Supporting Information

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**S5. Reporting of Precision for Deer Abundance and Density Estimates**

**Methods**

We extracted the measure of precision (i.e., SD, SE, CI, or CrI) reported for each deer abundance and density estimate. We analyzed the reporting of precision using a general linear model (GLM) with a probit-link binomial family (McCullagh and Nelder 1989). We included the following explanatory variables: year of data collection (1980–2017), region (North America, South America, Asia, Australasia), the first-order method (pedestrian sign counts, pedestrian direct counts, vehicular direct counts, aerial direct counts, motion-sensitive cameras, harvest data), the deer density (deer/km2), and whether management was a clear objective (yes or no). We first compared the full model with and without the interaction terms between the year of data collection and the 3 categorical variables (5 models). Following the stepwise model selection approach (Murtaugh 2009), we then fitted a first set of candidate models by removing one explanatory variable from the best model. We selected the final model based on the lowest Akaike’s Information Criterion corrected for small sample sizes (AIC*c*). This step was repeated until the removal of any additional explanatory variable resulted in a higher AIC*c* value (Burnham and Anderson 2002). All analyses were performed using R version 4.0.2 (R Core Team 2020). The data and code that support the findings of this study are openly available in figshare at <https://doi.org/10.6084/m9.figshare.18846647.v1> (Forsyth et al. 2022).

**Results**

The best model explaining the probability of deer abundance and density estimates reporting precision included all explanatory variables as well as the interaction terms between year and method, and between year and management (Tables S5.1 and S5.2). The probability of reporting precision increased over time for all methods, but at highly variable rates (Fig. 5.1A–F). Harvest data estimates had a low probability of reporting precision prior to 2010, but since then nearly all estimates reported precision. Motion-sensitive cameras and vehicular direct counts showed the strongest increase of reporting precision, from <20% in 1980 to almost 90% in 2017. Although almost doubling since 1980, the reporting of precision from pedestrian direct counts was still <60% in 2017, the lowest rate of all methods.

The reporting of precision also varied spatially (Fig. 5.1G). Europe showed the lowest probability of reporting precision, closely followed by North America and Asia, all being on average lower than 30%. Australasia and South America, on the other hand, showed a much higher rate of reporting precision (>70%). Until 2010, estimates from studies with a clearly articulated management objective were less likely to report precision than estimates from research studies, but this trend was inverted during the last decade (Fig. 5.1H). Overall, the reporting of precision increased with deer density (Fig. 5.1I).

**Table S5.1.** Summary of the stepwise selection process identifying the best model explaining the probability of precision being reported for deer abundance or density estimates in articles published during 2004–2018. For each step, the best model is shown in bold, with the overall best model in step 2. AIC*c*: Akaike Information Criterion corrected for small sample size. *wi*: model weight.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | df | logLik | AIC*c* | ΔAIC*c* | *wi* | Pseudo *R*2 |
| Step 1: |  |  |  |  |  |  |
| Year + method + region + management + density | 13 | –1,677 | 3,380 | 84 | 0.00 | 0.31 |
| Year \* method + region + management + density | 18 | –1,632 | 3,301 | 5 | 0.08 | 0.33 |
| Year \* management + method + region + density | 14 | –1,667 | 3,361 | 65 | 0.00 | 0.31 |
| Year \* region + method + management + density | 17 | –1,672 | 3,378 | 82 | 0.00 | 0.31 |
| **Year \* method + year \* management + region + density** | **19** | **–1,629** | **3,296** | **0** | **0.92** | **0.33** |
|  |  |  |  |  |  |  |
| Step 2: |  |  |  |  |  |  |
| **Year \* method + year \* management + region + density** | **19** | **–1,629** | **3,296** | **0** | **1.00** | **0.33** |
| Year \* method + year \* management + region  | 18 | –1,686 | 3,408 | 112 | 0.00 | 0.31 |
| Year \* method + year \* management + density | 15 | –1,750 | 3,530 | 234 | 0.00 | 0.28 |
| Year \* method + region + density | 17 | –1,639 | 3,312 | 16 | 0.00 | 0.33 |
|  year \* management + region + density | 9 | –1,911 | 3,839 | 543 | 0.00 | 0.21 |
|  method + management + region + density | 12 | –1,740 | 3,505 | 208 | 0.00 | 0.28 |

**Table S5.2.** Coefficients from the best model (see Table S5.1) explaining the probability of precision being reported for deer abundance or density estimates in articles published during 2004–2018.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | SE | *Z-*value | *P-*value |
| Intercept | –55.56 | 14.79 | –3.76 | <0.001 |
| Year | 0.03 | 0.01 | 3.74 | <0.001 |
| Method motion-sensitive cameras | –125.10 | 45.08 | –2.78 | 0.006 |
| Method vehicular direct counts | –99.30 | 27.15 | –3.66 | <0.001 |
| Method pedestrian direct counts | –18.65 | 19.26 | –0.97 | 0.333 |
| Method pedestrian sign counts | 79.77 | 26.92 | 2.96 | 0.003 |
| Method harvest data | –546.60 | 128.90 | –4.24 | <0.001 |
| Management yes | –84.16 | 34.19 | –2.46 | 0.014 |
| Region Europe | –0.41 | 0.08 | –4.94 | <0.001 |
| Region North America | –0.03 | 0.08 | –0.41 | 0.685 |
| Region Australasia | 1.70 | 0.40 | 4.22 | <0.001 |
| Region South America | 1.82 | 0.20 | 9.20 | < 0.001 |
| Deer density | 0.09 | 0.01 | 7.64 | <0.001 |
| Year : method motion-sensitive cameras | 0.06 | 0.02 | 2.78 | 0.005 |
| Year : method vehicular direct counts | 0.05 | 0.01 | 3.67 | <0.001 |
| Year : method pedestrian direct counts | 0.01 | 0.01 | 0.94 | 0.350 |
| Year : method pedestrian sign counts | –0.04 | 0.01 | –2.95 | 0.003 |
| Year : method harvest data | 0.27 | 0.06 | 4.23 | <0.001 |
| Year : management yes | 0.04 | 0.02 | 2.45 | 0.014 |

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**Figure S5.1.** Probability of reporting precision for deer abundance or density estimates in articles published during 2004–2018.

**Literature Cited**

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