**Severe decline of the only remaining population of walia ibex in Ethiopia: proposed actions and recommended recategorization as Critically Endangered**

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Supplementary Material 1Morphological features used to identify walia *Capra walie* age and sex classes.

Adult males (> 7 years) are of stout build (100–125 kg), with large, curved horns (90–115 cm) and a prominent dark beard; adult females (> 5–6 years) are smaller, with relatively thin horns and no beard. Subadult males (3–6 years) are distinguished by their short beards. The horns of both adult and subadult males are similar in form. Males have a bony structure on their foreheads, which is not found in females. Subadult females (3–4 years) are smaller than adult females but otherwise share the same physical characteristics. Yearlings/young (1–2 years) are smaller than subadults and have very small horns. Juveniles/kids (0–1 year) lack obvious horns; they still depend on their mothers’ milk and remain in close proximity to them at all times.

Supplementary Material 2 Census methodology.

We divided the known walia range along the Simien escarpment in the Simien Mountains National Park in northern Ethiopia into 52 blocks, which we surveyed in two stages over 7 days with 26 teams of two observers (ranger and local guide/Park expert). On the first day, we assigned two of the 52 blocks to each team (one block in each half of the census area) and provided training on the methodology and the required equipment. The teams then travelled to base camps with access to the first 26 observation blocks. On the following 2 days, each team observed one block and recorded all walia seen, according to the methodology. Teams relocated to the second half of the census area on the fourth day and counted walia in the remaining 26 blocks on the fifth and sixth days. The teams assimilated their data on day seven for data checking and handover. Teams were equipped with binoculars, GPS devices and, for a limited number of teams, spotting scopes. The teams surveyed on foot each block over two 4-hour periods (06.00–10.00, 14.00–18.00), searching for up to an hour at a time. They observed the walia range from the 16 observation points used in previous surveys and also used other strategic points with wide views over the cliffs and slopes, allowing team members to spot walia at distances of 100–600 m. In addition, the observers counted walia opportunistically whilst moving on foot through the census block towards observation points or elsewhere.

Supplementary Material 3 Modelling walia numbers with generalized additive models.We used generalized additive models to model the change in numbers of walia over time ([Scholte et al., 2022](#b14)). We included year as a fixed factor with a negative binomial error distribution and log link function ([Wood, 2006](#b15)). We used a cubic B-spline covariance structure with a cubic difference penalty on the B-spline coefficients using the gam function in the package mgcv in R 4.4.2 ([Eilers & Marx, 1996](#b2); R Development Core Team. 2023). For generalized additive models, χ2 with estimated degrees of freedom was used to assess the significance of the model smooth terms, i.e. time ([Wood, 2006](#b15)). The likelihood ratio statistic does not follow a χ2 distribution ([Hastie & Tibshirani, 1990](#b7)), so this gave an approximate P value for the null hypothesis ([Wood, 2013](#b16)). Confidence intervals (CI) for predicted values increased steeply with time between consecutive surveys, so we checked that any significant trends with time were unequivocal by plotting fitted values (± CI).

Supplementary Table 1 Results of 2015–2024 counts.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2015 | 2019 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Season | wet | dry | wet | wet | dry | wet | dry | dry |
| Adult ♂ | 160 | 147 | 150 | 132 | 143 | 68 | 80 | 63 |
| Adult ♀ | 298 | 209 | 241 | 187 | 205 | 87 | 105 | 131 |
| Subadult ♂ | 99 | 71 | 66 | 94 | 78 | 29 | 46 | 42 |
| Subadult ♀ | 69 | 54 | 71 | 82 | 43 | 28 | 17 | 9 |
| Yearling | 92 | 59 | 631 | 74 | 48 | 14 | 27 | 24 |
| Juvenile | 104 | 43 | 52 | 48 | 19 | 30 | 15 |
| Non-identified | 43 | 36 | 54 | 70 | 36 | 24 | 14 | 22 |
| *Total* | 865 | 619 | 645 | 691 | 601 | 269/3612 | 319 | 306 |

1No distinction between yearling and juvenile.

2Corrected for uncounted blocks, see main text.

**References**

Eilers, P.C. & Marx, B.D. (1996) Flexible smoothing with *B*-splines and penalties. *Statistical Science*, 11, 89–121.

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Supplementary Material 4 Key informant interview questionnaire.

This is a brief questionnaire that was prepared to obtain the perception of community members, rangers, wildlife managers, village and district officials that have direct or indirect contact or knowledge on Simen Mountains National Park (SMNP). The interviews were held in Amharic with the English version as guideline. Questions were asked as much as possible in an open way.

Code number of interviewee …………………… Date…………………………………………. District/Wereda……………. Village/Kebele………………………………

Name of interviewer……………………………………………………

Sex…………………………………… Age………………………………………

Occupation…………………………………………………

For how long have you lived in this locality?.....................................................

1. Which wild animals/mammals live in your area? Mention them by name …………………………………………………………………………………………
2. Rank them in terms of abundance

1……………………………………

2……………………………………

3…………………………………….

1. How do you explain the general population trend of the above mentioned wild animals/mammals through last three to five years?

1.

a. increasing, b. decreasing, c. no change, d. no idea

2.

a. increasing, b. decreasing, c. no change, d. no idea

3.

a. increasing, b. decreasing, c. no change, d. no idea

1. If your answer for question number 3 is b, what do you think is /are the reason/s? Mention for each ranked species.

1.

1. Killings, b. habitat degradation, c. migration to other localities, d. a and b., e. if other combination mention…………………………………………………………

2.

a. killings, b. habitat degradation, c. migration to other localities, d. a and b., e. if other combination mention……………………………………………………………

3.

a. killings, b. habitat degradation, c migration to other localities, d. a and b., e. if other combination mention…………………………………………………………………

1. If your answer for question number 4 is a, mention the reason/s for each ranked species.

1…………………………………………………………………………………………

2…………………………………………………………………………………………

3…………………………………………………………………………………………

1. If your answer for question number 4 is a, b or c, explain by whom the killing is done, what is/are the reason/s for the habitat degradation (deforestation for agriculture/settlement, fire or any possible combination of these) or to where the migration occurs for each ranked species?

1.………………………………………………………………………………………

2…………………………………………………………………………………………

3………………………………........................................................................................

1. How do you see the trend of Walia ibex population through the last three to five years? Ask this question if Walia is not mentioned in the above questions, otherwise skip this and other related questions below).
2. Increasing, b. decreasing, c. no change, d. no idea
3. If your response for question 7 is b, what do you think is/are the reason/s?
4. Poaching, b. habitat degradation, c. migration to other localities, d. if there are other reasons or combination of reasons mentioned list them ………………………………………………………………………………………
5. If your answer for question number 8 is a, b or c, explain by whom the poaching is done, what is/are the reason/s for the habitat degradation (deforestation for agriculture/settlement, fire or any possible combination of these) or to where the migration occurs for the species (Walia ibex)?

…………………………………………………………………………………………

1. What do you recommend to reverse the decreasing trend of Walia if the case is so? (ask this question if the response of the respondent for question 7 is b, otherwise skip it)

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1. Any general comment on walia and other wildlife conservation in SMNP Park?.................................................................................................................................

Thank you very much for your time and response.