What Makes Penguins Chonky

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# 1 Introduction

Penguins are pretty great. However, Keum *et al.* (2001) showed that both fat and imaginary penguins can “decay amplitudes in perturbative QCD picture”. Since that sounds pretty bad, we should probably figure out what makes penguins fat, if not imaginary. The mean penguin weighs 9.2632844 pounds.

Male penguins tend to be fatter than female penguins, and it looks like Gentoo penguins on Biscoe island might be at serious risk of perturbing the QCD picture (Fig.1.1) (Keum *et al.* 2001; Horst *et al.* 2020).

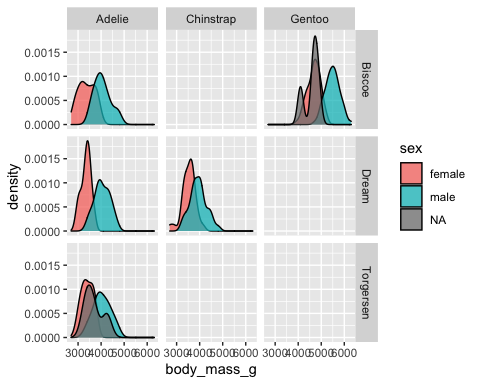


Figure 1.1: Distribution of penguin weight in grams by sex,species, and island.

But, it seems like bill length and flipper length matter too (Fig.1.2).

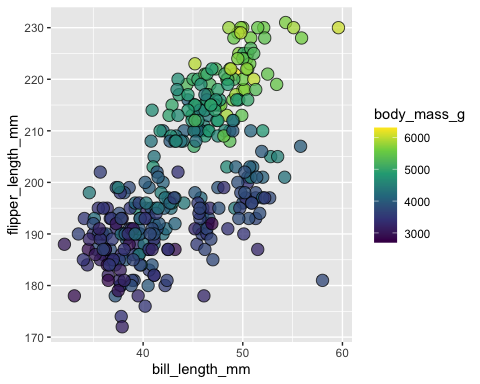


Figure 1.2: Penguin body mass from Horst *et al.* (2020) as a function of bill length and flipper length

For those that like tables, here’s a table of some penguins (Table.1.1).

Table 1.1: Here are some penguins

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| species | island | bill\_length\_mm | bill\_depth\_mm | flipper\_length\_mm | body\_mass\_g | sex | year |
| Adelie | Torgersen | 39.1 | 18.7 | 181 | 3750 | male | 2007 |
| Adelie | Torgersen | 39.5 | 17.4 | 186 | 3800 | female | 2007 |
| Adelie | Torgersen | 40.3 | 18.0 | 195 | 3250 | female | 2007 |
| Adelie | Torgersen | NA | NA | NA | NA | NA | 2007 |
| Adelie | Torgersen | 36.7 | 19.3 | 193 | 3450 | female | 2007 |
| Adelie | Torgersen | 39.3 | 20.6 | 190 | 3650 | male | 2007 |

# 2 Methods

Here are two models we tried (Tab.2.1).

Table 2.1: Candidate models

|  |  |  |
| --- | --- | --- |
| Model | Abrev. | Description |
| First | A | Islands! |
| Second | B | Flippers! |

# 3 Results

Here are our models (Table.??)

Why are penguins fat?

|  | A | B |
| --- | --- | --- |
| (Intercept) | 4375.848\*\*\* | -5736.897\*\*\* |
|  | (51.323) | (307.959) |
| sexmale | 674.238\*\*\* |  |
|  | (58.492) |  |
| islandDream | -996.806\*\*\* |  |
|  | (63.735) |  |
| islandTorgersen | -997.284\*\*\* |  |
|  | (88.356) |  |
| flipper\_length\_mm |  | 48.145\*\*\* |
|  |  | (2.011) |
| bill\_length\_mm |  | 6.047 |
|  |  | (5.180) |
| Num.Obs. | 333 | 342 |
| R2 | 0.565 | 0.760 |
| R2 Adj. | 0.561 | 0.759 |
| AIC | 5133.3 | 5063.5 |
| BIC | 5152.3 | 5078.8 |
| Log.Lik. | -2561.630 | -2527.741 |
| F | 142.318 | 536.626 |
| \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01 | | |

# 4 Discussion

Looks like team flipper is a better model than team island.

For future research, we might try and model some presence and absence data using the binomial function (4.1)

If someone gives us a lot more funding we will also do some state-space modeling (Brooks *et al.* 2017), or some Bayesian stuff (McElreath 2020).

# 5 References

Brooks, M.E., Kristensen, K., van Benthem, K.J., et al. (2017) glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. *The R journal* **9**, 378–400.

Horst, A.M., Hill, A.P. and Gorman, K.B. (2020) Allisonhorst/palmerpenguins: V0.1.0.

Keum, Y.-Y., Li, H.-n. and Sanda, A.I. (2001) Fat penguins and imaginary penguins in perturbative QCD. *Physics Letters B* **504**, 6–14.

McElreath, R. (2020) *Statistical rethinking: A Bayesian course with examples in R and Stan*, Second (CRC texts in statistical science). Taylor and Francis, CRC Press, Boca Raton.

# 6 Supplementary Materials

Here are our Supplementary Materials

Here is another flipper model (Table.??)

My SI flipper model

|  | SI Flipper Model |
| --- | --- |
| (Intercept) | 185.365\*\*\* |
|  | (0.913) |
| islandDream | 1.069 |
|  | (1.152) |
| islandTorgersen | 2.809\*\* |
|  | (1.195) |
| speciesChinstrap | 5.959\*\*\* |
|  | (1.033) |
| speciesGentoo | 28.353\*\*\* |
|  | (1.005) |
| sexmale | 6.861\*\*\* |
|  | (0.624) |
| Num.Obs. | 333 |
| R2 | 0.837 |
| R2 Adj. | 0.835 |
| AIC | 2111.4 |
| BIC | 2138.1 |
| Log.Lik. | -1048.718 |
| F | 336.881 |
| \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01 | |

As a reminder, we thought about an equation (6.1).

# 7 Appendix

This is an appendix

The appendix also has equations in it (7.1), as well as a reference (Horst *et al.* 2020)