Game of Dragon Ecology

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Introduction

In the fictional television series Game of Thrones, based on the series of epic fantasy novels A Song of Ice and Fire, three dragons are raised by Daenerys Targaryen, the "Mother of Dragons." Our team is assigned to analyze dragon characteristics, behavior, habits, diet, and interaction with their environment. The main question is:

What is the ecological impact and requirements of the dragon?

1. What are the energy expenditures of the dragons?
2. What are their caloric intake requirements?
3. How much area is required to support one dragon?

Methods

- Exponential growth for length
- Logistic model for length with the dragon data from exponential growth equation.
- Applied existing models for similarly sized organisms for:
  - Energy expenditure
  - Caloric intake
  - Area

Acknowledgments

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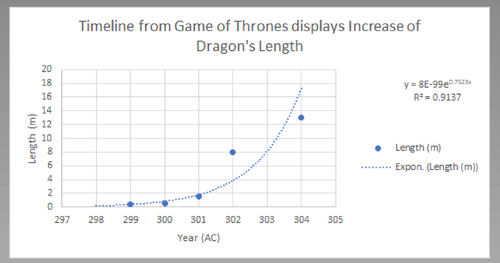

Figure 1
The exponential model is the growth of length dragon based off of the animals used as comparison in *Game of Thrones* timeline.

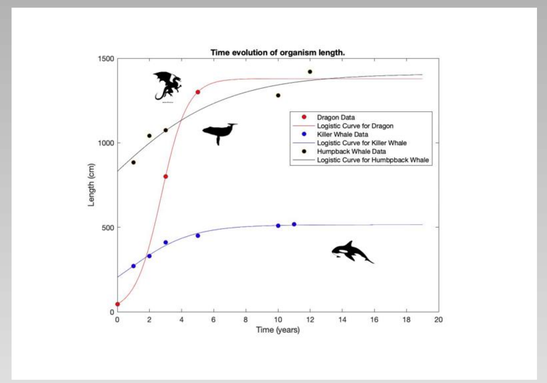

Figure 2
The logistic curve for the dragon has r = 2.1264, t0 = 2.6842, K = 3.0218e+03. The logistic curve for the humpback whale has r2 = 0.4780, t02 =3.7781, and K2 =1.9536e+03. The logistic curve for the killer whale has r3 =0.2536, t03 = 6.0077,and K3 =454.2961.

$$\text{A)}\ \left(\frac{dM}{dt}\right) = rM\left(1-\frac{M}{K}\right)$$

$$\text{B)}\ M(t) = \left(\frac{K}{1+Ce^{-rt}}\right)$$

Figure 3
The logistic growth equation from (A) and (B) were used to estimate the carrying capacity (K). The carrying capacity is the growth limit of the dragon based on the model's prediction.

Results

$$\text{A)}\ \left(\frac{3000\ kg\ dragon}{x\ unknown\ length}\right) = \left(\frac{15\ kg\ A.condor}{16.5\ m\ length}\right)$$

$$\text{B)}\ \left(\frac{3000\ kg\ dragon}{x\ unknown\ width}\right) = \left(\frac{15\ kg\ A.condor}{11\ m\ width}\right)$$

Figure 4
The equations (A) and (B) are used to estimate the area needed calculate the area needed to support 3 dragons. We had chosen Andean condor because it is known for being one of the biggest flying bird that is alive to this day. One bird weighs about 11-15 kg (Andean condor, 2019). The AZA Andean Condor SSP recommends that any Andean condor enclosures or modifications meet or exceed above 16.5 m x 11 m x 7.6 m (AZA Raptor TAG, 2010).

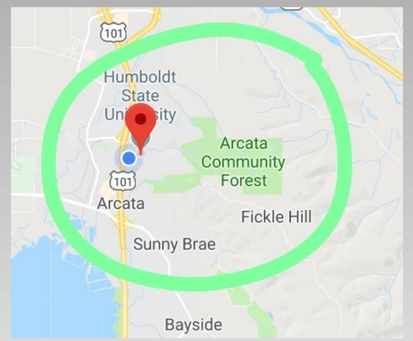

Figure 5
The image above is a representation of the space demanded to support one dragon.

$$\text{A)}\ \left(\frac{X\ meals}{1\ year}\right) dragon = \left(\frac{3{,}000\ kg\ dragon}{2{,}000\ kg\ Saltwater\ Crocadile}\right)\left(\frac{50\ meals}{1\ year}\right)$$

$$\text{B)}\ \left(\frac{X\ kCal\ dragon}{day(s)}\right) = \left(\frac{3{,}000\ kg\ dragon}{2{,}000\ kg\ SW\ crocadile}\right)\left(\frac{22{,}400\ kCal}{1\ bison}\right)\left(\frac{50\ bisons}{1\ year}\right)\left(\frac{1\ year}{365\ day(s)}\right)$$

Figure 6
Equation (A) is used to calculate the amount of meals a dragon would consume in comparison to the saltwater crocodile. Equation (B) calculates the caloric intake of the dragon.

Conclusions

1. The energy expenditure for Indian elephant is 5.4x10^5 kJ/d weighing at 3.67 t (McNab, 2012). Mammals have a greater amount of energy expenditure than ectotherms due to the cost of generating their own heat. Therefore, we know that the energy expenditure for 3,000 kg dragon is less than 5.4x10^5 kJ/d.
2. The caloric intake for one dragon is 4,602.74 kCal per day which sums to 75 meals per year.
3. Figure 4 is used to calculate the area needed for a dragon. The area for a dragon is at minimum 3,300 m X 4,500 m, as shown in Figure 5.

Literature cited

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