

# WHY should we worry about conserving all species?



MSc in Data Analytics – Group A

Data Visualization CA2

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## I) Background

IUCN (**I**nternational **U**nion for **C**onservation of **N**ature) is an international organization that was found in 1948 and it consists of both civil and government organizations. IUCN gathers and analyzes the data of species from all around the globe to create awareness among population and promote nature conservation. It publishes an IUCN Red list every year where it places all the globally assessed species in different group's like- **data deficient, least concern, vulnerable, near threatened, endangered, critically endangered, extinct in the wild** and **extinct**. IUCN threatened species group consists of all vulnerable, endangered and critically endangered species. Threatened species are defined as the species that are more vulnerable to the danger of extinction in future.

The ever increasing human population has pushed many species to extinction or on the brink of extinction. The population of many species have been decreasing over the years at an alarming rate and unless something is done to stop this it will keep on continuing. Human activities like deforestation, poaching, pollution, overfishing and oil spill contributes majorly to the increase in the number of threatened species along with global warming which is also a result of human activities. We need to conserve all of the species especially the threatened ones as they are more prone to being extinct in the near future. The Red list by IUCN helps in identifying the name of threatened species, the number of threatened species by year or by country and the extinct species to create awareness among the population and government so that necessary action for conservation of these species can be taken.

## II) Datasets Information

Serial Number	Dataset Source	Dataset description	Last Update
1	<a href="https://nc.iucnredlist.org/redlist/content/attachment_files/2019_1_RL_Stats_Table_1b.pdf">https://nc.iucnredlist.org/redlist/content/attachment_files/2019_1_RL_Stats_Table_1b.pdf</a>	Numbers of threatened species by major groups of organisms (1996–2019)	21 March 2019
2	<a href="https://nc.iucnredlist.org/redlist/content/attachment_files/2019_1_RL_Stats_Table_5.pdf">https://nc.iucnredlist.org/redlist/content/attachment_files/2019_1_RL_Stats_Table_5.pdf</a>	Threatened species in each country	21 March 2019

Table 1

### III) Process

Datasets 1 and 2 are both taken from the IUCN website (<https://www.iucnredlist.org/resources/summary-statistics#Figure%202>). Dataset 1 gives the information about the number of threatened species from year 1996-2019. These species are classified into four main categories of vertebrates, invertebrates, plants, and fungi and protists. These main categories are further classified into various subcategories each (Figure 1). Vertebrates are classified into mammals, fishes, birds, reptiles, and amphibians. Invertebrates are classified into insects, molluscs, crustaceans, corals, arachnids, velvet worms, horseshoe crabs, and other invertebrates. Plants are classified into mosses, ferns & allies gymnosperms, flowering plants, green algae, and red algae. Fungi & protists are classified into lichens, mushrooms, and brown algae.

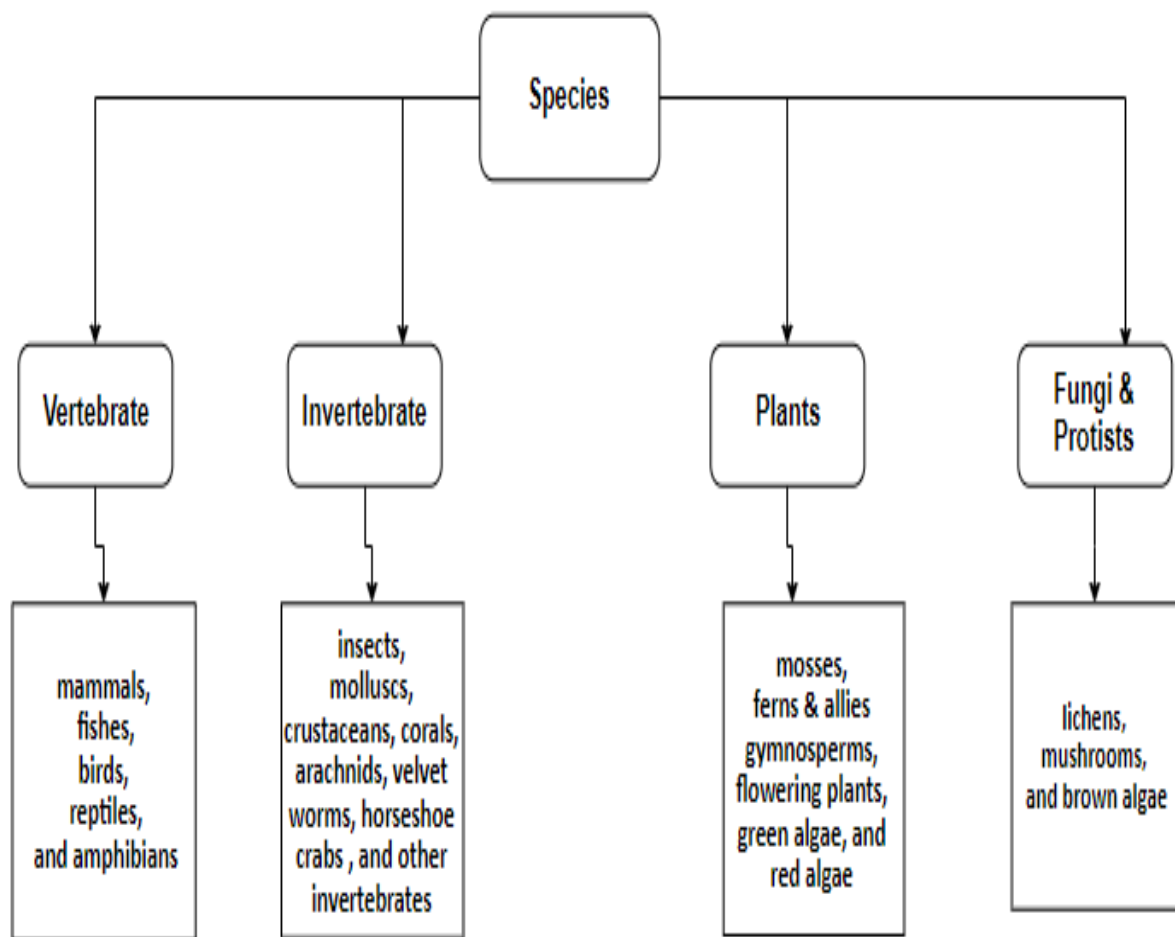


Figure 1

Dataset 2 contains information about the number of threatened species in each continent by countries for the year 2019. Only European countries data was taken from this dataset as the infographic wants to target the audience in Europe.

Since both these datasets were in pdf format they were extracted from the pdf using R. Using `extract_areas` function of R the pdf table was extracted and the missing column names were also fixed after the extraction was complete. After successful transformation of both tables they were written and saved as csv. Excel was used to extract data from these csv files that was to be used in creating visualizations as all the data in the csv file wasn't required.

After obtaining the data and deciding on the number and type of visualization (Piktochart charts and images option was explored before deciding on the charts) needed for the infographic a wireframe was created to define the layout of the infographic using an online tool WireframePro (Figure 2).

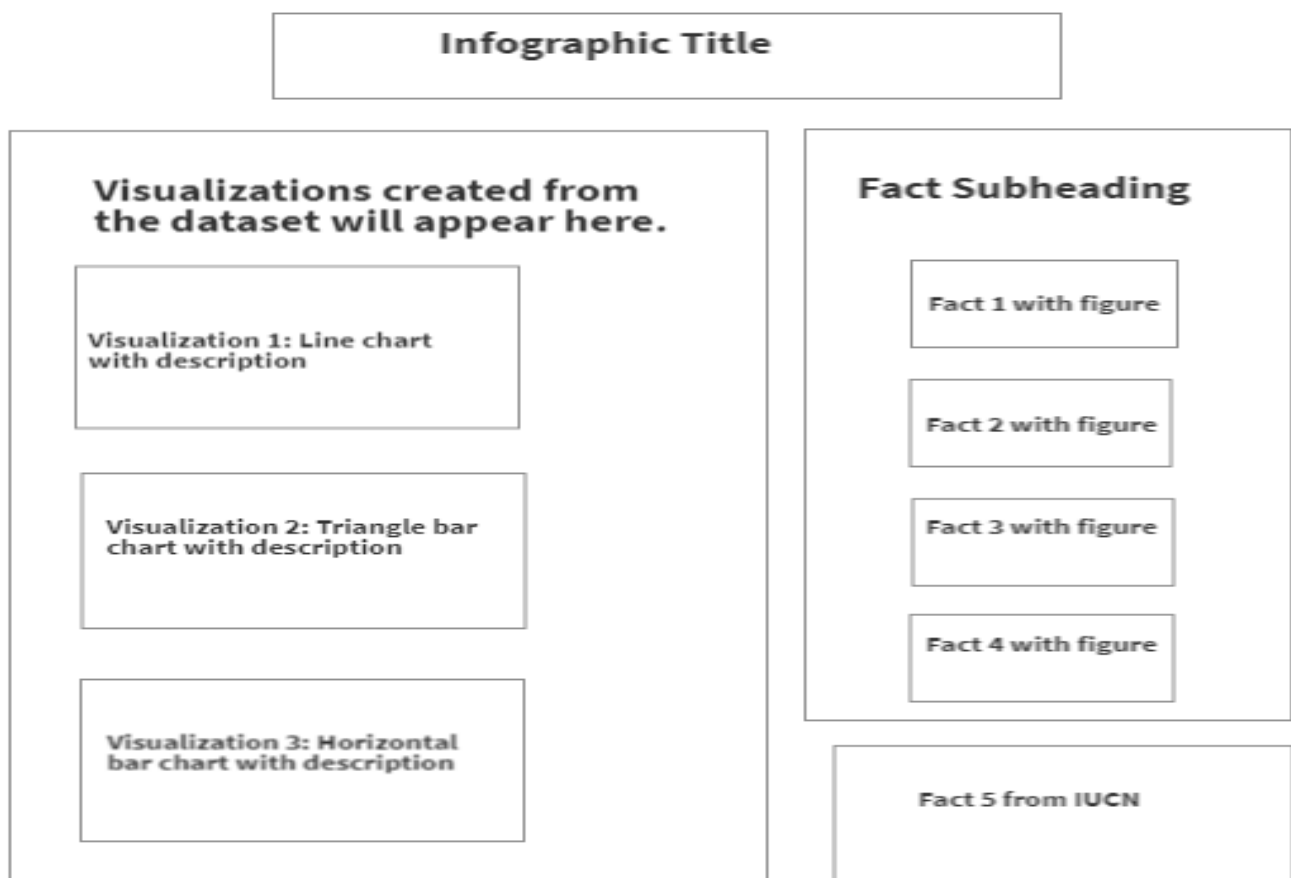


Figure 2

After completion of the wireframe the background color for infographic was decided based on the visualization color which was decided as red. After thorough research an appropriate background color (green) was selected and then the visualizations were made using the dataset. The visualizations, texts and images were placed following the layout of the wireframe. After everything was in place research was done for finding appropriate text Fonts that were legible in infographic. Impact, Lato, and Open Sans text fonts were chosen for the Infographic. After completion of the major tasks some finishing touch were done in the Infographic to make it look presentable.

## IV) Infographic Goal

Threatened species can go extinct in the future if proper steps for their conservation are not taken soon enough therefore there is a need to create awareness among people and government bodies about the importance of conserving all these species. The goal of this infographic is to make the European audience aware about the alarming decline in the population of many species by giving them the facts and figures about the threatened species and the human activities that are responsible for the decline in the number of species.

## V) Story as told by Infographic

All the three visualizations together with the infographic images spins the story of how with each passing year different species becomes vulnerable to extinction in many countries by becoming threatened and how humans are responsible for it.

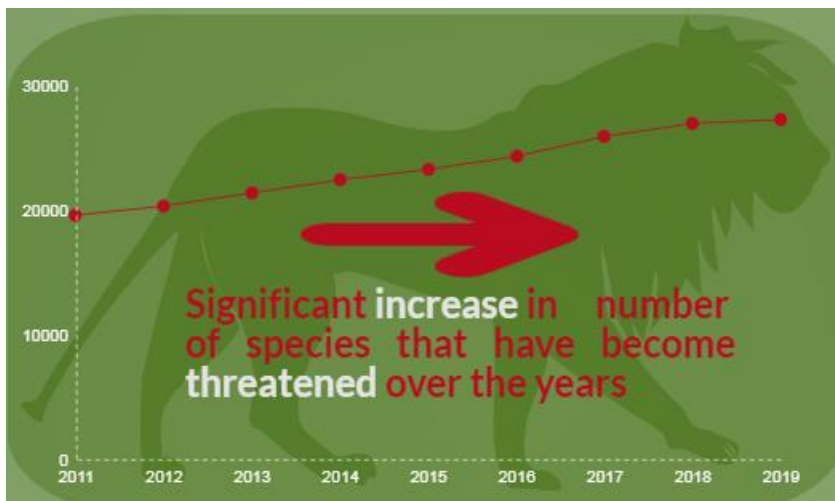


Figure 3

The line graph in Figure 3 shows that from the year 2011 to 2019 there was a continuous increase (rise) in the total number of species that have become threatened. As each year passes by more and more species population keeps on declining making them vulnerable to extinction in future.

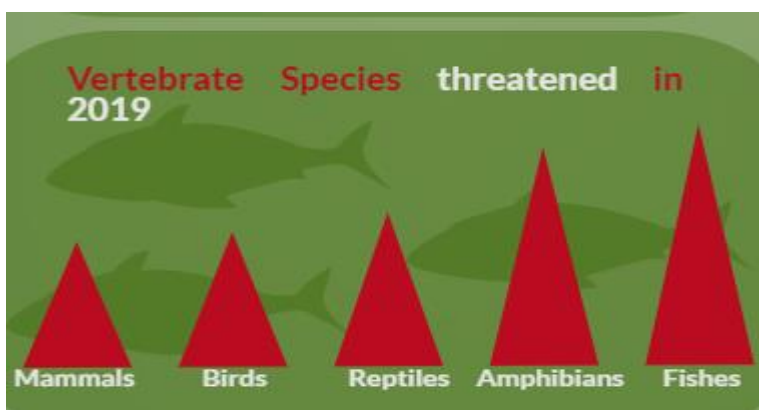


Figure 4

Figure 4 shows the number of vertebrate species like mammals, birds, reptiles, amphibians, and fishes that have become threatened in 2019 according to the IUCN Red list. Triangle bar chart is used to represent all the vertebrates and it could be seen that fishes have the highest number of threatened



species and mammals have the lowest number of threatened species in the vertebrate category.

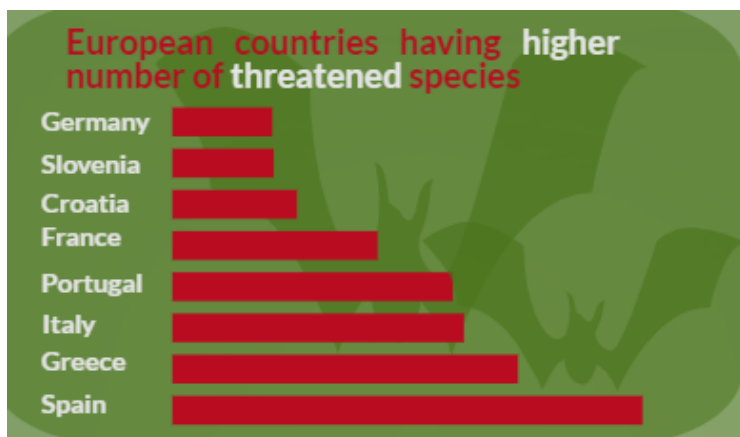


Figure 5

European countries.

Figure 5 shows the top eight European countries that have higher number of threatened species. Since the infographic wants to target the audience in Europe the graph only shows European countries. From the visualization we can see that Spain has the highest number of threatened species compared to all the other



Figure 6

Overfishing time is defined as doing excessive fishing in an area without giving marine life enough to replenish in that area. This has caused endangerment of many fish species as they are continuously being fished. Deforestation is yet another cause that has made many species threatened. Since most of the species lives in forest, deforestation causes them to lose their habitat which makes them vulnerable to all types of danger.

The aim of this section is to make the audience realize how humans are responsible for the endangerment and extinction of species and how it's their responsibility to conserve them by mending their ways. There should also be some strong conservation policies in place to either ban or decrease the human activities that are negatively impacting many species.

After giving the statistical information about the threatened species in the form of visualization the infographic focuses on listing some of the human activities that caused many species to become threatened (refer to Figure 6).

Plastic pollution in ocean causes death of many marine animals every year. The small plastic particles ingested by marine animals result in their death. Other animals and birds can also become entangled in plastic debris causing them to get injury. Poaching is illegal hunting or capturing of animal .Poaching of elephants for their tusks and rhinos for their horns have caused them to become endangered.

## VI) Styling Justification

### I) Colors used

The color red is used for visualization graphs as the data is taken from the IUCN Red list and their primary color for threatened species is red. There is a concept called color harmony in color theory that states that a pleasing visual can be created when two complementary colors are used together. Complementary colors are the colors that are opposite to each other in a color wheel and they can be used together to make things stand out in a visual. Since red and green are complementary colors and red was used for graphs therefore green was used as the background color in infographic. The other reason for using these colors was because of their color meaning, red color is a symbol of danger while green color is a symbol for nature. The use of these colors in the infographic represents “**nature in danger**”.

White color is used for text in the infographic as on the green background this colors pops out and is easily visible making the text more readable.

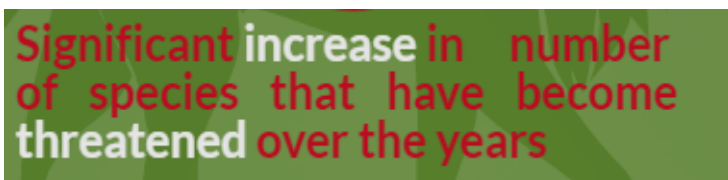


Figure 7

In some parts of the infographic red colored text is used throughout so that white can be used for highlighting some words as shown in Figure 7.

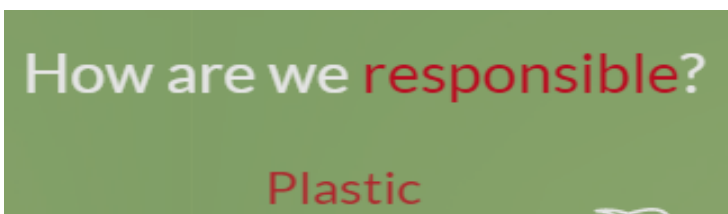


Figure 8

The right section of infographic that states the reasons for species becoming threatened has highlighted words in red as shown in Figure 8 as red signifies danger.



Figure 9

Black color was used for images as it is the color that has been associated with evil and death and since the images represent the reason of how some species die by human activities black color was apt for these images (refer figure 9).

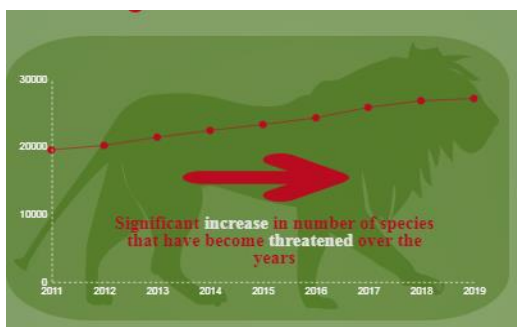


Figure 10

Figure 10 shows three different shades of green used in the infographic. The same green color (#4A741B) was used in the infographic but with different opacity values. Background color had 35 % opacity, rounded square box that had visualizations had the opacity of 53%, and the mammals or fish images used inside the square box had the opacity of 65%.The red (#BA0C21) color was same throughout with 100% opacity except for the box shown

in Figure 11 where red color had the opacity of 63%.

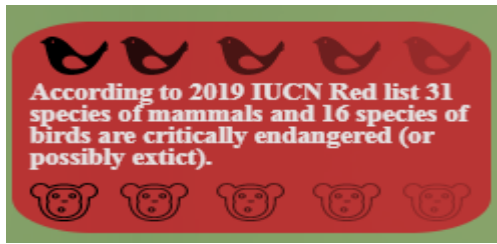


Figure 11

The red box (Figure 11) uses mammals and bird's images inside it arranged in decreasing order of their opacity values. The opacity is reduced by 20 % for the next image such that the first image has an opacity of 100%, the second 80%, and fifth and last one has the opacity of 20%.

## ii) Fonts used

The aim of selecting an appropriate font for the infographic was that the text in the infographic should be clear, visible and legible. Since sans-serif provide a better on screen readability than serifs for digital content three types of sans serif font were used in the infographic. Impact with font size of 40 and 61 was used for the main infographic title, Lato with font size of 35 and 30 was used for the titles and subtitles for the right section of the infographic and Open Sans with font size of 23 was used for the body text. Impact with its thick letter makes the content stand out from the rest of the infographic which is why it was used for the main title to catch the reader's attention. Lato and Open Sans both belong to the family of humanist sans-serif therefore they go well with each other and make the content readable.

## ii) Layout

The layout of the infographic was kept simple in a 60:40 ratio, approx. 60% of the space on left side was kept for the visualization while the remaining 40% approx. space in the infographic was kept for the facts. This design was decided after creating the wireframe. To draw reader's attention to visualization first more space was reserved for it because it highlights the problem of how species are becoming threatened every year, no. of threatened species and countries having higher number of threatened species. The top 40% section on right mentions the reasons for the problem that is described on the left side. So to make sure reader's attention lands on left side first after reading the title more space was covered by visualizations because only after seeing what the problem is one can know about the possible cause of that problem. The bottom 40% of the infographic contains a fact that points out the severity of the issue discussed in the infographic.

## VII) Tools Used

RStudio was used for extracting pdf table, changing missing column names of the table and for converting the cleaned dataset to csv so that they can be used for visualizations.



```

install.packages("rmarkdown")
Sys.setenv(JAVA_HOME='C:\\Program Files\\Java\\jdk1.8.0_201')
library(rJava)
library(tabulizer)
library(data.table)
library(supernova)
library(miscTools)
library(dplyr)
location <- 'C:\\Users\\Admin\\Documents\\2019_1_RL_Stats_Table_1b (2).pdf'
out <- extract_areas(location,pages = 1,1)

head(out,5)
write.csv(out,file="yearlythreatnedinvert.csv",row.names=FALSE)
library(readr)
out <- read_csv("yearlythreatnedinvert.csv")
out<-na.omit(out)
names(out)[names(out) == "x1"] <- "Year"
names(out)[names(out) == "x2"] <- "Mammals"
names(out)[names(out) == "x3"] <- "Birds"
names(out)[names(out) == "x4"] <- "Reptiles"
names(df)[names(df) == "x4"] <- "Amphibians"
names(out)[names(out) == "x5"] <- "Fishes"
names(out)[names(out) == "x6"] <- "Total invertebrates"
head(out)
write.csv(out,file="yearlythreatned.csv",row.names=FALSE)

```

Figure 12

Piktochart was used for creating this infographic (texts, images, and charts). I had tried both Canva and Piktochart to find out which online tool provided better charts and images for my infographic idea and since I liked the images in Piktochart more than Canva I decided to use it. MS Excel was used to extract useful data from csv that was required for visualization.

<https://www.draw.io/> is an online flowchart maker that was used in creating the vertebrate species hierarchical diagram in Figure 1. WireframePro (<https://wireframepro.mockflow.com>) is another online tool that was used for creating the wireframe for the infographic as shown in Figure 2.

## VIII) Reflection

The process started with extraction of data from the pdf which took some time as both the datasets were in pdf format and since column values were missing after extraction the column had to be renamed using R. Then the data that was actually required for visualization was taken into a separate excel sheet. Wireframe was created for the infographic and this was a difficult task because I had to create different layouts before settling for one that I found to be perfect for my infographic.

The task for creating an infographic started with selecting an appropriate background colors since it was already decided that visualizations were going to be red an appropriate color that get along well with red was required. I had to read color theory and after my research I decided to go with green color. The visualizations part was easy as I already knew what type of visualization I needed based on my data even the placements of visualization,

images and text was easy as I had already decided upon it by creating a wireframe for a neat presentation.

The task of selecting an appropriate font was a difficult one as I had to choose three fonts out of many available fonts. I had to do a thorough research for an appropriate font based on how they looked and what was their significance and the type of fonts that were apt for digital content because of their legibility which led me to use Impact, Lato, and Open Sans.

## References

<https://www.nationalgeographic.com/animals/reference/threatened-species/>

<http://www.color-wheel-pro.com/color-meaning.html>

<https://www.iucn.org/about>

[https://en.wikipedia.org/wiki/International\\_Union\\_for\\_Conservation\\_of\\_Nature](https://en.wikipedia.org/wiki/International_Union_for_Conservation_of_Nature)

<https://www.colormatters.com/color-and-design/basic-color-theory>

## Image source for cover page

<https://pixabay.com/photos/bald-eagle-landing-soaring-bird-1624943/>

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