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2nd Meeting of the AEWA Red-breasted Goose International Working Group

13-15 November 2019 – Bucharest, Romania

MONITORING METHODS TO ASSESS THE NUMBERS OF RED-BREASTED GOOSE ALONG THE FLYWAY

These methods are based on the following comprehensive documents:

WWT/BSPB (2015). Goose monitoring at key Natura 2000 sites in Bulgaria. Unpublished report

Cuthbert, R. & Aarvak, T. (Compilers) 2016. Population estimates and survey methods for migratory goose species in Northern Kazakhstan. AEWA Lesser White-fronted Goose International Working Group Report Series No. 5. Bonn, Germany. 96pp.

The overall aim of these monitoring methods is to enable the development of a comprehensive monitoring scheme for the Red-breasted Goose along the flyway to assess the impact of conservation actions implemented under EU Life project "LIFE for safe flight."

Due to specifics of monitoring geese staging sites in Northern/Central Kazakhstan and adjacent areas in Russia, monitoring methods for these sites are outlined in section "II. Monitoring methods for Kazakhstan", with monitoring sites listed in Annex 2 and a separate recording form provided in Annex 4.

I. PROTOCOL FOR MONITORING WINTERING RED-BREASTED GEESE IN BULGARIA, ROMANIA, SOUTH-WEST RUSSIA AND UKRAINE.

Key survey sites

The key sites that should be surveyed are included in Annex 1.

The 2nd Meeting of the AEWA Red-breasted Goose International Working Group is being hosted by the Romanian Ministry of the Environment with the support of the Romanian Ornithological Society and is organized with funding and logistic support by the Red-breasted Goose EU LIFE Project "LIFE for Safe Flight" coordinated by the Bulgarian Society for the Protection of Birds (BSPB), and co-funded by the EU LIFE Program and Whitley Fund for Nature

Timing of surveys and sampling plan

In Bulgaria, Romania, South-West Russia and Ukraine co-ordinated counts need to be undertaken in the months of **December, January** and **February**, on the **same day** or no more than **one day apart** to avoid potential double counting at adjacent sites. For Bulgaria, it is recommended that ageing is conducted in February, after hunting season is over and geese are more settled, making scanning feeding flocks at closer range possible.

Counts are conducted from fixed count points, where each observer/group of 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. Given the variability in where geese may roost, observers are therefore needed at all count points to have confidence that all known key roosting sites are covered.

Total counts and species composition

For many goose species, which feed in open (often non-wetland) landscapes during the day, surveys are undertaken at the roost sites, when birds are concentrated at relatively few locations. Assessing population size of most migratory goose species is best undertaken by counting flocks leaving their roost sites in the early morning.
Counting and identification of species in flight, difficult on its own, is further hindered by often large, fast-moving groups of birds and poor light conditions, therefore requiring experienced observers for counting. New counters should familiarize themselves with instructions and recording forms in advance and join an existing count team for practise before conducting independent counts. At large sites where there are multiple teams, a co-ordinator should be identified who will assign teams to different count sections, and who will be responsible for collating the data at the end of the survey.

Individual count teams should arrive on site whilst it is still dark before the birds leave their roost sites. All count teams should be provided with a standard recording form on which all data should be recorded. When counting large roosts, it is a good practice to have at least 3 people: 2 observers counting birds departing in different directions/counting different species in the same flock and a person recording data onto recording form.

Although the focus of the surveys is on the Red-breasted Goose (RBG), other goose species, particularly Greater White-fronted Geese (GWFG) and Greylag Geese, should be counted and recorded in the same way whenever possible. Observers should prioritize counting the above mentioned species, as counting birds of other species may distract observers from counting the target species. Many of these other species may be recorded later in the day, when all roost counts have been completed.

Depending on behaviour/activity of the target species, weather conditions and visibility at the survey site, two main methods – direct count or estimation of species composition by random sampling – can be used.

NOTE: As accuracy of a count will differ depending on the method used, **it should always be recorded which method has been used** for each particular count

1. *Direct counts (smaller flocks, up to 2-3,000 inds., good conditions)*

When observing groups of RBG or LWFG in a relatively small mixed flock of geese in favourable conditions (relatively close, good visibility and light, stationary on the ground or water), accurately count all the individuals of each species. Even when mixed in a flock of White-fronted or other geese, RBG tend to flock in their own group.

Try to identify all individuals by species and the RBG by age at the same time. Scan the whole flock systematically from one end to the other (if needed multiple times), individual by individual. Carefully wait until each individual shows itself well, to be positively identified (and aged when possible). Record the exact species only if you are sure they are identified properly. If you cannot determine the species in a flock or are uncertain of % of RBG to GWFG in a flock (eg. if too distant, bad visibility), then record the total number of geese. Add this total to the "unidentified" column on the data recording sheet (Annex 3).

2. *Estimation of total numbers for each goose species (larger flocks, over 3,000 inds./poor conditions)*

Sometimes, especially at key staging sites, when a very large number (thousands or tens of thousands) of geese and possibly hundreds or even thousands of RBG are present - counting and identifying each individual is simply not possible. Counts of such large numbers can be further hindered by poor visibility due to darkness, mist, large distance to the flock, blinding sunlight etc. In such conditions, this is only possible to estimate the number of each species by counting the total number of all geese present, followed by estimation of species composition by random sampling.

2.1. Counting the total number of geese present

Counters should count all birds that are seen taking off from a roost at dawn, using spotting scopes and binoculars. As departure from the roost normally starts much before sunrise, observers need to be ready and in position for the count in the dark before the dawn. Observers should separate geese flying from the specific roost site from those flying from elsewhere – these should be recorded separately on the recording form.

For larger flocks (over 3,000 inds.), count 10 individuals accurately, then use this "measuring flock" to estimate a bigger "measuring flock" of 100 individuals (= 10 x 10), and then estimate the size of the whole flock in groups of hundreds. This should be taken into account, that some parts of the flocks are denser and the "measuring flock" needs to be regularly "calibrated". To help keep large counts tally counters should be used, for example two such counters can be used to keep separate counts of two different species. For each flying flock, together with **exact time**, the **direction of movement** should be recorded.

NOTE: Double counting by observers from nearby point vantage points can be minimized if counting sections are clearly defined prior to counts and flock size, time and direction of movement is compared later.

2.2. Estimating species composition by random sampling

<u>Flocks on the ground:</u> When there is no time to identify all individuals in a large goose flock on the ground, a random sample of birds in the flock should be taken. To do this it is recommended to identify and record **every fifth bird**, which is believed to produce more precise estimates of the species composition than counting in groups of fixed size (i.e. groups of 30 birds), and overcomes the issue of RBG being more likely to flock in groups of their own species.

NOTE: When identifying birds in a flock, patiently identify every fifth bird, don't just pick the most easily visible birds! Such sampling is very intensive and requires good concentration, and it is recommended to sample in this way for 10-15 minute periods and then have a 5-10 minute break before sampling again.

Flying flocks: The easiest way to estimate the proportion of each species (and at the same time the age structure) is to take random samples of flying flocks when the geese are returning from feeding sites to the roosting site to drink (and often again departing to the feeding areas) during mid-day and the afternoon. Again, the samples have to be randomly selected, and it is again recommended to count and identify every fifth bird, evenly covering the whole goose population present. It is also recommended to have one of the observers taking photographs of the flocks which are being sampled. Looking through images in the afternoon/evening will help to verify the accuracy of observers' counts of flying flocks and help to more accurately identify species composition.

NOTE: Good photographic equipment and a telephoto lens will be required to undertake this, as well as good light conditions. Image ID/IDs should be carefully recorded on the recording form next to the flock data to avoid confusion.

Practical advice for sampling:

- Take samples of every fifth individual and work your way through the whole flock as far as possible.
- Randomly choose the flock that you are sampling (e.g. when finished with one flock, decide in advance to take the next sample after 2 minutes on the left side, the first flock in sight at that moment).
- Include only individuals that you have seen properly in the samples; if you can't identify all of the individuals then record this in your records classifying them as far as possible (i.e. "unidentified white-fronted goose", "unidentified Anser goose").
- Record samples in 15 min periods, and keep the original samples separate to calculate statistics from the data.
- It is important to take samples evenly during the whole return (or departure) flight to get nonbiased data.
- Save all the original sample data to count the statistical precision of the estimate (standard deviation and variance) later.

API and age sampling *(please see Annex 6 for recording form and Annex 7 for recording instructions)*

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. In Bulgaria, for instance, 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 ageing are scarce. While the ideal would be to examine body condition throughout the winter, it is recommended that both ageing and API sampling efforts are concentrated in February, when the hunting season is over and geese are relatively more settled in their feeding grounds.

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. The minimum recommended number of birds and flocks sampled on an annual basis is **1000 individuals** and **10 flocks** respectively.

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.
2. 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.
3. 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.

Ageing
Young RBG 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.

GWFG adult differ from juveniles by black patches on the belly versus plain grey belly of juveniles (juveniles also stand out with ill-defined white side line).

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 4-point scale developed for
Barnacle Geese *Branta leucopsis* by Owen et al. 1981 (Fig. 1).

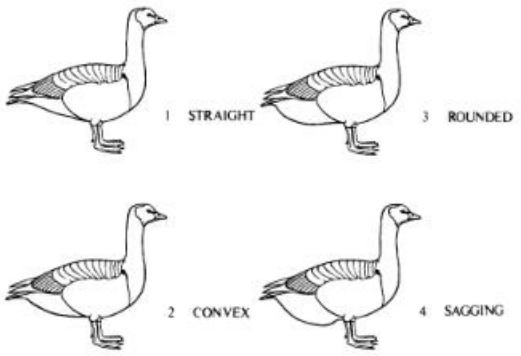

Fig. 1. Classification point values (1–4) of abdominal profiles of barnacle geese.

Figure 1 *API classification categories for Red-breasted Goose, following Owen et al. 1981 (Source: Owen M, 1981. Abdominal profile: a condition index for wild geese in the field. J. Wildl. Manage. 45: 227– 230).*

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.

Checking for marked individuals *(please see Annex 6 for recording form and Annex 7 for recording instructions)*

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. In such cases special attention should be paid to recording the markings and reading the codes and colours.

Red-breasted Geese may have:	**European White-fronted Geese may have:**
Metal leg rings	Metal leg rings
Plastic colour leg rings	Plastic colour leg rings
Satellite/radio transmitters	Colour plastic neck collars
	Satellite/radio transmitters
Combination of the above	Combination of the above

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

For each ringed RBG observed, always check both legs, carefully read the colour codes (recorded from the top down, right to left leg) and note down in the following way:

- metal ring on the right leg, white + orange colour ring on the left leg: MR, WOL
- red + uncertain (e.g. because of mud) colour ring on the right leg, metal ring on the left leg: R?R, ML
- metal ring on the right leg, definitely no ring on the right leg: MR, –L

NOTE: The colours of the rings may bleach over the years, and some of the colour rings may also be lost.

Recording hunting pressure

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. 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

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.

NOTE: 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.

Foraging distribution and habitat preferences

Observers are provided with a map, a standard data form (Appendix 8) and a standard list of plots to be covered (Appendix 9). Each plot should be assessed for presence/absence of geese, and marked as **observed** or **not observed**.
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.

II. PROTOCOL FOR MONITORING STAGING RED-BREASTED AND LESSER WHITE-FRONTED GEESE IN KAZAKHSTAN (AND ADJACENT SITES IN RUSSIA).

As part of the EU Life project, “LIFE for safe flight” surveys for Red-breasted Geese in Kazakhstan are undertaken at the same time as monitoring for other, more numerous,

populations of Greater and Lesser White-fronted Geese. Thus, survey methods need to be compatible with other species monitoring work.

Key survey sites

80 sites surveyed by Cuthbert *et al* in 2016, of which 7 sites were identified as priority, are included in Annex 2.

NOTE: Two sites (Zhatykol and Balakol), included in Appendix 2 as part of "Kostanai West" group of sites, are actually across the border in Russia and as there are only two sites and common methodology is applied, these were considered as part of Kazakhstan's sites for simplicity.

Timing of surveys and sampling plan

Co-ordinated counts of staging RBG need to be undertaken in Kazakhstan in **October**. Due to a large number of sites, large distances between them and a relatively small number of observers involved, **simultaneous counts** (same day or no more than one day apart) can only be conducted **at several selected key sites**.

Surveys of RBG in Kazakhstan will always be a compromise between the number of lakes to be visited and the time required to produce the best possible estimate at visited lakes. These issues are further influenced by the migratory behaviour of geese in a given year, with differences in the timing of the arrival of birds at lakes and also in the numbers present. The sampling design also depends on the key question to be asked: whether we are trying to obtain a total population estimate (in which case as many lakes as possible should be visited) or if the objective is to monitor a representative part of the population (allowing surveys to potentially be restricted to a smaller area containing key sites).

According to Cuthbert *et al* (2017), a potential "optimum" survey design which would allow monitoring of key sites, as well as some wider sample of sites, could consist of four survey teams:

- Two teams in the western part of Kostanay Province and adjacent sites in Russia
- One team in the southern part of Akmola Province
- One mobile team covering northern and eastern part of Kostanay Province and North Kazakhstan Province in order to survey as many lakes as possible, to ensure these areas are covered, particularly in years when birds are more widely distributed across the region.

When working in areas not already identified as permanent staging / wintering sites of LWfG, always locate your observation point — if possible, using a GPS – and mark it on a map. At each survey location it is important to use the best vantage points. For larger sites divide the area into sections that are visible from the chosen vantage points without overlap of areas counted and without missing any part of the site. For roost counts, try to find the most frequently used daily fly route from the feeding grounds to the roost (or from the roost to the feeding grounds), and choose an observation point next to such route. When using GPS, don't rely on the GPS's memory, but always also write down the co-ordinates in your note book.

Total counts and species composition

For many goose species, which feed in open (often non-wetland) landscapes during the day, surveys are undertaken at the roost sites, when birds are concentrated at relatively few locations. Assessing population size of most migratory goose species is best undertaken by counting flocks leaving their roost sites in the early morning.

Counting and identification of species in flight, difficult on its own, is further hindered by often large, fast-moving groups of birds and poor light conditions, therefore requiring experienced observers for counting. New counters should familiarize themselves with instructions and recording forms in advance and join an exciting count team for practise before conducting independent counts. At large sites where there are multiple teams, a co-ordinator should be identified who will assign teams to different count sections, and who will be responsible for collating the data at the end of the survey.

Individual count teams should arrive on site whilst it is still dark before the birds leave their roost sites. All count teams should be provided with a standard recording form on which all data should be recorded. When counting large roosts, it is a good practice to have at least 3 people: 2 observers counting birds departing in different directions and a person recording data onto recording form.

Although the focus of the surveys is on the Red-breasted Goose (RBG), other goose species, particularly Lesser White-fronted Goose (LWFG), Greater White-fronted Geese (GWFG) and Greylag Geese, should be counted and recorded in the same way where this is possible. Ruddy Shelduck *Tadorna ferruginea* should also be included in the surveys of roosting sites, as this species is frequently found in large numbers within mixed species flocks and is impossible to be separated from other species during dawn counts.

Observers should prioritize counting the above mentioned species, as counting other birds (i.e. swans, cranes, waders) may distract observers from counting the target species. Many of these other species may be recorded later in the day, when all roost counts have been completed.

Depending on behaviour/activity of the target species, weather conditions and visibility at the survey site, two main methods – direct count or estimation of species composition by random sampling – can be used.

NOTE: As accuracy of a count will differ depending on the method used, it should always be recorded which method has been used for each particular count

3. *Direct counts (smaller flocks, up to 2-3,000 inds., good conditions)*

When observing groups of RBG or LWFG in a relatively small mixed flock of geese, in favourable conditions (relatively close, good visibility and light, stationary on the ground/water), accurately count the number of individuals of each species. Even when mixed in a flock of White-fronted or other geese, RBG tend to flock in their own group.

Try to identify all individuals by species and the RBG and LWFG by age at the same time. Scan the whole flock systematically from one end to the other, individual by individual.

Carefully wait until each individual shows itself well, to be positively identified (and aged when possible). Record the exact species only if you are sure they are identified properly. If you cannot determine the species in a flock or are uncertain of % of RBG/LWFG to GWFG in a flock (e.g. if too distant, bad visibility), then record the total number of geese. Add this total to the "unidentified" column on the data recording sheet (Annex 4).

4. *Estimation of total numbers for each goose species (larger flocks, over 3,000 inds./poor conditions)*

Sometimes, especially at key staging sites, when a very large number (thousands or tens of thousands) of geese and possibly hundreds or even thousands of RBG and LWFG are present - counting and identifying each individual is simply not possible. Counts of such large numbers can be further hindered by poor visibility due to darkness, mist, large distance to the flock, blinding sunlight etc. In such conditions, this is only possible to estimate the number of each species by counting the total number of all geese present, at the same time estimating species composition by random sampling.

2.1. Counting the total number of geese present

Counters should count all birds that are seen taking off from a roost at dawn, using spotting scopes and binoculars. As departure from the roost normally starts much before sunrise, observers need to be ready and in position for the count in the dark before the dawn. Observers should separate geese flying from the specific roost site from those flying from elsewhere – these should be recorded separately on the recording form.

For larger flocks (over 3,000 inds.), count 10 individuals accurately, then use this "measuring flock" to estimate a bigger "measuring flock" of 100 individuals (= 10 x 10), and then estimate the size of the whole flock in groups of hundreds. This should be taken into account, that some parts of the flocks are denser and the "measuring flock" needs to be regularly "calibrated". To help keep large counts tally counters should be used, for example two counters can be used to keep count of two different species.

NOTE: Double counting by observers from nearby point vantage points can be minimized if counting sections are clearly defined prior to counts and data is compared later.

2.2. Estimating species composition by random sampling

Flocks on the ground: When there is no time to identify all individuals in a large goose flock on the ground, a **random sample** of birds in the flock should be taken. To do this it is recommended to identify and record **every fifth bird**, which is believed to produce more precise estimates of the species composition than counting in groups of fixed size (i.e. groups of 30 birds), and overcomes the issue of RBG being more likely to flock in groups of their own species. To give a precise estimate of the proportion of LWfG in a flock a minimum of 20-25% of the flock should be counted (i.e. every fifth or fourth bird, respectively). Counting a much higher proportion of the flock (i.e. 50% or 60%) will not greatly improve the precision of the estimate: this time is better spent on other components of the survey or moving to the next site.

NOTE: When identifying birds in a flock, patiently identify every fifth bird, don't just pick the most easily visible birds! Such sampling is very intensive and requires good concentration, and it is recommended to sample in this way for 10-15 minute periods and then have a 5-10 minute break before sampling again.

Flying flocks: The easiest way to estimate the proportion of each species (and at the same time the age structure) is to take random samples of flying flocks when the geese are returning from feeding sites to the roosting site to drink (and often again departing to the feeding areas) during mid-day and the afternoon. Samples have to be **randomly** selected, and it is again recommended to count and identify **every fifth bird**, evenly covering the whole goose population present. Digital photography may provide additional means of sampling of birds and verification of count accuracy. For large roosting congregations, it is recommended to have one of the observers taking photographs of the flocks which are being sampled. Looking through images in the afternoon/evening will help to verify the accuracy of observers' counts of flying flocks and help to more accurately identify species composition.

NOTE: Good camera and a telephoto lens will be required to undertake this, as well as good light conditions. Image IDs should be carefully recorded on the recording form next to the flock data to avoid confusion.

Practical advice for sampling:

- Take samples of every fifth individual and work your way through the whole flock as far as possible.
- Randomly choose the flock that you are sampling (e.g. when finished with one flock, decide in advance to take the next sample after 2 minutes on the left side, the first flock in sight at that moment).
- Include only individuals that you have seen properly in the samples; if you can't identify all of the individuals then record this in your records classifying them as far as possible (i.e. "unidentified white-fronted goose", "unidentified Anser goose").
- Remember that distinguishing juvenile Lesser White-fronts from White-fronts is tricky!
- Record samples in 30 min (or shorter) periods, and keep the original samples separate to calculate statistics from the data.
- It is important to take samples evenly during the whole return (or departure) flight to get nonbiased data.
- Save all the original sample data to count the statistical precision of the estimate (standard deviation and variance) later.

NOTE: Counting a flock of geese and identifying all individuals requires time and patience. Finding a LWFG in a flock of hundreds of White-fronted Geese may require several repeated careful "scans" of the whole flock by telescope even in good observation conditions, and this may easily take more than half an hour.

API and age sampling *(please see Annex 6 for recording form and Annex 7 for recording instructions)*

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. In Bulgaria, for instance, 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 ageing are scarce. While the ideal would be to examine body condition throughout the winter,

it is recommended that both ageing and API sampling efforts are concentrated in February, when the hunting season is over and geese are relatively more settled in their feeding grounds.

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. The minimum recommended number of birds and flocks sampled on an annual basis is **1000 individuals** and **10 flocks** respectively.
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.

Ageing
Young RBG 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.

GWFG adult differ from juveniles by black patches on the belly versus plain grey belly of juveniles (juveniles also stand out with ill-defined white side line).

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 4-point scale developed for
Barnacle Geese *Branta leucopsis* by Owen et al. 1981 (Fig. 1).

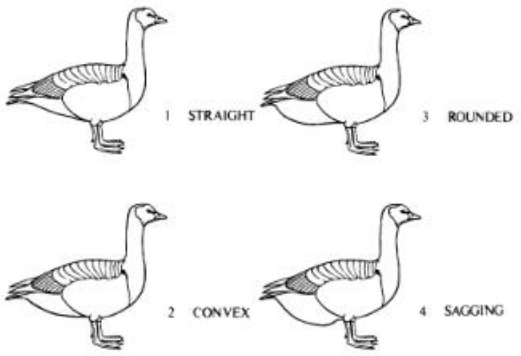

Fig. 1. Classification point values (1–4) of abdominal profiles of barnacle geese.

Figure 1 *API classification categories for Red-breasted Goose, following Owen et al. 1981 (Source: Owen M, 1981. Abdominal profile: a condition index for wild geese in the field. J. Wildl. Manage. 45: 227– 230).*

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.

Checking for marked individuals *(please see Annex 6 for recording form and Annex 7 for recording instructions)*

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:	**Greater White-fronted Geese may have:**	**Lesser White-fronted Geese may have:**
Metal leg rings	Metal leg rings	Metal leg rings
Plastic colour leg rings	Plastic colour leg rings	Plastic colour leg rings (up to 3)
Satellite/radio transmitters	Colour plastic neck collars	Colour plastic neck collars with a code
Combination of the above	Combination of the above	Combination of the above

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

For each ringed RBG observed, always check both legs, carefully read the colour codes (recorded from the top down, right to left leg) and note down in the following way:

- metal ring on the right leg, white + orange colour ring on the left leg: MR, WOL
- red + uncertain colour (e.g. because of mud) ring on the right leg, metal ring on the left leg: R?R, ML
- metal ring on the right leg, definitely no ring on the right leg: MR, –L
- also note down for each individual LWfG, if it definitely has no rings (often this is not possible, because the legs are hidden in the vegetation)

NOTE: The colours of the rings may bleach over the years, and some of the colour rings may also be lost.

Recording hunting pressure

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. 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

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.

NOTE: 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.

Foraging distribution and habitat preferences

Observers are provided with a map, a standard recording form (Appendix 8) and a standard list of plots to be covered (to be added as Appendix 9). Each plot should be assessed for presence/absence of geese, and marked as **observed** or **not observed**.
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.

Annex 1 Key wintering RBG sites in Europe to be monitored as part of the "LIFE for safe flight" project. **Russia list needs expanding…..**

Number	Name	SPA code

Bulgaria		
1	Shabla Lake Complex	BG0000156
2	Durankulak Lake	BG0002050
3	Atanasovsko Lake	BG0000270
4	Burgas Lake	BG0000273
5	Mandra-Poda complex	BG0000271
6	Svishtov-Belene Lowlands	BG0002083
Romania		
7	Iezer Calarasi	ROSPA0051
8	Lacul Strachina	ROSPA0059
9	Bertesti de Sus-Gura Ialomitei	ROSPA0120
10	Balta Alba-Amara-Jirlau	ROSPA0004
11	Balta Mica e Brailei	ROSPA0005
12	Delta Dunarii	ROSPA0031
13	Lacul Razim	ROSPA0031
14	Lacul Sinoe	ROSPA0031
15	Balta Tataru	ROSPA0006
16	Ianca-Plopu-Sarat	ROSPA0048
Ukraine		
17	Danube region Odessa district	
18	Odessa district	
19	Nikolaev district	
20	AR Crimea	
21	Kherson district	
22	Zaporozhye	
SW Russia		
	Manych	
	To be added……	

Annex 2 Key staging areas for RBG and LWFG in Kazakhstan, monitored by Cuthbert et al in September- October 2016. Priority sites are highlighted in ***bold italics***, asterisk * indicates 2 sites in Russia, across the border from the sites covered by the Kostanay West team.

Survey team	Lake name	Lat N	Lon E
Akmola	Russky Zharkol	50.20323	67.29406
Akmola	***Kazakhskiy Zharkol***	***50.42720***	***67.26260***
Akmola	***Taldykol***	***50.46368***	***67.10831***
Akmola	Shoindykol	50.41917	67.32087
Akmola	Sabyndy	50.50010	67.18556
Akmola	Koskakol	50.77859	67.45296
Akmola	Aupeldik	50.83452	68.23135
Akmola	Szocsinszkoe	50.96032	68.19196
Akmola	Kubikol	50.88503	68.69540
Akmola	Korzhakol	51.09750	68.94458
Akmola	Kozhakol	50.94186	69.16685
Akmola	Samtas	50.77604	69.08002
Akmola	Tengiz	50.60521	69.15307
Akmola	Saumalkol	50.71373	69.70505
Akmola	Sholak	50.56221	69.77075
Akmola	Zhumay	50.68046	69.80665
Akmola	Temirastau	50.70690	69.94308
Akmola	Mayshukur	50.73282	69.97643
Akmola	Kumdykol, Ashu-Kumkol, Uzynkol, Zharlykol	50.55003	70.68375
Akmola	Zharlykol (Burevestnik)	51.02335	69.84106
Akmola	Shandykol	51.07399	69.68269
Akmola	Alakol	51.17950	69.74598
Kostanay North	Shoskaly	51.35068	64.30791
Kostanay North	Kulakol	51.21279	64.54955
Kostanay North	Karashar	51.50514	64.50996
Kostanay North	Maly Aksuat	51.51217	64.49281
Kostanay North	Sharkol	51.64456	64.54300
Kostanay North	Bolshoy Aksuat	51.49990	64.51659
Kostanay North	Kushmurun	52.52599	64.71681
Kostanay North	Bidaik	52.31543	64.55584
Kostanay North	***Koybagar***	***52.55561***	***65.58037***
Kostanay North	Tjyuntjugur	52.70992	65.78412
Kostanay North	Boshakol	53.10814	65.94010
Kostanay West	Urkash, by the village	51.33999	62.33230
Kostanay West	Urkash,	51.35222	62.37222
Kostanay West	Urkash,	51.43970	62.54210
Kostanay West	Batpakkol	51.42462	62.65553
Kostanay West	Mamyrkol	51.59927	62.70814
Kostanay West	Druzhba	51.43320	62.92226
Kostanay West	Jegisbay(?)	51.38689	62.94564
Kostanay West	Unknown 1	51.35676	62.97708

Kostanay West	Unknown 2	51.31809	62.92960
Kostanay West	Unknown 3	51.24699	62.84895
Kostanay West	Shoptykol N (?)	51.06071	62.76700
Kostanay West	Unknown 4	51.21115	62.56756
Kostanay West	Unknown 5	51.19333	62.54273
Kostanay West	Urkash, Lake Tenis	51.33212	62.34128
Kostanay West	Bliskopa	51.75683	61.86366
Kostanay West	Ayke	51.00559	61.58998
Kostanay West	Shelkar Karashatau	50.40819	61.18270
Kostanay West	Sulukol	50.98702	62.02286
Kostanay West	***Kulykol***	***51.34146***	***61.77020***
Kostanay West	***Taldykol***	***51.39053***	***61.96859***
Kostanay West*****	Zhetykol (Russia)	51.03102	60.96978
Kostanay West*****	Balakol (Russia)	51.03102	60.96978
Kostanay West	Zharsor	51.40420	63.04187
Kostanay West	Diyevka	52.01723	63.59707
North Kazakhstan	Akzhan	54.15594	65.71372
North Kazakhstan	Sarayoban	54.12393	65.91022
North Kazakhstan	Retchnoe	54.08017	65.78692
North Kazakhstan	Lebyazhe	53.96310	65.91216
North Kazakhstan	Zhaman Sharkol	53.96310	65.91216
North Kazakhstan	Shoshkaly	54.02192	66.04486
North Kazakhstan	Zhaksysharkol	53.81080	66.05495
North Kazakhstan	Bolshoy Kak	53.61633	66.22688
North Kazakhstan	Aksuat	53.63784	66.47507
North Kazakhstan	Maly Kak	53.79212	66.84679
North Kazakhstan	Zhaltyr	53.98130	67.29217
North Kazakhstan	***near Balykty***	***54.22829***	***68.98962***
North Kazakhstan	Uzynkol	54.13502	69.08708
North Kazakhstan	Kumdykol	54.06979	69.01241
North Kazakhstan	Karasor	54.16415	69.18821

North Kazakhstan	Terenkol	54.38099	69.20073
North Kazakhstan	Shagly Teniz	54.16486	69.83712
North Kazakhstan	Tayinsha	54.13863	70.24908
North Kazakhstan	Solenoe	54.84401	70.32056
North Kazakhstan	Sukhoe (Kamyshlovo)	54.84722	70.24250
North Kazakhstan	Kamyshlovo	54.83636	70.16959
North Kazakhstan	Polovinnoe	54.84865	70.02918

Annex 3 Data **recording form** for Red-breasted Goose and Greater White-fronted Goose **roost counts** in **Europe**

1. Site name				Code	
2. Date	/ /	Start time	:	End time	:
3. Observers					

4. Weather		temperature		cloudiness		Visibility (km)	
Wind (Beaufort scale)		wind direction		rain		Snow cover (cm)	

5. Count totals target species				
	B. ruficollis	*A. albifrons*	*A. anser*	Unidentified geese
Roosted in your count section				
Roosted in the sea in front of your count				
Passed from adjacent count sections				
Came from other directions (specify				

6. Count accuracy – was the count complete (OK) or other factors led of the omission of significant number of geese during the count (Low)?			
	B ruficollis	*A albifrons*	Unidentified
Count accuracy	OK / Low	OK / Low	OK / Low
If 'Low', please tick all that apply:			
Birds leaving as I arrived			
Birds left in the dark			
Poor visibility (fog, snow, etc)			
Roost flight very busy/chaotic			
7. Ice cover: Please indicate the proportion of the lake covered (%).			

8. Count totals non-target species.				
Did you have to stop counting non-target species?				Yes / No
Species	Number	Species	Number	Accuracy
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low

9. **Additional information**. Use the row number from section 10 if the information is related to a particular flock.

	10. Counts	Point name		Another sheet used?	Yes / No
	Date: / /	Start time:	:	End time:	:

No	**Time** (15 minute interval)	Total	*B ruficollis*	*A albifrons*	*A anser*	Uniden. geese	Roost place - lake (L); sea (S)	Gun shots
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
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Annex 4 Data **recording form** for Red-breasted Goose, Lesser White-fronted Goose and Greater White-fronted Goose **roost counts** in **Kazakhstan**

1. Site name				Code	
2. Date	/ /	Start time	:	End time	:
3. Observers					

4. Weather		temperature		cloudiness		Visibility (km)	
Wind (Beaufort scale)		wind direction		rain		Snow cover (cm)	

5. Count totals target species						
	B. ruficollis	*A. erythropus*	*A. albifrons*	*A. anser*	*T. ferruginea*	Unidentified geese
Roosted in your count section						
Roosted in the sea in front of your count						
Passed from adjacent count sections						
Came from other directions (specify						

6. Count accuracy – was the count complete (OK) or other factors led of the omission of significant number of geese during the count (Low)?						
	B. ruficollis	*A. erythropus*	*A. albifrons*	*A. anser*	*T. ferruginea*	Unidentified
Count accuracy	OK / Low	OK / Low	OK / Low	OK / Low	OK / Low	OK / Low
If 'Low', please tick all that apply:						
Birds leaving as I arrived						
Birds left in the dark						
Poor visibility (fog, snow, etc)						
Roost flight very busy/chaotic						

7. Ice cover: Please indicate the proportion of the lake covered (%)	

8. Count totals non-target species.				
Did you have to stop counting non-target species?				Yes / No
Species	Number	Species	Number	Accuracy
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low
				OK / Low

9. **Additional information**. Use the row number from section 10 if the information is related to a particular flock.

	10. Counts		Point name				Another sheet used?			Yes / No
		Date:	/ /	Start time:		:		End time:		:
No	**Time** (15 minute interval)	Total	*B ruficollis*	*A erythropus*	*A albifrons*	*A anser*	*T ferruginea*	Uniden. geese	Direct count (D)/ sample (S)	Gun shots
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
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42										

Annex 5 Data recording **instructions** for **roost counts** (both for surveys in Europe and Kazakhstan)

NOTE: Prior to count fill in only "Start time" detail in section 2. During the count you need to fill only section 10 (Counts) of the form. Complete the other parts of the form (Sections 1-9) when the count is finished.

1. *SITE NAME*: Please write the point name (or point coordinates).
2. *DATE AND TIME*: Fill exact date, start time and end time.
3. *OBSERVERS*: Please write full names of all observers at the count point.
4. *WEATHER*: Please describe the weather conditions according to the indicated parameters. If necessary include additional information.
5. *COUNT TOTALS TARGET SPECIES*: After the end of the count, please review all rows (10. Counts) and calculate the total number of all goose species roosted in **your count section**, roosted in the sea in front of your count section, Passed from adjacent count sections or appeared from different directions. **Try to count predominantly flocks in your count section (ie. leaving lake if lake is in your section, or if they crossed the shoreline in your section). In this way you avoid double counting and confusions.**
6. *COUNT ACCURACY*: To mark the accuracy of count is essential for interpreting the results and the number of target species. Please indicate whether you consider that the total numbers of the target species are a real reflection of the birds roosted in your counting area (OK) or if other factors have made a negative impact and you have missed a significant number of geese (Low). If the accuracy is Low, please fill the relevant columns below and specify the reasons.
7. *ICE COVER*: If you count on a lake, please indicate the approximate lake area covered with ice (in %).
8. *COUNT TOTALS NON-TARGET SPECIES*: For the count of other non-target bird species (cormorants, ducks, raptors): write the Latin names of the additional species you have counted at the count point. Please note whether the non-target species count is full or partial (stopped due to an intensive target species count).
   Record them with their Latin names abbreviated (eg. *C.cyaneus, P.pygmeus*).
   Skip to record non-target species when there are too many Red-breasted and White-fronted geese flocks and there is no time to record other information.
9. *ADDITIONAL INFORMATION*: Please, indicate any additional information you consider as relevant. If the information concerns a particular flock, indicate the number of the row where the flock is registered.
10. *COUNTS*: Guidelines on how to collect and fill in the information in Section 10 are given below:

- Fill the exact date, start time and end time.
- Write the time to a possible accuracy of **15 minute intervals**. If there are a lot of geese, it is enough to record the time every 15 minutes (4 times per hour), but fill the data for each flock separately in different rows.
- If you need another sheet to continue counting, please mark YES in the top right corner of the form.
- **For each flock mark the number of Red-breasted Geese (RBG), Lesser White-fronted Geese (LWFG)*, Greater White-fronted Geese (GWFG), Ruddy Shelduck* and Greylag Geese. Record exact species only if you are sure they are identified properly. If cannot determine species or are uncertain of % of RBG to GWFG in a flock (eg. if distant or cannot check all the birds carefully), count flock size and write total in "unidentified"**
- **If there are many birds and large flocks and you cannot count RBG and GWFG separately, firstly count the entire flock and then count the RBG in it or estimate it as a percentage of the flock. Later you can easily calculate the number of GWFG.**
- Record the information of each flock on a separate row in the form.
- It is not necessary to write a number in the "Total" column if you have counted separately Red-breasted and White-fronted Geese.

- In the "Roost place"****** column, mark where the birds came from. If birds lift from lake, write **L** (lake). If birds arrive from sea, write **S** (sea). If you're not sure where they came from, write **U** (unknown) in the column.
- If you have a doubt that a flock is counted from another count point - note in Section 9. ADDITIONAL INFORMATION the name of the adjacent point, the exact time of observation, the flock number, species composition and the direction of the flight **OR** mark the row number in the "COUNTS" form, where this information written already. Do the same for the geese flocks left your sector and directed to an adjacent count sector.
- Count the gun shots for each approximately 15 minute intervals, keep a tally of the gun shots heard around the roosts and elsewhere (eg in feeding areas or villages). Write the numbers in the "Gun shots".

The count ends when all the target species leave the roosting place. Please fill in the rest of the information required (Sections 1-9) immediately after the count (no later than 1 hour) in order not to miss important details.

(*) relevant to Kazakhstan only

(**) only relevant to Europe as in Kazakstan all roost sites are lakes

Annex 6 Data **recording form** for Red-breasted Goose, Lesser White-fronted Goose and Greater White-fronted Goose **ageing, API and marked individuals**

1. Site name				Code	
2. Date and time	/ /	Start time	:	End time	:
3. Observers					
4. Obs. position (Lat/Long)		**6. Flock location**		**8. Flock size**	
5. Distance to birds (m)		**7. Crop type**		**9. Flock ID**	

10. Age and IPA counts

	B. ruficollis						***A. erythropus***						***A. albifrons***					
	ad	juv	API				ad	juv	API				ad	juv	API			
			1	**2**	**3**	**4**			**1**	**2**	**3**	**4**			**1**	**2**	**3**	**4**

11. Marked birds

	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio
1									
2									
3									

1. Site name				Code	
2. Date and time	/ /	Start time	:	End time	:
3. Observers					
4. Obs. position (Lat/Long)		**6. Flock location**		**8. Flock size**	
5. Distance to birds (m)		**7. Crop type**		**9. Flock ID**	

10. Age and IPA counts

	B. ruficollis						***A. erythropus***						***A. albifrons***					
	ad	juv	API				ad	juv	API				ad	juv	API			
			1	**2**	**3**	**4**			**1**	**2**	**3**	**4**			**1**	**2**	**3**	**4**

11. Marked birds

	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio
1									
2									
3									

1. Site name				Code	
2. Date and time	/ /	Start time	:	End time	:
3. Observers					
4. Obs. position (Lat/Long)		**6. Flock location**		**8. Flock size**	
5. Distance to birds (m)		**7. Crop type**		**9. Flock ID**	

10. Age and IPA counts

	B. ruficollis						***A. erythropus***						***A. albifrons***					
	ad	juv	API				ad	juv	API				ad	juv	API			
			1	**2**	**3**	**4**			**1**	**2**	**3**	**4**			**1**	**2**	**3**	**4**

11. Marked birds									
	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio	Leg ring	Neck collar	Sat/radio
1									
2									

Annex 7 Data recording instructions for **ageing, API** and recording **marked** individuals

01. SITE NAME: Please write the name of the nearest survey site
02. DATE AND TIME: Fill exact date, start time and end time.
03. OBSERVERS: Please write full names of the observer conducting sampling
04. POSITION: Lat N/Long E coordinates of the observers' position
05. DISTANCE TO BIRDS: Approximate distance to birds (m)
06. FLOCK LOCATION: If the map of the area is provided, with crop fields numbered, then assigned number of the occupied field should be recorded.
07. CROP TYPE: Type of the crop (current or previously harvested) on the field used by the observed flock
08. FLOCK SIZE: Total number of birds in the flock
09. FLOCK ID: A unique ID of the flock for that date
10. AGE AND API COUNT: Using counter, for each species (for a mixed flock) record *Number of young* and *Number of adult* birds and *API* (using score from 1 - 4) by sampling each 5th individual in a given flock, scanning from one side of the flock to the other.

Additional comments for section 10:

- 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.
- 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.
- If the flock is smaller than about 300 birds, try to sample the whole 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.

11. MARKED BIRDS: For any marked bird observed, record the following detail, for each species separately:
- if ringed, record ring combination.
- if bird has a neck collar, record its colour and code, if possible to read
- put *YES* if bird is tagged and *NO* if not

Annex 8 Data recording form for goose foraging distribution and habitat preferences

Survey details					
Date:	/ /	Observer names:			
Transect details					
Start point:		Start time	:	End time	:
Description of route taken (also recorded on GPS):					

Plots with geese								
Flock ID	Plot No.	Number of geese		Crop type	Previous crop	Lat/long of observers		Time
		RbG	WfG			*eg 28.401399 6*	*eg 43.6990013*	*(hh:mm)*
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Key instructions

1. Complete survey and transect details at the start of the transect. Remember to note the end time at the end of the transect.
2. Ensure the GPS is turned on and recording the track. Note the general route eg the order of villages passed through
3. Follow the transect, assessing all plots marked on the map for goose presence/absence
4. In List of Plots (annex 9) mark whether plots were visited or not visited with a Y/N
5. For all plots with geese, complete in **Plots with Geese** section. Count geese of each species to nearest 10%
6. Crop type should be taken in the location of the flock. If flock is spread across more than one crop type, record crop as the one in which the majority of the flock is seen
7. Previous crop type is the type of stubble on which the main crop is seeded eg maize.

Annex 9 Form for standard list of plots to be surveyed for goose foraging distribution and habitat preferences (see Annex 8).

	Plot No.	Visited? Y/N		Plot No.	Visited? Y/N		Plot No.	Visited? Y/N
1			41			81		
2			42			82		
3			43			83		
4			44			84		
5			45			85		
6			46			86		
7			47			87		
8			48			88		
9			49			89		
10			50			90		
11			51			91		
12			52			92		
13			53			93		
14			54			94		
15			55			95		
16			56			96		
17			57			97		
18			58			98		
19			59			99		
20			60			100		
21			61			101		
22			62			102		
23			63			103		
24			64			104		
25			65			105		
26			66			106		
27			67			107		
28			68			108		
29			69			109		
30			70			110		
31			71			111		
32			72			112		
33			73			113		
34			74			114		
35			75			115		
36			76			116		
37			77			117		
38			78			118		
39			79			119		
40			80			120		

Annex 10 List of equipment

Each counting team should have:

- Good quality binoculars
- Good quality spotting scope
- Good quality, steady tripod
- GPS unit
- Tally counter
- Enough recording sheets
- Copy of the counting instruction
- Copy of the survey protocol
- Map of the survey site with marked count points and count sections
- A4 sized clipboard
- Spare pencils
- Wrist watch
- Compass