trend in % of area within and outside SPAs with suitable area of goose foraging crop, compared between years. Estimation of total habitat loss over this period.

Requires good database with key information on type of development, location, company details, size of development eg number of turbines, hectareage; proximity to SPAs etc.]

