

**Table S2. Mixed effects models applied on body-size data.** (A) Data set with Sex, Species and Locality as fixed factors. (B) Data set with Sex and Locality as fixed factors. (C) Data set with Sex, Species, Locality and Year as fixed factors. (D) Data with Species, Locality and Year as fixed factors.

(A)								
M.a <- formula(Size ~ Sex * Species * Locality)								
M1 <- gls(M.a , method = "REML", data = PARROT)								
Linear mixed-effects model fit by REML								
Data: PARROT								
	AIC	BIC	logLik					
	53942.23	54216.51	-26929.11					
Random effects:								
Formula: ~1   Station								
	(Intercept)	Residual						
StdDev:	17.00036	47.63831						
Number of Observations: 5108								
Number of Groups: 64								
M2 <- lme (M.a, random = ~1   Station, weights = varIdent(form = ~ 1   Species), data = PARROT)								
Linear mixed-effects model fit by REML								
Data: PARROT								
	AIC	BIC	logLik					
	53245.79	53546.2	-26576.89					
Random effects:								
Formula: ~1   Stations								
	(Intercept)	Residual						
StdDev:	14.5811	42.24512						
Variance function:								
Structure: Different standard deviations per stratum								
Formula: ~1   Species								
Parameter estimates:								
	<i>S. taeniopterus</i>	<i>S. iseri</i>	<i>S. viride</i>	<i>S. vetula</i>	<i>S. aurofrenatum</i>			
	1.00	0.80	1.70	1.50	1.04			
Number of Observations: 5108								
Number of Groups: 64								
	Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
M1	1	44	53837.26	54124.61	-26874.63			
M2	2	46	53245.79	53546.20	-26576.89	1 vs 2	595.4719	<.0001

## GAMMs

```
M3 <- gamm(Size ~ Sex * Species * Locality, random = list(Station =~ 1), data = PARROT)
```

	Length	Class	Mode
lme	18	Lme	List
gam	30	30	List

```
anova(M3$gam)
```

Family: gaussian

Link function: identity

Formula:

```
Size ~ Species * Locality * Sex
```

Parametric Terms:

	df	F	p-value
Species	4	79.418	< 2e-16
Locality	3	3.124	0.0248
Sex	1	49.549	2.19e-12
Species:Locality:Sex	12	5.343	4.60e-09

R-sq.(adj) = 0.571

Scale est. = 2253.4 n = 5108

## (B)

```
M.b <- formula(Size ~ Species * Locality)
```

```
M4 <- gls(M.b , method = "REML", data = PARROT1)
```

Linear mixed-effects model fit by REML

Data: PARROT1

AIC	BIC	logLik
63974.98	64201.62	-31953.49

Random effects:

Formula: ~1 | Stations

	(Intercept)	Residual
StdDev:	19.50081	58.20187

Number of Observations: 5834

Number of Groups: 64

```
M5 <- lme(M.b , random = ~ 1 | Station, weights = varIdent(form = ~ 1 | Species), data = PARROT1)
```

Linear mixed-effects model fit by REML

Data: PARROT1

AIC	BIC	logLik
62702.3	62975.61	-31310.15

Random effects:

Formula: ~1 | Station  
(Intercept) Residual  
StdDev: 16.80161 5 0.75933

Variance function:

Structure: Different standard deviations per stratum

Formula: ~1 | Species

Parameter estimates:

<i>S. taeniopterus</i>	<i>S. iseri</i>	<i>S. viride</i>	<i>S. vetula</i>	<i>S. aurofrenatum</i>	<i>S. rubripinne</i>	<i>S. chrysopterus</i>
1.00	0.78	1.89	1.56	1.08	1.52	1.44

Number of Observations: 5834

Number of Groups: 64

	Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
M1	1	33	64291.13	64511.10	-32112.56			
M2	2	41	62702.30	62975.61	-31310.15	1 vs 2	1604.821	<.0001

### GAMMs

Family: gaussian

Link function: identity

Formula:

Size ~ Species \* Locality

```
M6 <- gamm(Size ~ Species * Locality, random = list(Station =~ 1), data = PARROT1)
```

```
anova(M6$gam)
```

Parametric Terms:

	df	F	p-value
Species	7	108.053	< 2e-16
Locality	3	2.866	0.0352
Species:Locality	21	12.207	< 2e-16

R-sq.(adj) = 0.396

Scale est. = 3371.4 n = 5834

(C)

```
M.f <- formula(Size ~ Species * Locality * Year * Sex)
```

```
M7 <- gls(M.e, method = "REML", data = PARROT3)
```

Linear mixed-effects model fit by REML

Data: PARROT3

AIC	BIC	logLik
60855.33	61134.92	-30385.67

Random effects:

Formula: ~1 | Stations  
(Intercept) Residual  
StdDev: 13.65538 46.53488

Number of Observations: 5789

Number of Groups: 64

M8 <- lme(M.e , random = ~ 1 | Station, weights = varIdent(form = ~ 1 | Species), data = PARROT3)

Linear mixed-effects model fit by REML

Data: PARROT3  
AIC BIC logLik  
60228.06 60534.27 -30068.03

Random effects:

Formula: ~1 | Station  
(Intercept) Residual  
StdDev: 13.5467 39.13895

Variance function:

Structure: Different standard deviations per stratum

Formula: ~1 | Species

Parameter estimates:

<i>S. taeniopterus</i>	<i>S. iseri</i>	<i>S. viride</i>	<i>S. aurofrenatum</i>	<i>S. vetula</i>
1.00	0.90	1.67	1.14	1.66

Number of Observations: 5789

Number of Groups: 64

	Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
M7	1	41	61142.86	61415.79	--30530.43			
M8	2	46	60228.06	60534.27	-30068.03	1 vs 2	924.8064	<.0001

## GAMMs

anova(M9\$gam)

Parametric Terms:

	df	F	p-value
Species	4	5.458	0.000220
Locality	1	0.002	0.0248
Sex	1	5.601	2.19e-12
Year	1	1.165	0.280405
Species:Locality:Sex:Year	4	5.675	0.294356

R-sq.(adj) = 0.342

Scale est. = 3461.9 n = 6253

(D)

M.e <- formula(Size ~ Species \* Locality\*Year)  
M10 <- gls(M.e , method = "REML", data = PARROT4)

Linear mixed-effects model fit by REML

Data: PARROT4

AIC BIC logLik  
68738.95 68941.04 -34339.48

Random effects:

Formula: ~1 | Stations

(Intercept) Residual

StdDev: 16.48995 58.94914

Number of Observations: 6253

Number of Groups: 64

M11 <- lme(M.e , random = ~ 1 | Station, weights = varIdent(form = ~ 1 | Species), data = PARROT4)

Linear mixed-effects model fit by REML

Data: PARROT4

AIC BIC logLik  
68032.83 68275.33 -33980.41

Random effects:

Formula: ~1 | Stations

(Intercept) Residual

StdDev: 15.99506 49.60637

Variance function:

Structure: Different standard deviations per stratum

Formula: ~1 | Species

Parameter estimates:

<i>S. taeniopterus</i>	<i>S. iseri</i>	<i>S. viride</i>	<i>S. aurofrenatum</i>	<i>S. vetula</i>	<i>S. chrysopteron</i>	<i>S. rubripinne</i>
1.00	0.88	1.66	1.07	1.56	1.44	1.62

Number of Observations: 6253

Number of Groups: 64

	Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
M10	1	29	69003.32	69198.67	-34472.66			
M11	2	36	68032.83	68275.33	-33980.41	1 vs 2	984.4941	<.0001

### GAMMs

```
M12 <- gamm(Size ~ Species * Locality * Year, random = list(Station =~ 1), data = PARROT4)
```

```
anova(M3$gam)
```

Family: gaussian

Link function: identity

Formula:

```
Size ~ Species * Locality * Year
```

Parametric Terms:

	df	F	p-value
Species	6	7.447	5.79e-08
Locality	1	1.451	0.988
Year	1	1.861	0.173
Species:Locality:Year	6	1.449	0.192

R-sq.(adj) = 0.342

Scale est. = 3461.9 n = 6253