15-18 June 2020 EGM IWG5 Online Conference Format





Greylag Goose Session

Management of the NW/SW European Population of Greylag Geese: Decision Making Under Deep Uncertainty

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Adaptive Flyway Management Programme for the NW/SW European Population of the Greylag Goose Doc. AEWA/EGMIWG/5.14

Overview

- Motivated by a desire to regulate offtake to help achieve a number of management objectives
- But Flyway estimates of abundance and/or offtake appear to be biased
- Thus, traditional population modeling and decision-analytic tools not applicable
- Information-Gap Decision Analysis (info-gap)
 - Used in cases of "deep" uncertainty
 - Which action is most likely to satisfy a management criterion for the largest range of uncertainty?

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Inferring bias

Intrinsic growth rate (biological potential)

 $\bar{\lambda}$ = **1.159** (1.120–1.206)

 Realized growth rates from Range State mid-winter counts

 $\bar{\lambda}$ = 1.038 (1.026–1.051)

 Nominal levels of abundance & offtake reported in ISSMP

H = 450k and *N* = 1.5m



Finite growth rate

$$\bar{\lambda} \approx \lambda \left(1 - \frac{\beta H}{\alpha N} \right)$$

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Bias: Abundance? Offtake? Both?







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Conclusions concerning bias

- Similar problems
 - Greylag Geese breeding in Iceland (Frederiksen et al. 2004)
 - at a regional level in Europe (report not publicly released)
- Estimates of breeding pairs, IWC counts, and Range State mid-winter counts are in reasonable agreement
- Offtake reporting has been rather haphazard, and has lacked consistent protocols
- *If* abundance and offtake are approximately correct, Greylag Geese would require *much* higher survival and reproduction than is typical in arctic and subarctic breeding geese
- Most pressing need is to examine protocols for estimating offtake





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Info-Gap Decision Analysis

- Cannot use population targets as management criteria because it is abundance itself that is uncertain
- A feasible management criterion is the predicted population growth rate for varying levels of change in offtake
- Only possible at a Flyway level because of potential spatial variability in bias, and unknown MU-derivation of the offtake
- Suggested approach (other criteria possible):
 - Achieve a growth rate $\lambda = 0.98$ (15% decline over 10 years)
 - Might consider 0.96 $\leq \ \lambda \leq$ 1.00 as acceptable (a relatively restrictive criterion in the face of deep uncertainty)





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Probabilities of achieving $0.96 \le \lambda \le 1.00$







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Conclusions from Info-Gap

- Risk of *not* meeting the criterion of $0.96 \le \lambda \le 1.00$ is *very* high (>85%)
- While the info-gap suggests that an increase in offtake is necessary to stabilize or decrease population size
 - We don't know whether the level of offtake has changed from that reported in the ISSMP (2012–2016)
 - Recent IWC and Range State midwinter counts suggest the population is no longer increasing
- Does not take into account special needs and population trajectories of the MUs and their different segments (e.g., migratory segment to Spain)





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Conclusions from Info-Gap (2)

- Info-gap decision analysis does not provide a sound basis for adaptive, dynamic decision-making
- Which ultimately will be necessary to reliably manage Greylag Goose abundance in accordance with population targets in the two management units
- Only up-to-date, coordinated, and *reliable* monitoring data on abundance and offtake from throughout the flyway will allow us to realize that goal

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