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DEFINITION OF MANAGEMENT UNITS IN THE RUSSIA/GERMANY & NETHERLANDS POPULATION OF THE BARNACLE GOOSE AND IMPLICATIONS FOR MONITORING

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The 4th Meeting of the AEWA European Goose Management International Working Group is being hosted by Scottish Natural Heritage.

1. Background

In the International Single Species Management Plan (ISSMP) for the Barnacle Goose (*Branta leucopsis*), adopted at the 7th Session of the Meeting of the Parties to AEWA (MOP7) in December 2018 in Durban, South Africa, it has been suggested as an option, that the management of the Russia/Germany & Netherlands population could be divided into two or three Management Units (MUs). The EGMP Data Centre and the International Modelling Consortium herewith propose biologically defined Management Units (MUs) to be considered by the EGM IWG.

2. Proposed Management Units

The analysis proposes the definition of three MUs, all wintering in the same range in the Netherlands, Belgium, Germany, Denmark and south Sweden:

MU1: The arctic Russian breeding population (migratory).

MU2: The temperate Baltic breeding population, including the Oslo Fjord breeding population (migratory).

MU3: The temperate North Sea breeding population, breeding in the Netherlands, Belgium, Germany and south-west Denmark (considered sedentary).

Capture-Mark-Resighting (CMR) programs have shown that there is some exchange between the three MUs. The discrimination between MU2 and MU3 is geographic; however, it is predicted that if the temperate populations continue to grow and spread out, the division may become blurred. Therefore, the delineation of these MUs has to be considered within an adaptive process, and future studies will enable a refinement of the definition of MUs.

3. Implications of the use of MUs on monitoring data requirements for assessments

At the 2nd meeting of the International Modelling Consortium on 21-22 March 2019 (Kalø, Denmark), the implications for data requirements were evaluated, for an Adaptive Flyway Management Programme (AFMP) based on the three MUs, versus grouping MU2 and MU3, or managing the population as a whole. The basic essential variables needed for management are population size and offtake (harvest, culling, derogation shooting, egg destruction). Estimates of demographic variables, such as annual survival rates and productivity (percentage of juveniles in the population), as well as exchange rates between MUs would be important variables to include in population models. Survival rates can be derived from CMR programs coordinated among the breeding Range States. Productivity in MU2 and MU3 can be assessed during summer counts (July); such counts will have to be coordinated among breeding Range States. An overall productivity estimate for the population can be made in autumn.

3.1. Use of three MUs (MU1, MU2, MU3)

In the case the three MUs are used for the AFMP, it will be necessary to assess the population sizes of each MU on a regular basis, preferably at intervals of no longer than three years. Because birds from the three MUs mix in the wintering Range States, it will not be possible to derive an estimate of the numbers belonging to each MU based on winter counts in each Range State, unless systematic marking or tracking of geese is continued in each MU, to make an estimate of the proportion of birds from each MU in each Range State possible. Since the various MU groups of geese may change their migratory behaviour, marking, re-sighting or tracking efforts will have to be maintained.

An alternative way to derive a population size estimate for each MU is to count the post-breeding population size and the young (in July) in each Range State in the temperate region (MU2 and MU3). By subtracting the summer estimates from MU2+MU3 from the total mid-winter population estimate, the Russian MU1 population estimate can be derived. To account for the number of geese dying between summer and mid-

winter, an estimate of the numbers of geese taken (harvest in Russia + derogation shooting offtake in the temperate region) have to be added to the MU1 mid-winter population estimate.

To estimate the number of geese taken in each MU, either harvested (in Russia) or shot/culled under derogation, the number of geese taken in each Range State needs to be known. Regarding derogation offtake, including shooting, culling and egg destruction, data from the EU member states can be derived from the mandatory annual reporting to the EU. Bag statistics from Russia can provide an estimate of the Russian harvest; however, this can in theory also be estimated from ring recovery analysis. Furthermore, regardless of whether counts are conducted in mid-summer or mid-winter, it is necessary to know how much of the offtake (harvest + derogations) occurs prior to and after the anniversary date of the count.

3.2. Use of two MUs (arctic MU1 and temperate MU2+MU3 merged)

In the case of using two MUs, the monitoring data requirements do not differ from using three MUs (as above).

3.3. No use of MUs

If no MUs are used for the AFMP, a population estimate can be derived from a mid-winter count performed in all wintering Range States.

Information about number of geese taken, i.e. harvested, derogation shooting, culling and egg destruction, is required from each Range State.

4. Advantages and disadvantages of managing at different MU levels

As outlined above, managing on a MU basis comes at a cost regarding extra monitoring for a MU-based AFMP. A summary of the monitoring needs using MUs (either three or two) versus no MUs is presented in Table 1 below. In either case, a systematic national reporting of harvests (Russia) and derogations with a seasonal resolution is required. If MUs are used, it is necessary to maintain an extended protocol for population size monitoring. An internationally coordinated CMR program can provide estimates of the proportion of geese from each MU present in the Range States at the time of population monitoring, as well as data to estimate annual survival. Systematic summer counts of geese in the temperate regions can provide alternative MU population estimates, as well as productivity estimates.

If management objectives were similar for all three MUs, there would be no need for a MU approach. However, according to the ISSMP for the Barnacle Goose, as well as the outcomes of the discussions at the 2nd AEWA International Species Management Planning Workshop for the Barnacle Goose and the Greylag Goose (Leeuwarden, the Netherlands, 19 June 2018), management objectives differ to some degree. At least, three arguments for using MUs prevail:

First, according to the EU Birds Directive, Range States have the obligation to maintain the range of the population, which means that the Range States have to ensure that any management measures used do not negatively influence the migration of Barnacle Geese from the Russian arctic breeding grounds to the temperate wintering areas. To ensure this, countries will need to document, that in particular MU1 is maintained. The most effective way to monitor this is by application of MU-specific monitoring.

Second, biologically, the population processes, habitat interactions, anthropogenic pressures and management issues differ between the arctic MU1 and the temperate MU2 and MU3, as do the harvest opportunities and legal obligations. Furthermore, the arctic geese are regarded as a conservation asset in the wintering Range States, which does not apply to the summering geese in the same way.

Third, some temperate Range States have a more pronounced desire to manage national breeding populations than others, depending on the tolerance to agricultural damage or air safety risks caused by summering geese in particular.

Whether to split the temperate MUs (MU2 and MU3) or not, is open for discussion and should be decided by the EGM IWG. Biologically, it seems that MU2 is under an increasing predation pressure from White-tailed Eagles (*Haliaeetus albicilla*) and invasive Racoon Dogs (*Nyctereutes procyonoides*); however, the MU3 geese are also increasingly subject to the same predators. MU3 geese are considered sedentary, while MU2 geese are migratory.

Table 1. Overview of monitoring needs using 3 MUs, 2 MUs or no MUs, respectively, for the Russia/Germany & Netherlands Barnacle Goose Population

Variable	**3 MUs**	**2 MUs**	**No MUs**
Population estimate			
Mid-winter count	X	X	X
CMR program to estimate the segment of the different MU's in each winter Range State and exchange rates	X	X	
Summer population count	MU2 & MU3	MU2 & MU3	
Offtake			
Harvest (Russia only)	X	X	X
Derogation (shooting, culling and egg destruction, all with seasonal resolution)	X	X	X
Demographic variables (optional)			
Adult survival (CMR; marking in breeding Range States)	X	X	X
Productivity (age counts in autumn Range States)	X	X	X

5. Action requested from the EGM IWG

The EGM IWG is invited to consider the proposed definition of Barnacle Goose MUs and decide on the preferred option, considering the implications for the required monitoring.