Supplemental Table 1. The top models1 (ΔAICc < 2; in bold) as well as the next two best-fitting models to explain variation in the repeatability of glucocorticoid (GC) measures. Candidate variables in these models included factors associated with sampling regime (see main text for details).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  | Sampling interval | Number of individuals | Number of samples | df | AICc | ΔAICc2 | weight | mar  R2GLMM 3 | con  R2GLMM 3 |
| Initial4 |  |  |  | **3** | **7.9** | **0** | **0.324** | **0.00** | **0.77** |
|  |  | **✓** | **4** | **8.3** | **0.42** | **0.262** | **0.07** | **0.77** |
|  | **✓** | **✓** | **5** | **9.5** | **1.59** | **0.146** | **0.11** | **0.78** |
|  | **✓** |  | **4** | **9.6** | **1.70** | **0.138** | **0.02** | **0.76** |
| **✓** |  |  | 8 | 10.5 | 2.63 | 0.087 |  |  |
| **✓** | **✓** |  | 9 | 13.5 | 5.60 | 0.020 |  |  |
| Response5 |  |  |  | **3** | **2.4** | **0** | **0.223** | **0.00** | **0.58** |
|  |  | **✓** | **4** | **2.5** | **0.01** | **0.222** | **0.08** | **0.57** |
| **✓** |  |  | **8** | **3.0** | **0.51** | **0.173** | **0.32** | **0.67** |
|  | **✓** |  | **4** | **3.2** | **0.74** | **0.154** | **0.05** | **0.62** |
|  | **✓** | **✓** | **5** | **3.7** | **1.29** | **0.117** | **0.12** | **0.62** |
| ✓ | ✓ |  | 9 | 4.9 | 2.42 | 0.066 |  |  |
| ✓ |  | ✓ | 9 | 6.2 | 3.77 | 0.034 |  |  |
| Integrated6 |  |  |  | **3** | **3.3** | **0** | **0.724** | **0.00** | **0.00** |
|  | ✓ |  | 4 | 6.1 | 2.77 | 0.181 |  |  |
|  |  | ✓ | 4 | 7.6 | 4.28 | 0.085 |  |  |

1Linear mixed effects models; random effect for all models was ‘study ID’.

2 We used model selection with Akaike’s Information Criterion adjusted for small sample size (AICc). ΔAICc refers to the difference between the AICc of a given model and the best-fit model.

3Marginal and conditional R2 estimated for generalized linear mixed models (R2GLMM)

4Initial GCs refer to concentrations of GCs expected not to reflect the acute stress of capture. Check marks indicate variables included in the model, and rows without checkmarks indicate the null model.

5Response GCs refer to elevated GC titers following an acute capture, handling, or confinement stress.

6Integrated GCs refer to GC titers representing hormone secretion over a relatively long time.

Supplemental Table 2. The top models1 (ΔAICc < 2; in bold) as well as the next two best-fitting models to explain variation in the repeatability of glucocorticoid (GC) measures. Candidate variables in these models included factors associated with subject biology and sampling environment (see main text for details).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  |  | | |  | |  |  | |  | |  | |  | |  |  |
|  | | Exp Manip2 | | Sex | Captive condition3 | | | Taxon | | Within/Across LHS4 | df | | AICc | | ΔAICc5 | | weight | | mar  R2GLMM 6 | con  R2GLMM 6 |
| Initial7 | |  | |  |  | | | ✓ | |  | **6** | | **-18.9** | | **0** | | **0.381** | | **0.04** | **0.04** |
|  | | ✓ |  | | | ✓ | |  | **8** | | **-17.3** | | **1.64** | | **0.168** | | **0.04** | **0.04** |
|  | |  |  | | | ✓ | | ✓ | 7 | | -16.2 | | 2.77 | | 0.095 | |  |  |
| ✓ | |  |  | | | ✓ | |  | 7 | | -16.0 | | 2.88 | | 0.090 | |  |  |
| Response8 | |  | |  |  | | | ✓ | | ✓ | **8** | | **0** | | **0** | | **0.453** | | **0.09** | **0.11** |
|  | |  |  | | |  | | ✓ | **4** | | **1.5** | | **1.44** | | **0.221** | | **0.02** | **0.08** |
|  | |  |  | | | ✓ | |  | 7 | | 3.2 | | 3.16 | | 0.093 | |  |  |
| ✓ | |  |  | | | ✓ | | ✓ | 9 | | 3.8 | | 3.81 | | 0.067 | |  |  |
|  |  | | Sampling Environment (Cont)9 | | | | | | | | | | | | | | | | | | |
|  | | LHS10 | | | | df | AICc | | ΔAICc5 | | | weight | | mar  R2GLMM 6 | | con  R2GLMM 6 | |
| Integrated11 | |  | | | | **3** | **8.2** | | **0** | | | **0.720** | | **0.00** | | **0.09** | |
| **✓** | | | | **4** | **10.0** | | **1.89** | | | **0.280** | | **0.08** | | **0.08** | |
| Initial | |  | | | | **3** | **-3.3** | | **0** | | | **0.766** | | **0.00** | | **0.00** | |
| ✓ | | | | 5 | -0.9 | | 2.38 | | | 0.234 | |  | |  | |
| Response | |  | | | | **3** | **6.6** | | **0** | | | **0.923** | | **0.00** | | **0.04** | |
| ✓ | | | | 5 | 11.5 | | 4.97 | | | 0.077 | |  | |  | |

1Linear mixed effect models; random effect for all models was ‘study ID’

2Experimental manipulation refers to studies in which some or all individuals underwent a stressful manipulation intended to produce a response (not including routine capture and handling stress) at some point during the course of the study.

3Captive condition categorized as free-ranging, captive, and wild-caught captive

4Repeated measures of the same individuals made within or across life history stages (LHS)

5We used model selection with Akaike’s Information Criterion adjusted for small sample size (AICc). ΔAICc refers to the difference between the AICc of a given model and the best-fit model.

6Marginal and conditional R2 estimated for generalized linear mixed models (R2GLMM)

7Initial GCs refer to concentrations of GCs expected not to reflect the acute stress of capture. Check marks indicate variables included in the model, and rows without checkmarks indicate the null model.

8Response GCs refer to elevated GC titers following an acute capture, handling, or confinement stress.

9Subset analysis of only estimates measured *within* a life history stage

10Life history stage categorized as non-breeding, pre-breeding, or breeding season

11Integrated GCs refer to GC titers representing hormone secretion over a relatively long time.

Supplemental Table 3. Parameter estimates from model averages of the top candidate models (ΔAICc < 2) predicting variation in the repeatability of glucocorticoid measures. Variables evaluated include factors associated with subject biology and sampling environment (see main text for details). Significant effects (p<0.05) are indicated in bold.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | Variable | Estimate | SE | z-value | p-value |
| Initial2 | **Bird1** | **-0.516** | **0.101** | **4.939** | **<0.0001** |
| **Bony Fish** | **-0.609** | **0.186** | **3.155** | **0.002** |
| **Reptile** | **-0.405** | **0.168** | **2.336** | **0.020** |
| Female3 | 0.072 | 0.048 | 1.436 | 0.151 |
| Male | -0.089 | 0.075 | 1.137 | 0.255 |
| Response4 | **Bird1** | **-0.411** | **0.098** | **3.939** | **<0.0001** |
| **Bony Fish** | **-0.354** | **0.124** | **2.681** | **0.007** |
| Mammal | -0.118 | 0.138 | 0.800 | 0.424 |
| **Reptile** | **-0.480** | **0.167** | **2.686** | **0.007** |
| **Within LHS** | **0.235** | **0.082** | **2.700** | **0.007** |

1Reference level is Taxon=Amphibian

2Initial GCs refer to concentrations of GCs expected not to reflect the acute stress of capture.

3Reference level is Sex=Both

4Response GCs refer to elevated GC titers following an acute capture, handling, or confinement stress.

Supplemental Table 4. The top models1 (ΔAICc < 2; in bold) as well as the next two best-fitting models to explain variation in the repeatability of glucocorticoid (GC) measures. Candidate variables in these models included factors associated with laboratory and statistical techniques (see main text for details).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  | Repeatability Adjusted2 | Assay Tracer3 | Assay Type4 | df | AICc | ΔAICc3 | weight | mar  R2GLMM 6 | con  R2GLMM 6 |
| Integrated7 |  |  |  | **3** | **3.9** | **0** | **0.429** | **0.00** | **0.01** |
|  | ✓ |  | **4** | **4.3** | **0.48** | **0.337** | **0.01** | **0.01** |
|  |  | ✓ | **4** | **5.8** | **1.95** | **0.162** | **0.00** | **0.00** |
| ✓ |  |  | 4 | 8.2 | 4.29 | 0.05 |  |  |
| ✓ | ✓ |  | 5 | 11.5 | 7.63 | 0.009 |  |  |
| Initial8 |  | ✓ |  | **4** | **-6.6** | **0** | **0.326** | **0.00** | **0.00** |
|  |  |  | **3** | **-5.5** | **1.02** | **0.196** | **0.00** | **0.00** |
|  | ✓ | ✓ | **5** | **-5.3** | **1.22** | **0.177** | **0.02** | **0.05** |
| ✓ | ✓ |  | 5 | -4.3 | 2.29 | 0.104 |  |  |
| ✓ |  |  | 4 | -3.3 | 3.26 | 0.064 |  |  |
| Response9 |  |  | **✓** | **4** | **1.6** | **0** | **0.373** | **0.02** | **0.10** |
|  |  |  | **3** | **3.2** | **1.54** | **0.172** | **0.00** | **0.09** |
| **✓** |  | **✓** | **5** | **3.4** | **1.78** | **0.153** | **0.02** | **0.09** |
|  | ✓ | ✓ | 5 | 4.1 | 2.46 | 0.109 |  |  |
|  | ✓ |  | 4 | 4.6 | 2.93 | 0.086 |  |  |

1Linear mixed effects models; random effect for all models was ‘study ID’.

2Adjusted refers to whether or not estimates reflect GC repeatability after statistically controlling for factors expected to explain some of the variation in GC titers (e.g., year, sex, weather).

3Assay tracer categorized as enzyme-immnoassay or radioimmunoassay

4Assay type categorized as in-house assay or commercial kit-based assays

5We used model selection with Akaike’s Information Criterion adjusted for small sample size (AICc). ΔAICc refers to the difference between the AICc of a given model and the best-fit model.

6Marginal and conditional R2 estimated for generalized linear mixed models (R2GLMM)

7Integrated GCs refer to GC titers representing hormone secretion over a relatively long time. Check marks indicate variables included in the model, and rows without checkmarks indicate the null model.

8Initial GCs refer to concentrations of GCs expected not to reflect the acute stress of capture.

9Response GCs refer to elevated GC titers following an acute capture, handling, or confinement stress.

Supplemental Table 5. Parameter estimates from a conditional model average of the top candidate models (ΔAICc < 2) predicting variation in the repeatability of integrated, initial, and response glucocorticoid (GC) measures. Significant effects (p<0.05) are indicated in bold.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | | | |
|  | | | | | |
|  | Variable | Estimate | SE | z-value | p-value |
| Integrated3 | **Tracer1** | **-0.194** | **0.071** | **2.253** | **0.024** |
| **Type2** | **-0.172** | **0.076** | **1.869** | **0.062** |
| Initial4 | Tracer | -0.132 | 0.072 | 1.803 | 0.071 |
| Type | -0.110 | 0.072 | 1.472 | 0.141 |
| Response5 | **Type** | **-0.184** | **0.090** | **8.918** | **0.040** |
| Adjusted | 0.101 | 0.101 | 0.955 | 0.340 |

1Assay tracer categorized as enzyme-immnoassay or radioimmunoassay; Reference level is Tracer=RIA

2Assay type categorized as in-house assay or commercial kit-based assay; Reference level is Type=Kit

3Integrated GCs refer to GC titers representing hormone secretion over a relatively long time.

4Initial GCs refer to concentrations of GCs expected not to reflect the acute stress of capture.

5Response GCs refer to elevated GC titers following an acute capture, handling, or confinement stress.