**Supplementary Material**

Fishery bycatch is among the most important threats to the European population of Greater Scaup *Aythya marila*

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Table S4. Demographic parameters used for the age-structured matrix population model for Greater Scaup *Aythya marila* (after Fournier and Hines 2001, Flint *et al.* 2006, Flint 2015, Horswill and Robinson 2015).

Table S3. The results of modelling individual simulations of the Greater Scaup *Aythya marila* flyway population overwintering in northern and western Europe. Population size estimates refer to individuals of both sexes, i.e. simulation results pertaining to females only were doubled.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Simulation | Pop. number\*1000 | Additional mortality (bycatch) % | Pop. growth rate λ (median) | Pop. after 30 years \*1000 | Pop. increase in % | Prob. quasi extinction | Prob. reach thresh. of -30% |
| Stable population currently without bycatch (Stab\_0) | 212.5 | 0 | 0.9999 | 235.6 | 10.9 | 0.207 | 0.41 |
| Stable pop. with bycatch min. (Stab\_019) | 212.5 | 1.9 | 0.9835 | 145.6 | -31.51 | 0.437 | 0.661 |
| Stable pop. with bycatch max.(Stab\_023) | 212.5 | 2.3 | 0.9788 | 126.8 | -45.06 | 0.504 | 0.708 |
| Stable pop. with PBR *f*=0.5 (Stab\_064) | 212.5 | 6.4 | 0.9462 | 47.5 | -77.63 | 0.913 | 0.964 |
| Declining pop. without bycatch (Decl\_0) | 212.5 | 0 | 0.9863 | 158.4 | -25.48 | 0.381 | 0.616 |
| Decl. pop. with bycatch min. (Decl\_019) | 212.5 | 1.9 | 0.9702 | 98.2 | -53.81 | 0.657 | 0.829 |
| Decl. pop. with bycatch max. (Decl\_023) | 212.5 | 2.3 | 0.9664 | 87.6 | -58.76 | 0.712 | 0.855 |
| Decl. pop. with PBR *f*=0.1 (Decl\_013) | 212.5 | 1.3 | 0.9751 | 113.7 | -46.47 | 0.578 | 0.776 |
| Local pop. stable with bycatch | 20 | 6.2 | 0.9340 | 3.1 | -98.55 | 0.965 | 0.989 |

Table S4. Demographic parameters used for the age-structured matrix population model for Greater Scaup *Aythya marila* (after Fournier and Hines 2001, Flint *et al.* 2006, Flint 2015, Horswill and Robinson 2015).

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Description | Stable population λ=0.9999  value ±SD | Moderately declining population λ=0.9863  value ±SD |
| *s1* | survival from 1 to 2 yr old females | 0.81±0.05 | 0.81±0.05 |
| *s2* | survival from 2+ old females | 0.81±0.05 | 0.81±0.05 |
| *cs1* | clutch size 2 yr females | 8.765±0.75 | 8.765±0.75 |
| *cs2* | clutch size 2+yr females | 8.765±0.75 | 8.765±0.75 |
| *ns1* | nest success, probability clutch hatched, females 1yr old | 0.251±0.15 | 0.251±0.15 |
| *ns2* | nest success, females 2+yr | 0.271±0.15 | 0.271±0.15 |
| *chs* | chick survival to fledging | 0.365 | 0.34 |
| *s0* | juvenile survival (from fledging to 1st spring) | 0.40±0.05 | 0.40±0.05 |
| *prop1* | breeding propensity of 1yr females | 0.75±0.01 | 0.75±0.01 |
| *prop2* | breeding propensity 2+yr females | 0.99±0.01 | 0.99±0.01 |
| *sr* | clutch sex ratio | 0.5 | 0.5 |
| *re1* | re-nesting probability 1yr females | 0.51 | 0.51 |
| *re2* | re-nesting probability 2+yr females | 0.51 | 0.51 |

Table S5. Input data for computing the harvest rates used in further analyses (bolded values). Harvest rate was computed as the proportion of the total flyway population and SL population.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Flyway population, both sexes | 212,500 |  |  |  |
| Flyway population, females | 95,625 |  |  |  |
|  | Mean | Min | Max |  |
| Bycatch, both sexes | 3,991.5 | 3,194 | 4,789 |  |
| Bycatch, females | 1796.2 | 1,437.3 | 2,155.1 |  |
| Harvest rate, females | **0.019** | 0.015 | **0.023** |  |
| SL, both sexes | 20,000\* |  |  |  |
| SL, females | 9,000 |  |  |  |
|  | Mean | Min | Max |  |
| Bycatch, both sexes | 1,236.5 | 1,089 | 1,384 |  |
| Bycatch, females | 556.4 | 490.1 | 622.8 |  |
| Harvest rate, females | **0.062** | 0.055 | 0.069 |  |
| Total females, flyway population | 95,625 |  |  |  |
|  | *f* = 0.5 | *f* = 0.1 |  |  |
| PBR-informed bycatch limit, both sexes | 13,600 | 2,800 |  |  |
| PBR-informed bycatch limit, females | 6,120 | 1,260 |  |  |
| Harvest rate, females | **0.064** | **0.013** |  |  |

SL – Szczecin lagoon, PBR – Potential Biological Removal, *f* – coefficient reflecting the status of the population and its priority protection (0.5 stable population, 0.1 declining population), as recommended by Dillingham and Fletcher (2008).

\*Marchowski *et al.* 2018