

Data Visualization: Endangered Terrestrial Mammals

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Fig. 1. Endangered Javan Rhinoceros (*Rhinoceros Sondaicus*) located primarily in Indonesia

Abstract—Human activities have interfered with wildlife for centuries now. Poaching of terrestrial mammals such as rhinoceros and elephants is currently one of the major human activities plaguing wildlife. Approximately 20,000 elephants are killed yearly by poachers seeking to profit from their tusks. The main driving force behind this trade is the demand for ivory, particularly in certain regions of Asia ([WorldWildLife](#)). This project aims to contribute to conservation efforts by analyzing data sourced from the International Union for Conservation of Nature (IUCN) Red List database, a research article, and the World Bank database. The project sought to shed light on the habitats, populations, and threats faced by endangered terrestrial mammals using multiple visualizations. The visualizations revealed critical insights, highlighting species with dwindling populations needing immediate attention, showcasing the geographic distribution of endangered mammals, and showing the trends of percentage forest and terrestrial protected areas of some countries and regions where these endangered species can be located. These insights can inform conservation strategies, policy decisions, and awareness campaigns aimed at protecting endangered terrestrial mammals and their habitats. This project serves as a call to action, advocating for proactive measures to safeguard the biodiversity and future of terrestrial mammals facing extinction

Index Terms— Visualization, endangered terrestrial mammals, geographic distribution.

1 INTRODUCTION

Many animals are facing extinction and a population decline largely due to various human activities such as poaching and real estate/industry development. The motivation for this project stems from the critical need to conserve these endangered species to prevent extinction. This project is to bring to light the location of habitats and populations of endangered terrestrial mammals around the globe that are on the brink of extinction. Furthermore, the project aims to inform stakeholders in the conservation of endangered terrestrial mammals on where to put more effort and resources to prevent these mammals from going extinct.

The urgent need to address the plight of these mammals arises from the critical role they play in ecosystems, acting as keystone species essential for ecosystem stability and biodiversity maintenance. However, despite increased awareness and conservation efforts, some worrying terrestrial mammal populations persist.

The data collected covered a wide range of endangered terrestrial mammals. Data was pre-processed to make it suitable for analysis. Tableau was utilized to map the habitats and visualize the distribution of these endangered species.

Abbreviations of the red list category used in the visualizations are as follows:

CR - Critically Endangered, EN - Endangered, VU – Vulnerable, LR - Lower Risk, NT - Near Threatened, LC - Least Concern, and DD - Data Deficient

Species in the EN, CR, and VU categories were considered as Endangered Terrestrial mammals.

Furthermore, some visualizations were created with their intended audience and insights based on the following research questions:

- Which endangered mammals have the least populations and how they are classified by Order?
- What are the trophic levels of the endangered terrestrial mammals that support their survival?
- What are the population and population density distribution of endangered mammals across the globe?
- What is the trend of percentage forest area/percentage terrestrial areas of countries for the past 5 years where these endangered mammals(herbivores) can be located?

Through meticulous data preprocessing and the application of visualization techniques using tools like Tableau, the project delves into various facets of the issue, seeking to unearth insights beneficial to diverse stakeholders. By addressing pertinent research questions regarding population demographics, trophic levels, global distribution, and habitat loss trends, the study endeavors to offer actionable intelligence to stakeholders involved in conservation, policymaking, research, and public awareness.

The visualization techniques aim to identify vulnerable species, the dwindling populations, and the habitat locations and ranges of endangered terrestrial mammals. These insights are intended to serve as a call to collective action, encouraging a holistic approach to

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conservation and driving proactive measures to mitigate the imminent threat of extinction facing these invaluable creatures.

2 LITERATURE REVIEW

Research by Greenspoon et al (2023), “The global biomass of wild animals”, highlighted the biomass of endangered terrestrial mammals and their distribution across different taxa and continents. Hoffman et al (2011) in their research, “The changing fates of the world’s mammals”, analyzed and visualized the main drivers for the deteriorating mammal species from 1996 to 2008. Agriculture and hunting were the main threats to mammals from the research. This project will also seek to visualize the trends in forest and terrestrial protected areas. A decline in both will be considered tantamount to threats to terrestrial mammals.

3 DATA SOURCES AND PREPROCESSING

The data used for this project were retrieved from the International for Conservation of Nature (IUCN) Red List databases: <https://www.iucnredlist.org/resources/spatial-data-download>, the research article by Greenspoon et al (2022): https://gitlab.com/milo-lab-public/mammal_biomass/, and from the World Bank website. The data sources provide spatial and range information on habitats for endangered terrestrial mammals and their populations.

Python software program was used to preprocess data downloaded from IUCN. Redundant features/attributes were removed from the data and data was further filtered to contain mammals that primarily live on land.

4 VISUALIZATIONS

Visualizations such as bar charts, treemaps, and maps were utilized to help answer the following research questions:

- Which endangered mammals have the least populations and how they are classified by Order?
- What are the trophic levels of the endangered terrestrial mammals that support their survival?
- What are the population and population density distribution of endangered mammals across the globe?
- What is the trend of percentage forest area/percentage terrestrial areas of countries for the past 5 years where these endangered mammals(herbivores) can be located?

Tableau software was utilized to create these visualizations. All visualizations were ensured to follow Tufte’s and Cleveland’s rules.

4.1 Endangered mammals with low populations

The horizontal bar chart (fig.2.) and treemap (fig.3.) list and classify respectively the endangered terrestrial mammals with the least population in the world. It will inform policymakers, government agencies, and conservation organizations of endangered terrestrial mammals that need intensive scrutiny to avoid extinction. In addition, makes the public aware of the species that need more protection.

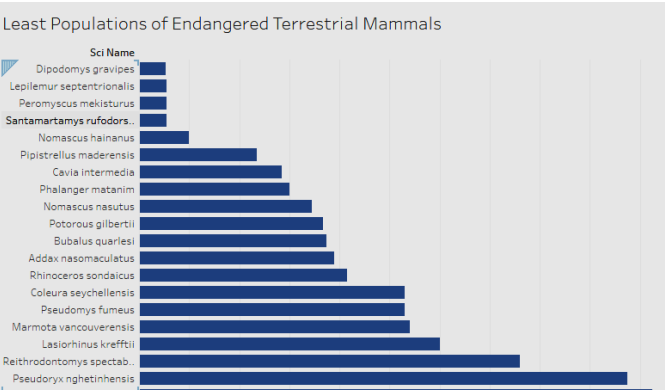


Fig. 2. Horizontal bar charts showing populations of some endangered mammals.

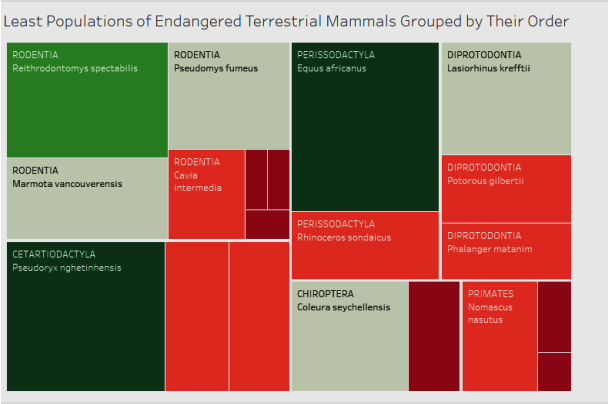


Fig. 3. Treemap showing groups some endangered mammals belong to.

4.2 Trophic levels

The vertical bar chart was used to highlight the trophic level of endangered terrestrial mammals. This can encourage researchers to study why there are more endangered species at one trophic level than others. It will also help government agencies and conservation organizations create awareness of activities affecting the survival of endangered species in terms of nutrition. Most of the endangered mammals have been identified as herbivores hence there need to protect our forest areas very well.



Fig. 4. Vertical bar charts of trophic levels of the endangered mammals

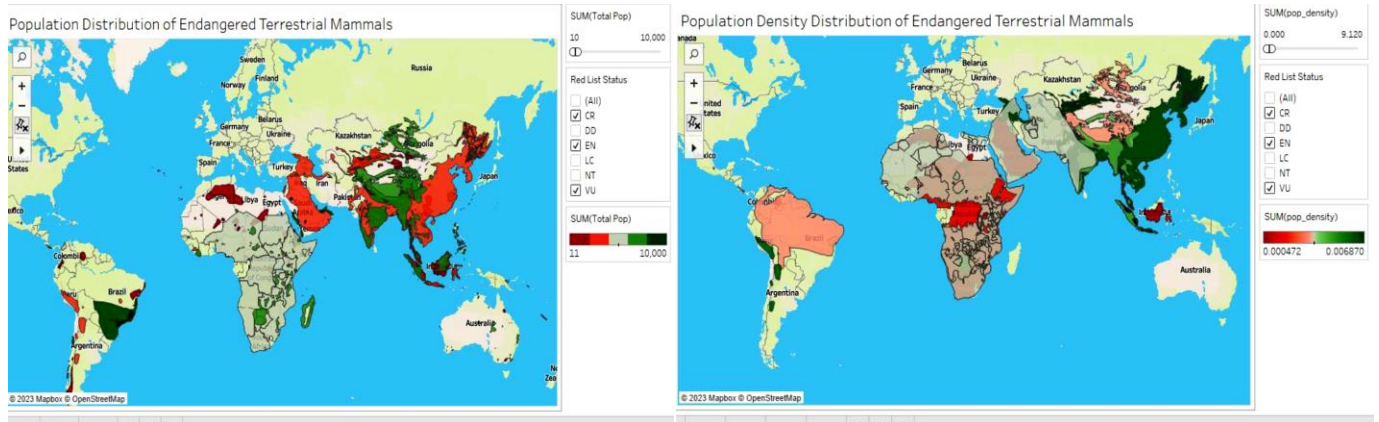


Fig. 5. Mappings of the habitats, range, populations, and population densities of endangered mammals around the globe.

4.3 Population and Population Density Distributions

Geospatial mappings were used to highlight regions with the lowest populations/population densities of endangered terrestrial mammals. This can inform government agencies/policymakers about which endangered mammals can be found within their territories and implement policies to help in the conservation of these species. In addition, it can help tourists locate endangered species around the world. Tourists seeking to find desired terrestrial mammals that are endangered can utilize mapping visualizations to locate these species. Furthermore, it can help inform donors what countries or regions will require resources to protect the desired species of mammals from going extinct.

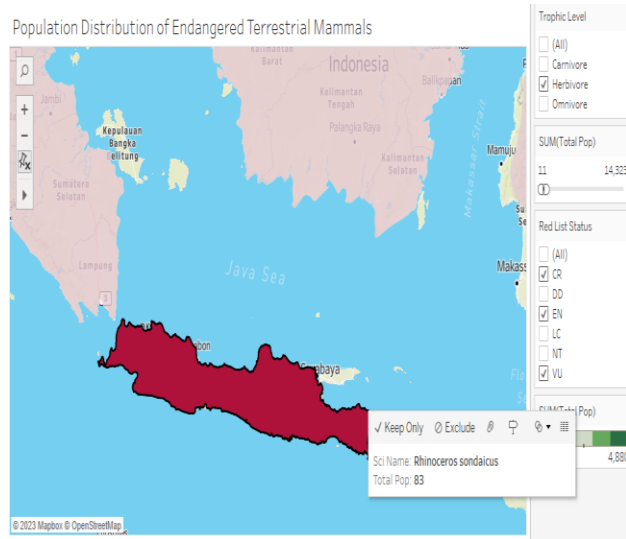


Fig. 6. Zooming in on the location of the endangered Rhinoceros sondaicus (Java Rhinoceros).

4.4 Forest/protected areas of countries/regions

Countries/regions where some endangered species are located were analyzed. A five-year trend from 2016 to 2021 of forest and terrestrial protected areas was visualized using data extracted from the World Bank website. Countries/regions with a decline in forest and terrestrial protected areas could signify heightened human activities and ineffective conservation efforts, posing severe threats to endangered mammals living within them. A bar chart visualization was utilized and it adhered to the principles advocated by Cleveland and Tufte. The visualization ensures data accuracy by presenting clear and precise information on the percentage changes in forest and terrestrial protected areas across countries/regions with no chart junk.

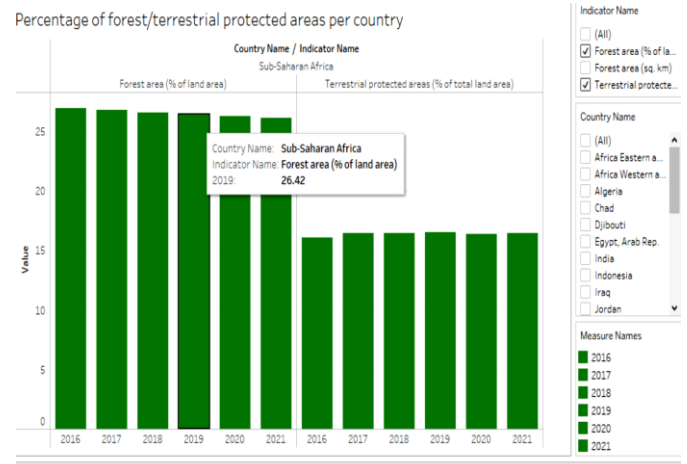


Fig. 7. Vertical bar charts showing trends (2016-2021) of percentage of forest /terrestrial protected areas in the Sub-Saharan region.

This visualization will enable users such as conservation organizations, government agencies, and policymakers to know whether their policies supporting the survival and safety of these endangered terrestrial species are being strictly followed.

5 DISCUSSION

The comprehensive visualizations developed in this project are set to offer invaluable insights to a wide range of stakeholders including tourists, conservation agencies, and government/policymakers. By providing a clear representation of population trends, trophic levels, and geographic distributions of the endangered terrestrial mammals, these visualizations aim to empower users to make informed decisions. Target audiences can leverage this information to strategize conservation efforts, allocate resources efficiently, and implement and track targeted policies aimed at safeguarding vulnerable species and

their habitats. Additionally, there is an aspiration to further enhance these visualizations by illustrating the specific threats facing these endangered mammals, fostering a deeper understanding of the challenges, and facilitating more targeted interventions to address imminent dangers.

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