DYNAMICS OF HUMAN WILDLIFE COEXISTENCE:

A CASESTUDY OF AMERICAN BLACK BEAR IN MASSACHUSETTS

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JULY 20, 2023

Boston University Institute for Global Sustainability
Summer Fellowship

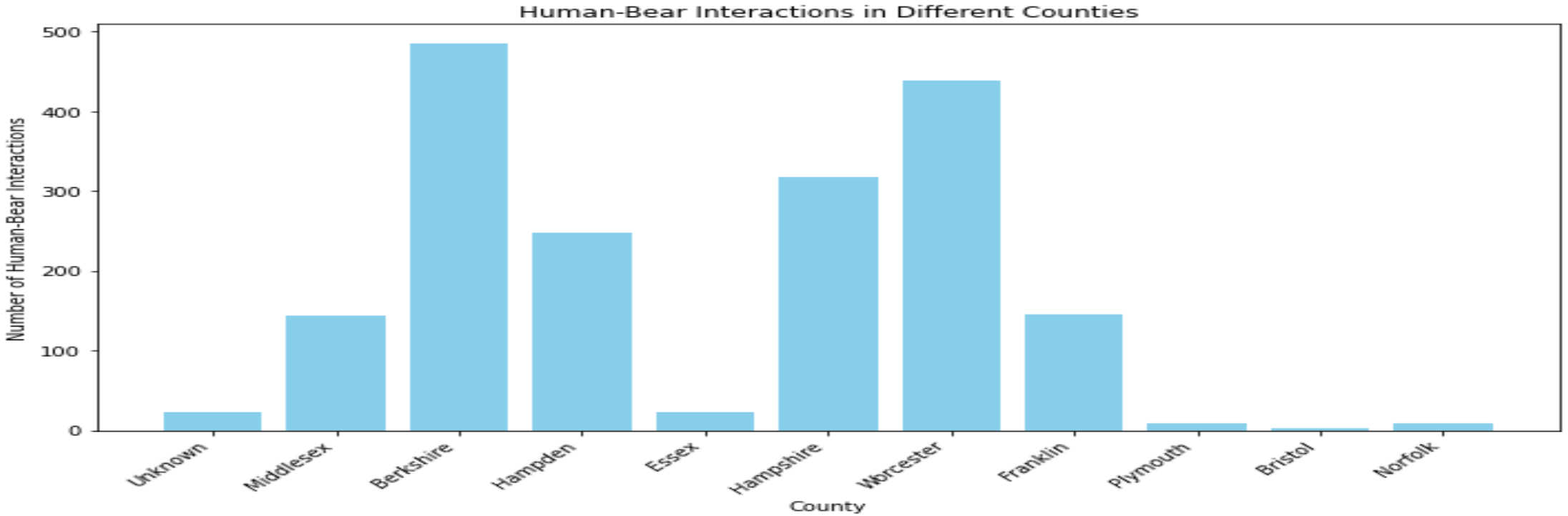
OBJECTIVES

- Evaluate the different types of HWCs reported
- Determine the spatial distribution of American Black Bear and map out areas prone to conflict
- Detailed PRISMA literature review on Human-Wildlife Coexistence
- Use Netlogo simulation to model the behavior of American Black bear from 2015 till 2022 under a changing climate

METHODS

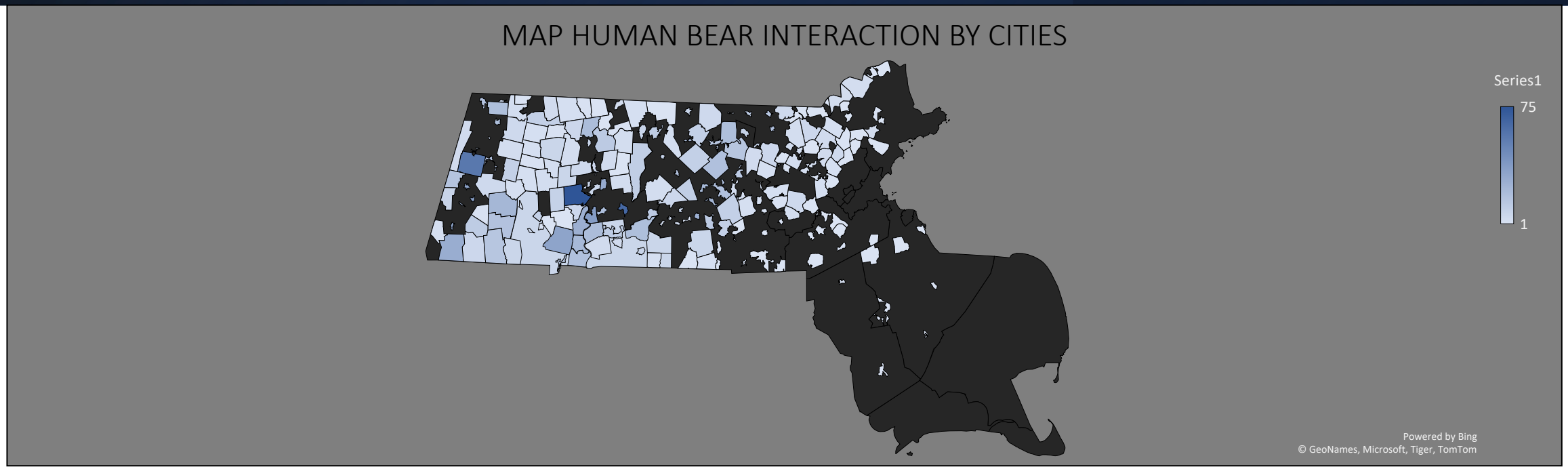
- Collected human wildlife interaction data from Massachusetts Department of Fisheries and Wildlife
- With 10,342 reports all over MA from 2014 till 2023
- Bear (1855), Coyote (1556), Deer (1,039), Fox (901) and Wild birds & Geese(897) were the top five reported wildlife species
- I had 1841 data of Bear-human interactions from 2015 – 2022
- Climate data from National Centers for Environmental Information (NOAA)
- Used SPSS version 25, Excel and Python to visualize and analyze the data

RESULTS



- Malpeli et al. (2020) found that areas with the highest probability of black bear interactions exhibited intermediate housing densities (300-600 houses/km²) and a substantial percentage of forest cover in their surroundings
- At the county scale, above-average interactions were predicted when the county had approximately 67.7% forest cover, 27.2% agricultural land, and 10.3% developed land
- In this study, the highest interaction reports were observed in Berkshire, Hampshire, and Worcester counties

RESULTS

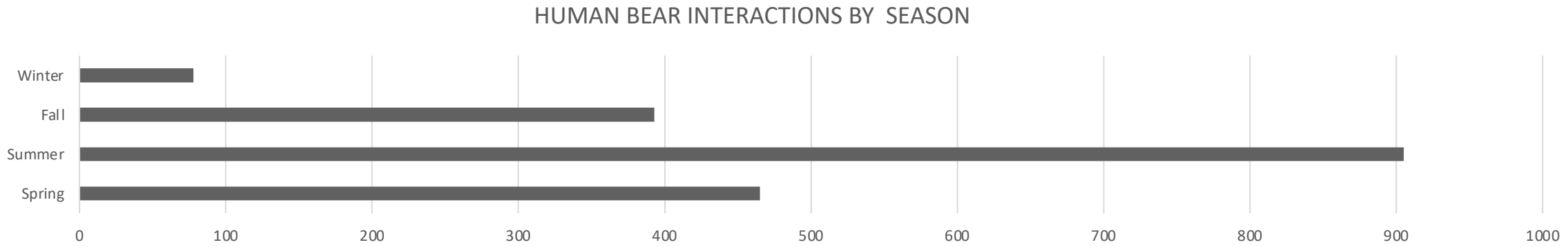


- Recent studies indicate that climatic factors and their changes play a crucial role in the distribution and movement of black bears, leading them closer to village communities and raising the potential for conflicts (Bashir et al., 2018)

- Given the ongoing climate change and warming at higher elevations, conflicts are expected to rise due to reported shifts in species' ranges (Singh et al., 2020)

- Here, I observed a higher incidence of reports in the northwest part of Massachusetts

RESULTS



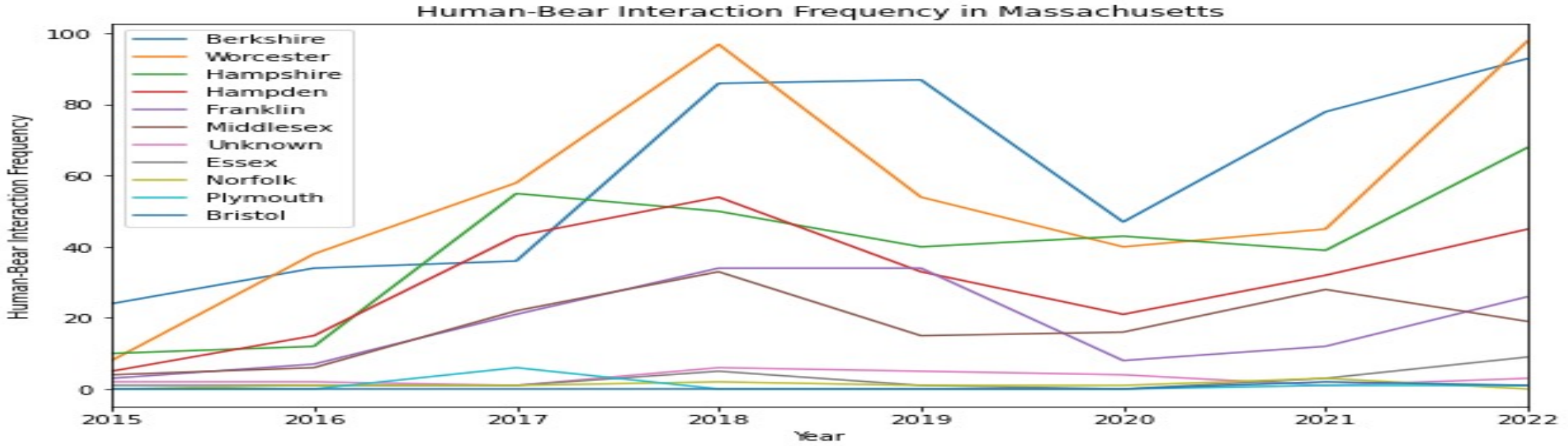
- Honda & Kozakai (2020) discovered that cool springs and hot summers might escalate human–bear conflicts as they coincide with reduced availability of key food sources

- Our own study corroborates these findings, demonstrating that the highest number of human-bear interactions occurred during summer when bears are actively seeking food and growing more fur in preparation for the winter season (which also aligns with their breeding period)

- Also, the ANOVA result shows significant differences in the frequency of bear sightings across the seasons with a p-value of 0.000071742

- Additionally, human activity increases during summer due to the need to cope with heat in homes, providing further justification for the observed high interactions and sightings during this season

RESULTS

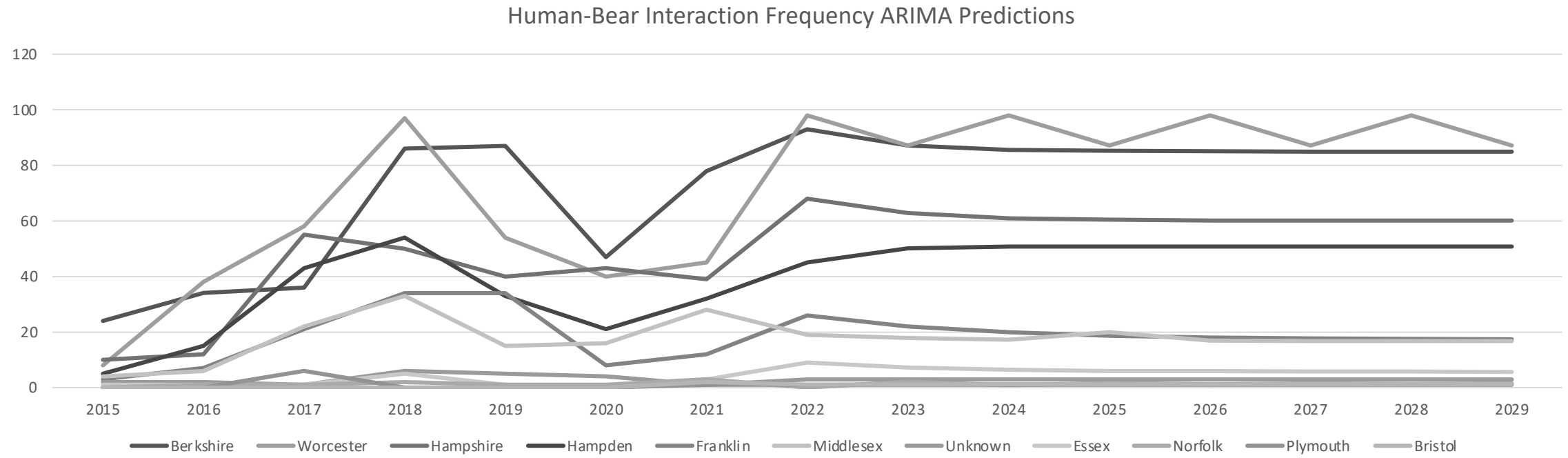


- While Hertz (2020) reported an increased number of animal sightings of wildlife in San Francisco during the lockdown, our study observed a reduction in human-wildlife interactions

- This reduction in interactions can be attributed to changes in human/wildlife movement patterns during the lockdown

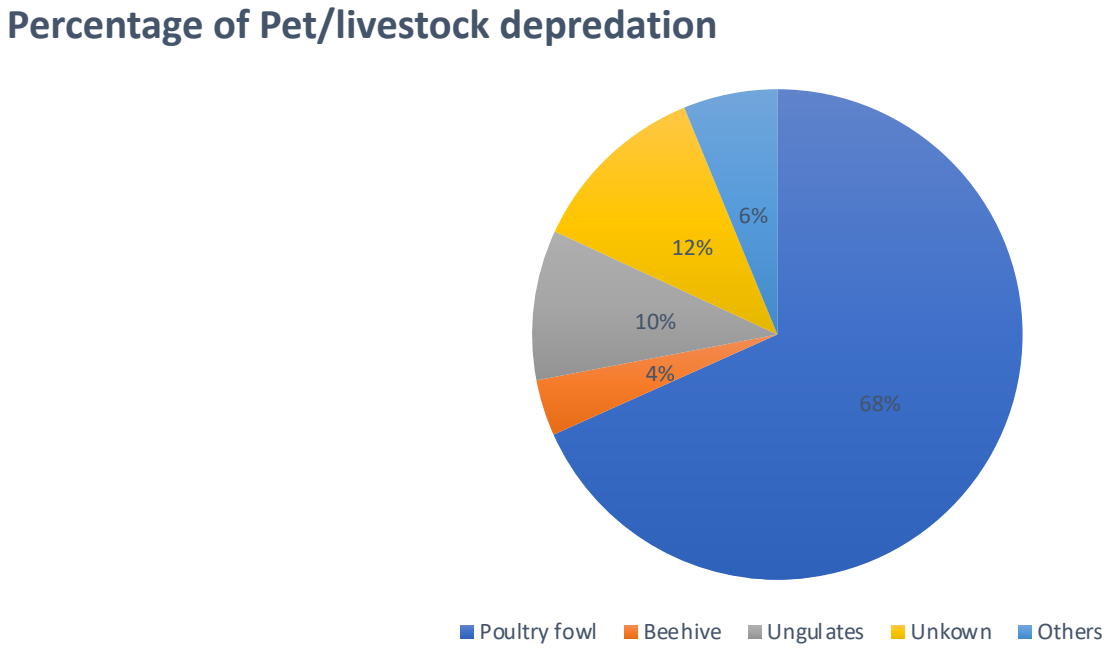
- Additionally, Kopucki et al. (2021) found a drastic decrease in wildlife mortality from factors such as roadkill during the same period.

RESULTS



- AutoRegressive Integrated Moving Average, predict future values of a time series based on its past observations
- ARIMA models are widely used in time series analysis to make predictions when the data shows a pattern of autocorrelation (correlation between the data points at different time lags) and seasonality
- No drastic increase/decrease predicted, however various factors like policy change, development, change in movement pattern, population growth can influence the predictions!

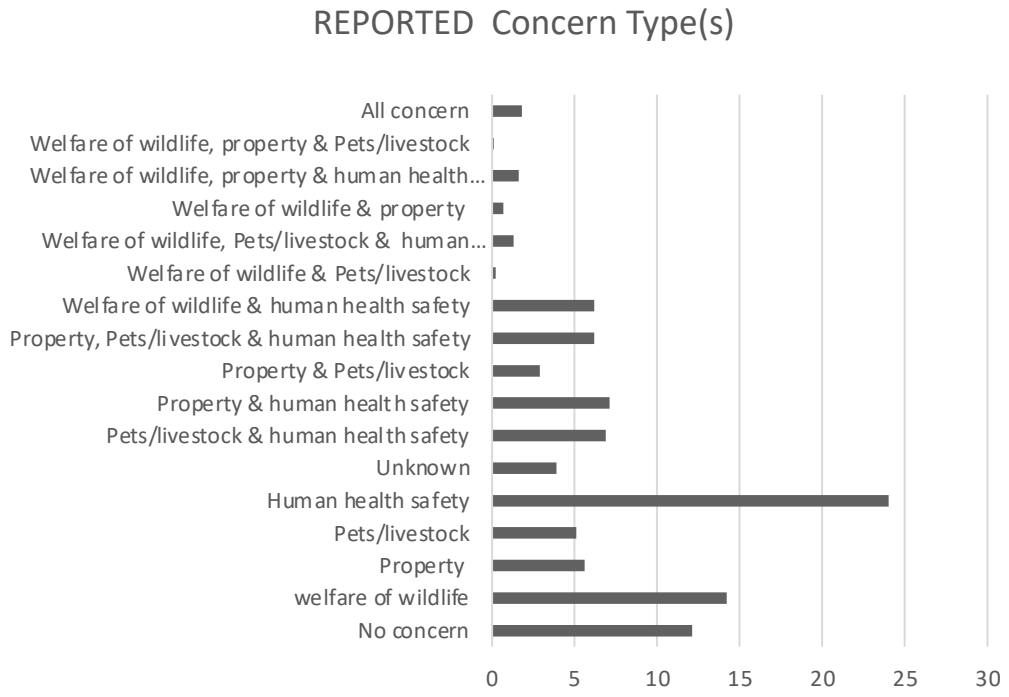
RESULTS

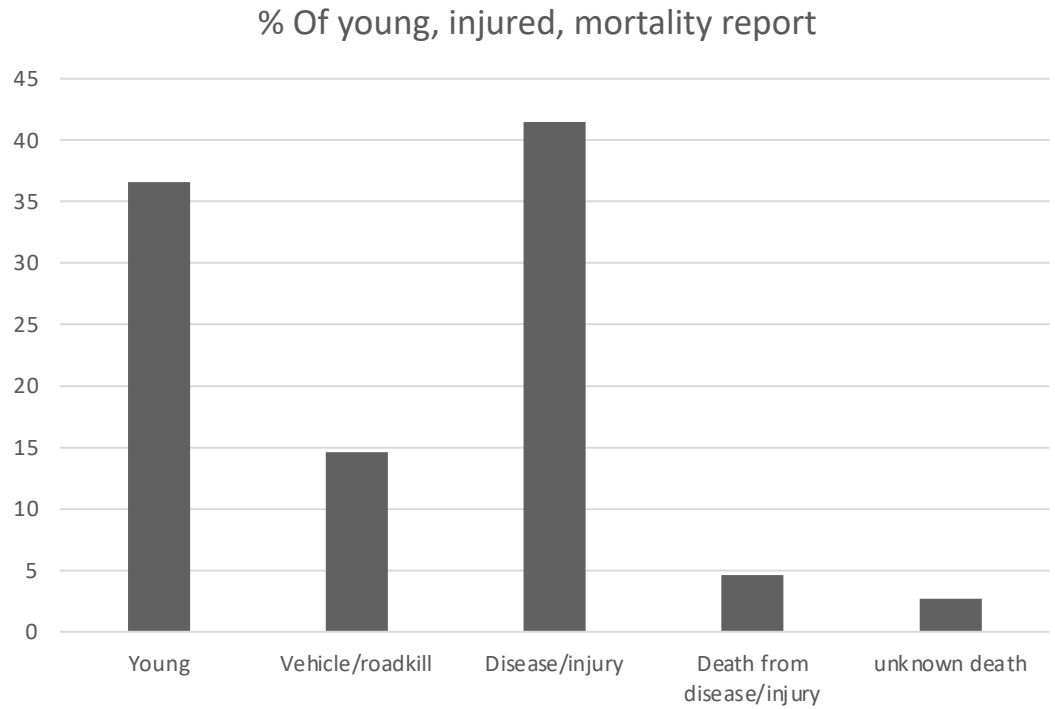


- The study by Reyna-Saenz (2020) identified the key variables strongly associated with predation sites, with a significant proportion being attributed to livestock management practices

- This finding reinforces our own result, indicating that Poultry fowls (Chicken, chicks, eggs, turkey, ducks) were the primary targets reported for livestock depredation, comprising approximately 68% of the cases (166 incidents)

RESULTS





- The study highlights that human health safety and wildlife welfare are major concerns due to the potential for disease or injury

- Zoonotic diseases, such as COVID-19, represent significant public health challenges in Human-Wildlife Conflict (HWC), with the potential to trigger pandemics (Ferreira et al., 2021)

RESULTS

ANOVA RESULT:

- Also, the counties (p = 0.00082551) and seasons (p = 0.0034235) have a significant effect on the human-bear interactions reported in MA

CORRELATION ANALYSIS:

- TOP 3 counties 'Berkshire', 'Hampshire', 'Worcester
- Winter Temperature and Winter Frequency (0.9993), Spring Temperature and Spring Frequency (0.9737), Fall Temperature and Fall Frequency (0.9279)
- Summer Temperature and Summer Frequency (-0.9068)
- In summary, there is a strong correlation between temperature and the frequency of human-bear interactions

TO DO LIST

- **Currently doing A literature review, reading and extracting data from 235 papers (final selection)…**

  (Understanding Human-Wildlife Coexistence: A Systematic Review of the Impact of Protected Area Boundaries, Climate Change, and Development on HWC)

- **August: Training on Agent based modeling using Net logo**

- **OCTOBER: Presenting the results at the zoological association of America Conference**

THANKS FOR LISTENING!!!