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Kate Hickey  
*Providence College*

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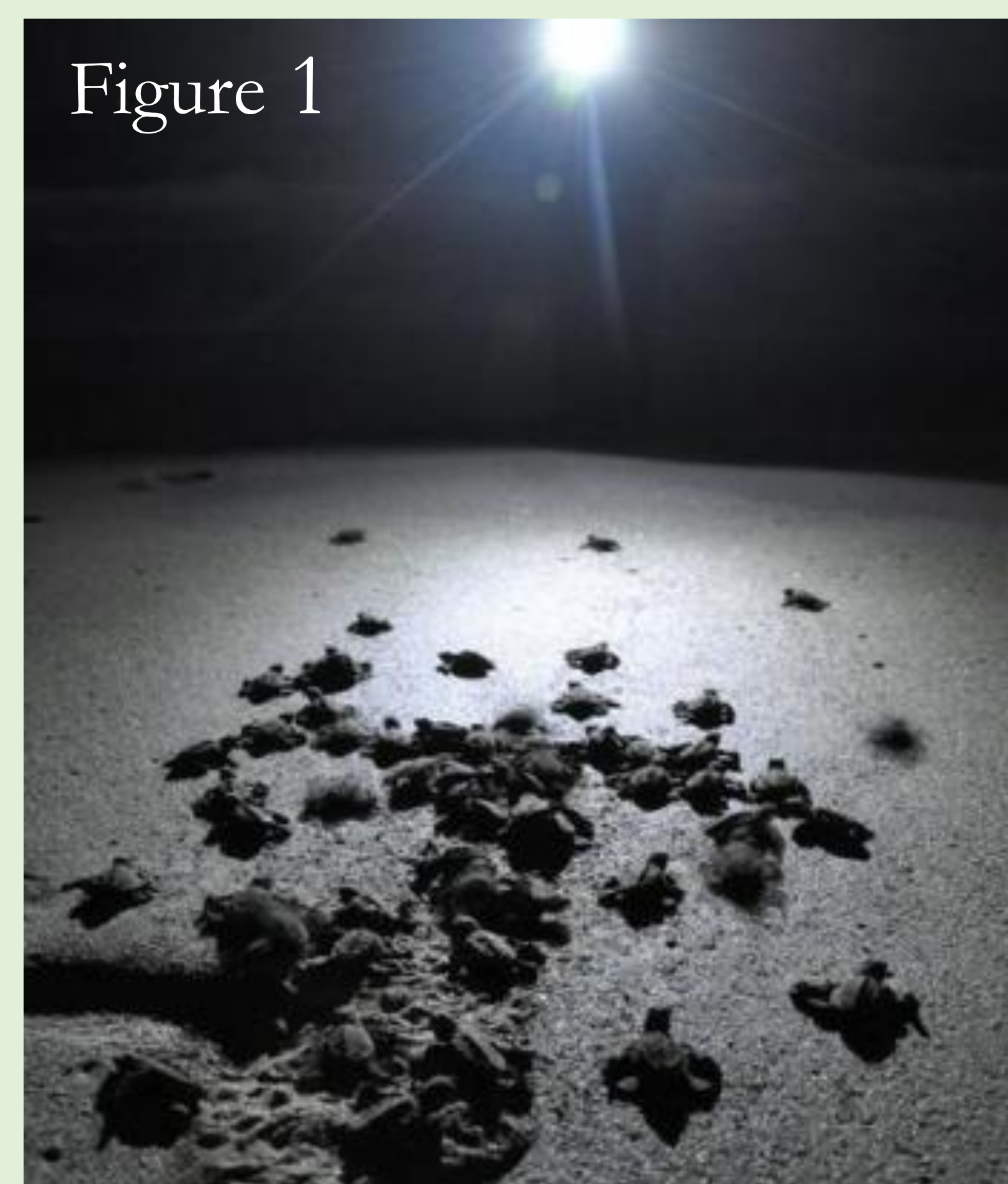


# Does artificial lighting cause sea turtle hatchling disorientations?

Kate Hickey

## Background

Sea turtle hatchlings run into obstacles from the minute they emerge from their shell. They have a 1 in 1,000 survival rate and new obstacles are on the horizon. Coastal development is increasing and is not planning on slowing down. It supports and funds tourism, but has some negative implications on the wildlife that uses this area, like sea turtles. A particular problem with development is the artificial lighting it emits which is effecting sea turtles nesting. When the hatchlings emerge from the nest, they use the horizon and moon to guide them in the direction of the sea. The light coming from the buildings and homes, in the opposite direction of the sea, are confusing and mislead and disorient the hatchlings in that direction instead. In this study I compare electricity use in Florida counties and the amount of hatchling disorientations that occurred there to study the correlation.



## Results

I predicted that there would be a strong correlation between the electricity use and the amount of hatchling disorientations there. Based on my graphs and figures consumption and consumption type both significantly effect the number of disorientation events in sea turtle hatchlings in coastal Florida counties. (Anova, GLM,  $df= 1,1$ ,  $x^2= 4588.8$ ,  $266.5$ ,  $p \text{ value} < 0.001$ ).

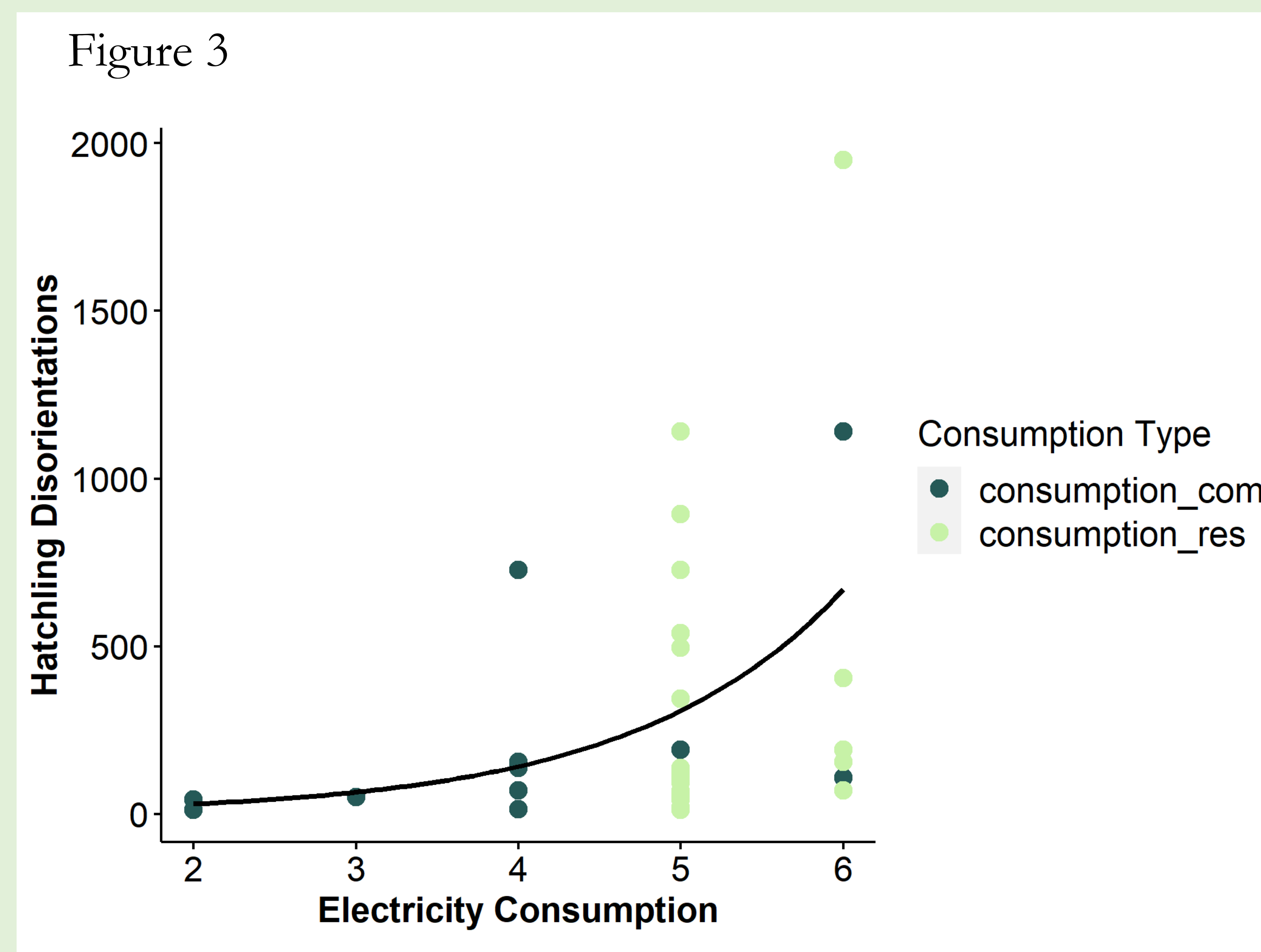


Figure 3  
This scatter plot compares the level of electricity consumption (0-6 MWh/capita) in coastal Florida counties to account for artificial lighting. Two types of electricity consumption are accounted for: residential consumption (consumption\_res), denoted in light green, or commercial consumption (consumption\_com) denoted in dark green. The consumption level and types are compared with the number of observed sea turtle hatchling disorientations to see the correlation. It is clear that as the consumption levels rise, so do the number of disorientations. Overall, residential lighting seems to effect the number of disorientations greater than the commercial lighting.

## Conclusion(s)

After my research and analysis, it is clear that electricity consumption directly effects the number of hatchling disorientations in that area. Sea turtles are already a critically endangered species and this new type of pollution, light pollution, is only adding to their dangers. There is no way to stop light pollution, but we can work to reduce it with laws and ordinances that call for residences and commercial properties along the beach to reduce their lighting during nesting season. Some organizations have already established “lights out” movements to limit the amount of lights that are on the beach as much as possible. If more laws are put into place and we work together, this problem can be stopped.

Further research could include which consumption type effects turtles more or even the effect of light type or color on hatchling disorientation.

## Acknowledgements

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Thank you to Dr. Rogers for his help with research and data collection.

## References

1. Day, Megan. *City and County Energy Profiles*. United States.
2. Florida Fish and Wildlife Conservation Commission. *Sea Turtle Disorientation Survey*. Florida, 2019.
3. Figure 2: Falchi, F., Cinzano, P., Duriscoe, D., Kyba, C. C. M., Elvidge, C. D., Baugh, K., Portnov, B. A., Rybnikova, N. A., & Furgoni, R. *Science Advances*, 2(6), e1600377 *The New World Atlas of Artificial Night Sky Brightness*. 2016
4. Figure 1: *Urban Marine Ecology, Light & Sound*, 2023

## Methods

The two variables I chose to compare are artificial lighting at night and sea turtle hatchling disorientation. To quantify artificial lighting, I used a data set from 2019 that recorded the residential and commercial energy use per county. The Florida Fish and Wildlife Conservation 2019 records of hatchling disorientation observations per county, and compared these counties with the overlapping matching counties from the first dataset.