Chernobyl: Evolution at Work

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ABSTRACT

Chernobyl was an unprecedented event in which the Chernobyl nuclear reactor exploded, causing mass devastation to the surrounding area. Due to the radioactive fallout, the land around the location was contaminated, and the animals that lived there were exposed to dangerous levels of radiation. This has caused the animals, specifically the *Hyla Orientalis,* a tree frog native to Chernobyl, Ukraine, to adapt, resulting in a statistically significant difference in skin pigment. This darker skin serves as a stronger barrier against the radiation from Chernobyl. By analyzing the relationship between levels of radiation in an area and the pigment of Hyla Orientalis' skin, we can build a deeper understanding of the biological adaptation in response to radiation, which can aid in developing treatment for radiation exposure.

OBJECTIVES

To determine, through analysis of numerous studies, why frogs with increased melanin production have a higher likelihood of surviving to reproductive age near the Chernobyl reaction than frogs with lower melanin production do.

METHODS

Comparing the *Hyla Orientalis* populations genetic mutation in the Chernobyl Exclusion Zone with the surrounding tree frog population using prior research studies and data and creating our own Punnett square.

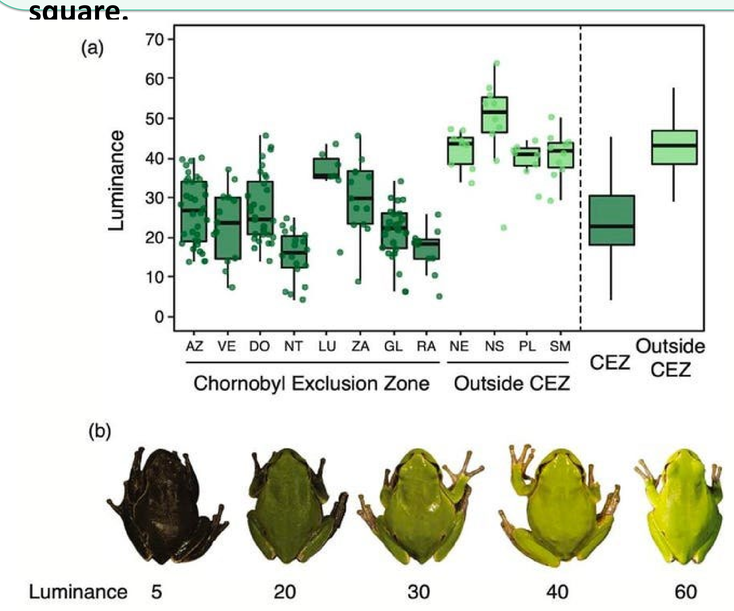

Figure 1. Luminance of tree frogs inside and outside the Chernobyl Exclusion Zone (Burraco, Orizaola 2022)

	B	G
B	BB	BG
G	BG	GG

BB exhibits homozygous dominance - black frog - will survive
BG exhibits incomplete dominance - dark green frog - may survive
GG exhibits homozygous dominance - green frog - will not survive

Figure 2. Genotype variability and likelihood of survival

RESULTS

- **Tree frogs within the CEZ exhibit significantly lower levels of luminance than frogs outside of it**
- **Tree frogs with increased melanin production are significantly more likely to survive to reproductive age**
- **Skin with high levels of melanin absorbs less radiation than skin with lower levels of melanin**

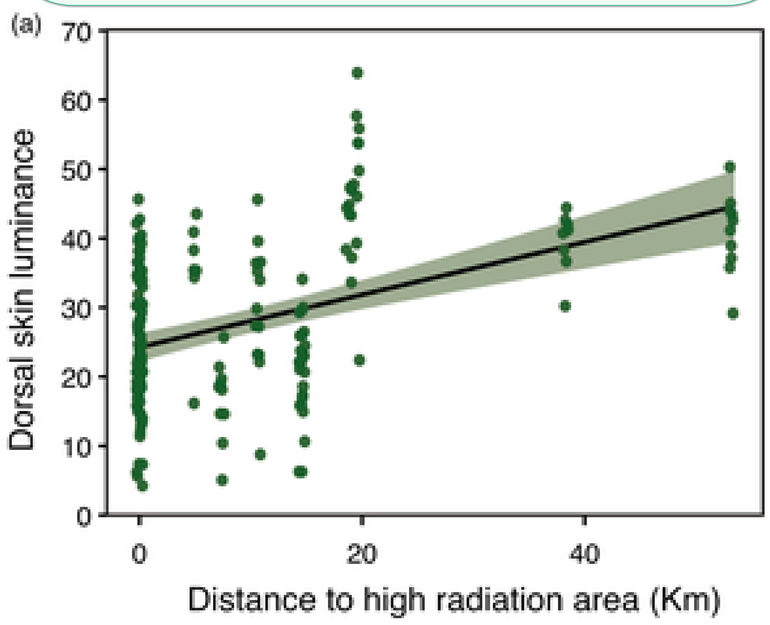

Figure 3. Luminance in relation to distance from nuclear reactor (Burraco, Orizaola 2022)

CONCLUSIONS

Through continued research efforts, we can continue to understand and expand our knowledge on the large-scale effects of continued exposure to radiation. Such efforts and discoveries may also lead to advancement in technology designed to mitigate the effects of radiation exposure. Such technology could be used to treat more common instances of radiation exposure like skin cancer caused by increased exposure to the sun's radiation.

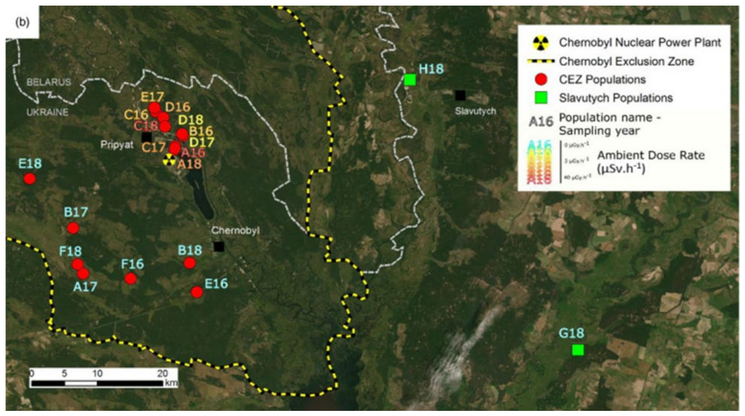

Figure 4. Map of Chernobyl Exposure locations (Car et al 2022)

FUTURE WORK

The Chernobyl disaster has led to important insights into the consequences of low- and high-level radiation. However, there are only a few studies of mutation rates in a small number of species. This lack of progress is likely due to the low level of investment in research at Chernobyl. A concerted research effort funded by global research and restoration conglomerates is needed to coordinate research and establish a modern research facility. A major international institute of radiation research supported by the international community would make the most out of one of the largest man-made environmental disasters.

References

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