Social factors are the main driver of space use in Virunga mountain gorillas in Rwanda

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Background

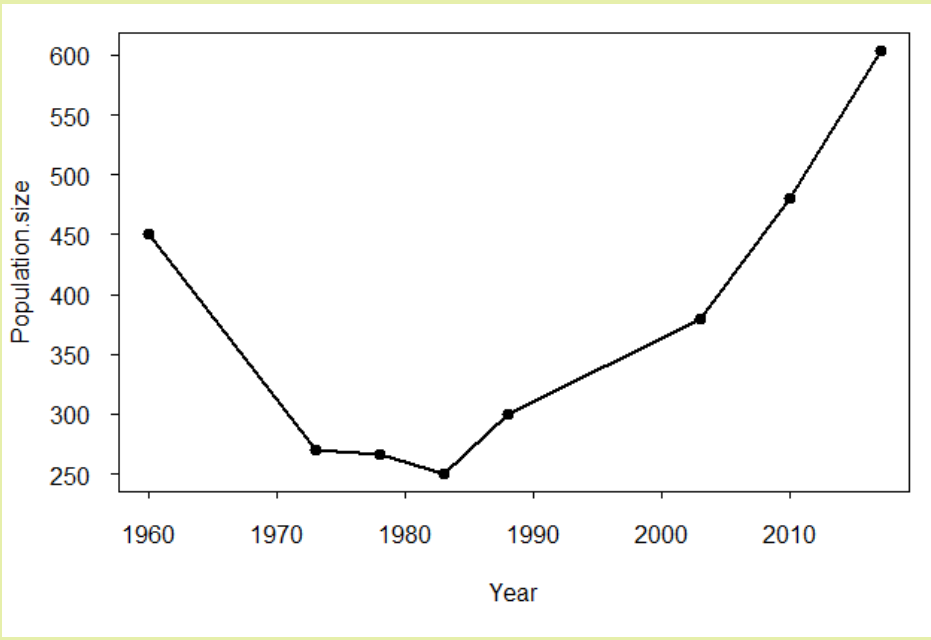
- Management of wildlife populations requires continuing efforts to understand the interactions between wildlife species and their habitats.

- Animal space use patterns determine access to resources necessary for survival and reproduction (Morales et al., 2010).

- Understanding of these relationships allow scientists to predict occupancy, abundance, survival, and reproduction of wildlife populations (Hobbs and Hanley 1990).

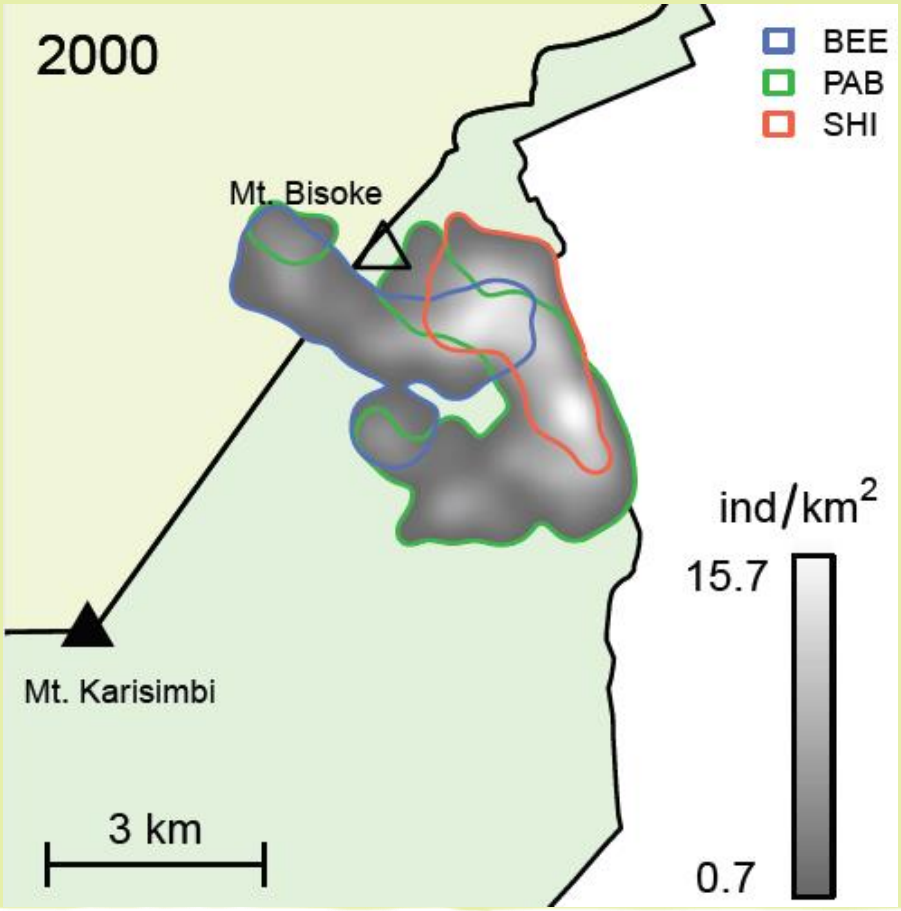
Virunga gorilla population increased

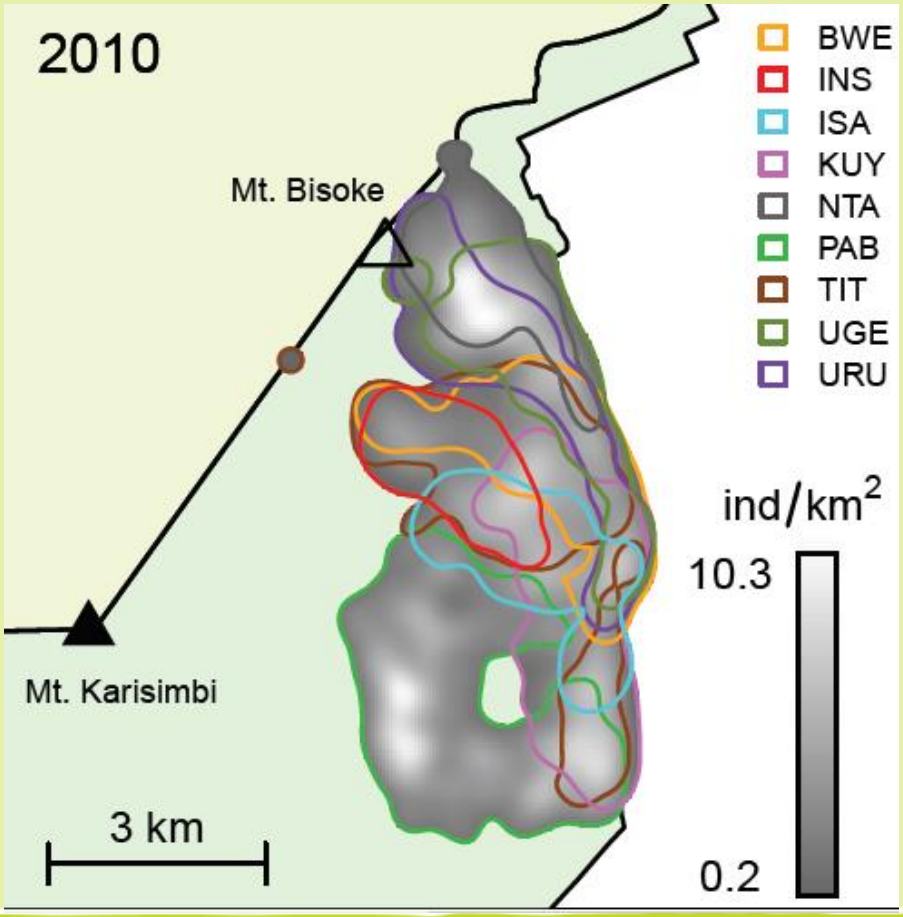
- Number of Virunga mountain gorillas more than doubled since 1980s
- Gorillas exploring new areas and range more often out of park boundary



Virunga gorilla population increased

- In some forest areas, the home range overlap of neighboring groups increased and group density tripled





Study Aim

- It is important to understand habitat use of this Endangered ape population and its adaptations to population growth on a small forest island

- **What are key determinants of habitat use of Virunga mountain gorilla groups in the Volcanoes National Park, considering ecological and social factors?**

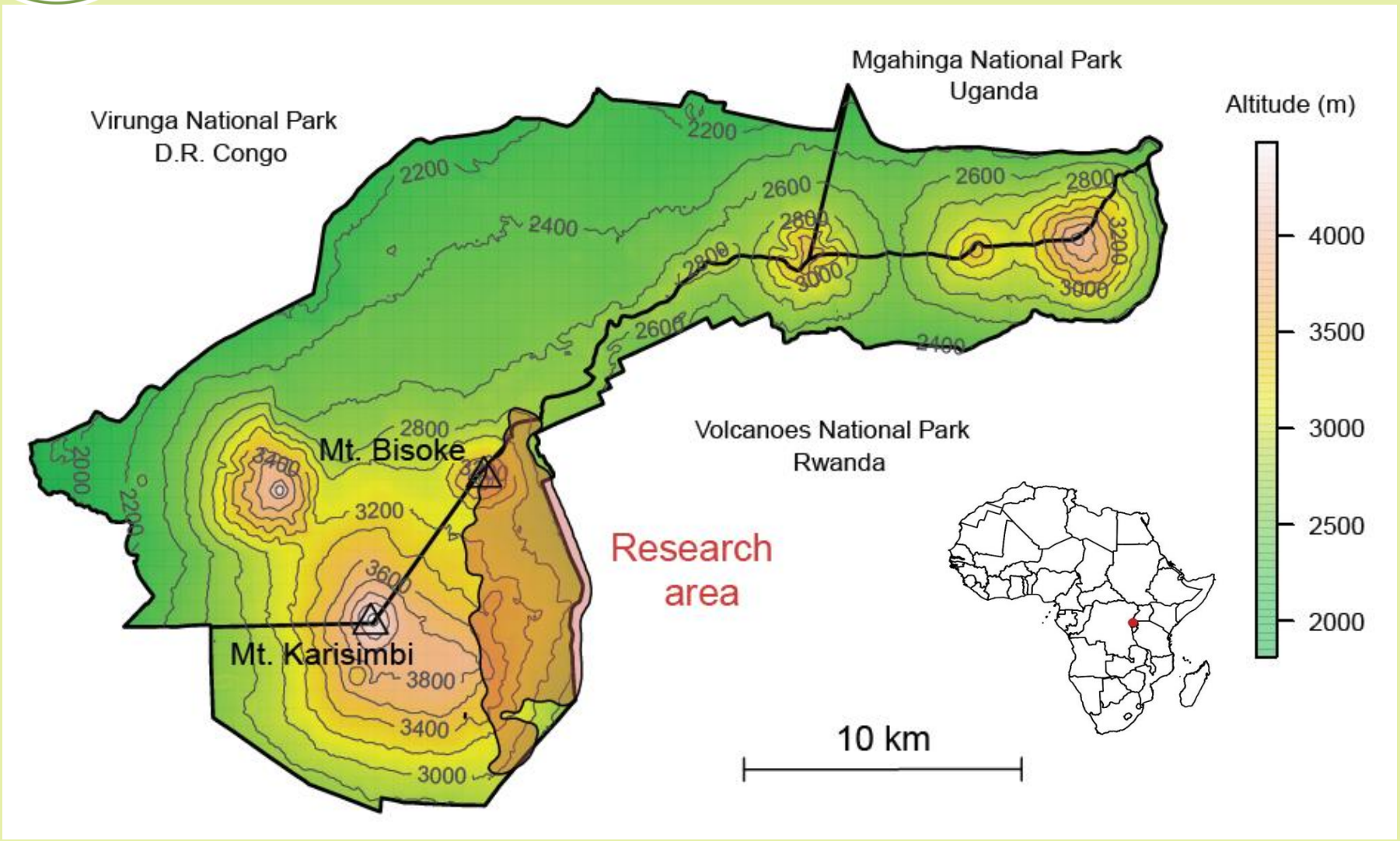
- Ecological factor: key gorilla food biomass

- Social factors: group density, group size, frequency of intergroup encounters

Predictions

- There is a positive relationship between monthly home range size and group size
- Local gorilla group density and home range size are positively related
- Group home range size increases with the frequency of intergroup encounters
- Group home range size and key gorilla food biomass are negatively related

Study site & Animals



Long-term Karisoke Data

- Daily nest and noon GPS locations of 15 social groups from 2009-2017 to calculate monthly group home range sizes
- Demographic data to calculate monthly group size and tenure of the dominant silverback
- Intergroup encounters to calculate monthly frequencies for each group
- Biomass assessment of the five key gorilla food plants by Grueter et al. 2012 in 2009 and by DFGF in 2014

Key Gorilla Food Plants

Galium spp [27%]

Carduus nyassanus [20%]

Peucedanum linderi [18.7%]

Rubus spp [3.6%]

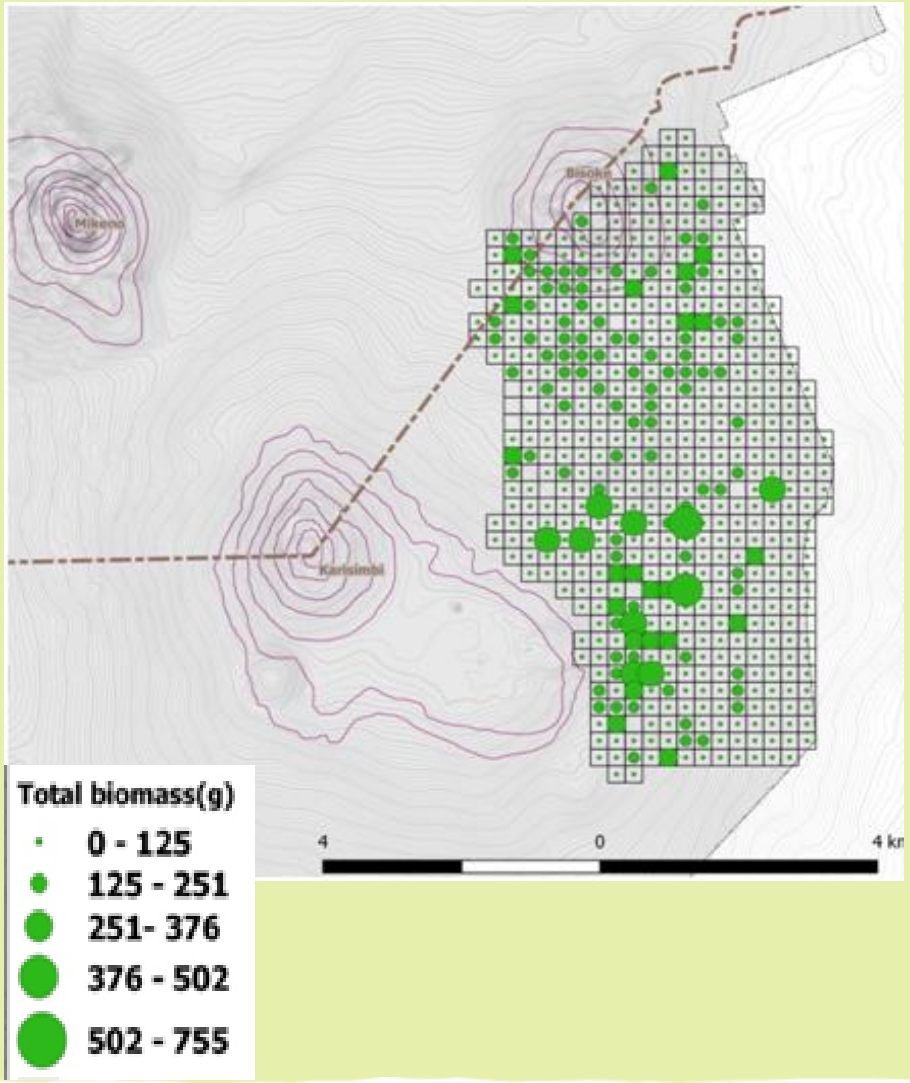
Laportea alatipes [2.9%]

Data Analysis

- Monthly group home range size was estimated using adapted digitized polygons method (Ostro *et al.*, 1999)

- We calculated local gorilla population density using the method proposed by Seiler et al. 2018

•Estimated the total food biomass in each grid cell of 500mx500m



Data analysis

- We run a Linear Mixed Model in R software
  - Response variable: monthly home range size
  - Random factors/slopes: group ID, month, year
  - Fixed effects: group density, intergroup encounter frequency, group size, food biomass
  - Control factors: number of GPS locations per group, dominant male tenure length, number of days feeding on bamboo

Results

- The larger the group size, the larger the home range size (t= 2.744; p= 0.01)

- More frequent intergroup encounters led to larger group home range size (t= 2.304; p=0.03)

Results

- Higher local group densities were linked to larger group home range sizes (t= 2.761; p = 0.01)
- Food biomass was unrelated to group home range size (t= -1.851; p= 0.083)

Discussion

Prediction 1: There is a positive relationship between monthly home range size and group size YES

Prediction 2: Local gorilla group density and home range size are positively related YES

Prediction 3: Group home range size increases with the frequency of intergroup encounters YES

Prediction 4: Group home range size and key gorilla food biomass are negatively related NO

Conclusion

- These findings suggest that social factors are the main drivers of space use in the Virunga gorilla study population
- This contrasts findings from the Bwindi mountain gorilla population where both social and ecological factors played a role in space use → more frugivorous
- This suggests gorilla key food in the area remains abundant resulting in low competition over food between groups

Recommendations

- Continue the monitoring of mountain gorilla ranging patterns as well as their long-term effects on gorilla reproduction and survival

- Advanced remotes sensing methods should be applied to assess gorilla food biomass in much more detail across the entire mountain gorilla range

- Monitoring climate change and its effects on gorilla key food plants and habitat use

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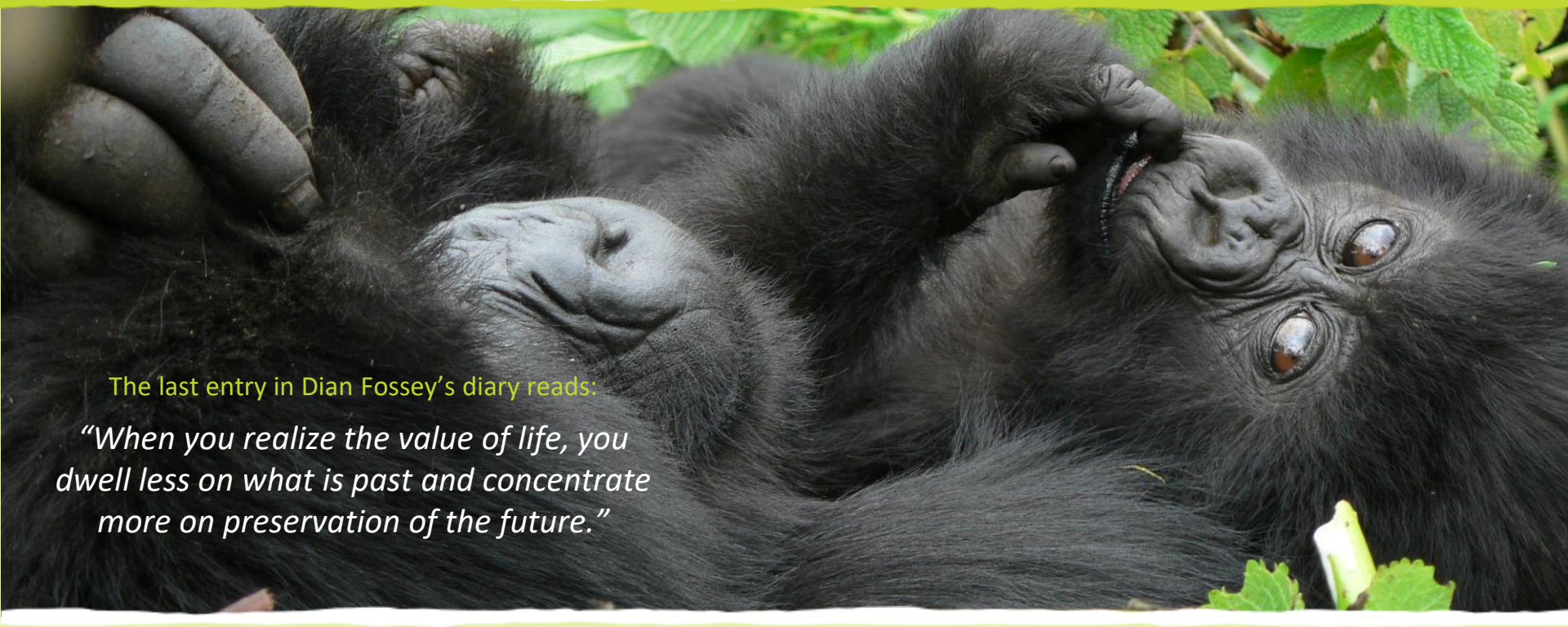
Reseachers in Max Planck Institute for Evolutionary Anthropology who helped in data analysis



The last entry in Dian Fossey's diary reads:

"When you realize the value of life, you dwell less on what is past and concentrate more on preservation of the future."

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