Hirola Conservation Program Progress Report: Primary Findings from 2012-2014

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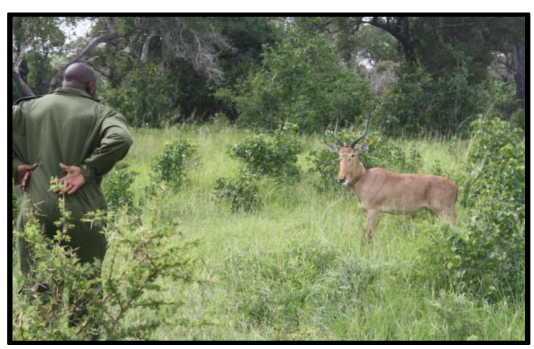
Summary

In this short report, we provide an update of findings regarding the ultimate factors underlying hirola declines in Ijara and Fafi Districts, Kenya. We hope that these findings and others will be used to inform the implementation of a long-term recovery strategy for hirola in eastern Kenya. This is not a final report, but rather a summary of data from the first two years of our field work. We present results for several questions we sought to answer in the past two years; these questions were motivated by an effort to guide future efforts in hirola conservation.

From an analysis of long-term satellite imagery, we report that a marked increase in tree cover coincided with the extripation of elephants and black rhino across the historic (native) range of hirola. Between 1985 and 2012, tree cover increased by over 250%; this is likely to have impeded the recovery of hirola following eradication of rinderpest in the mid-1990s to present.

Local Somali communities support range restoration for both hirola and livestock. Specifically, we identified manual removal of trees, seeding and fertilizing, elephant reintroductions, and rotational grazing as management interventions with the strongest support. Locals are neutral to controlled burning, and strongly oppose livestock reduction and soil ripping as management interventions for range restoration.

We conclude that range degradation is poised to cause hirola extinction, and the recovery of this species hinges ultimately on restoring grasslands in its native range. Interactions between range degradation (increased tree cover) and predation (following the recent recolonization of large carnivores to Ijara) may exacerbate hirola declines. Our resource selection functions provide a map of where future reintroductions are most likely to be successful. Finally, we recommend the development of a national hirola recovery strategy to be implemented in discrete and realistically-attainable phases for the next 20-30 years. Details of these findings including demographic drivers will be available in our final report that we will share with partners in 2015.



Findings to Date

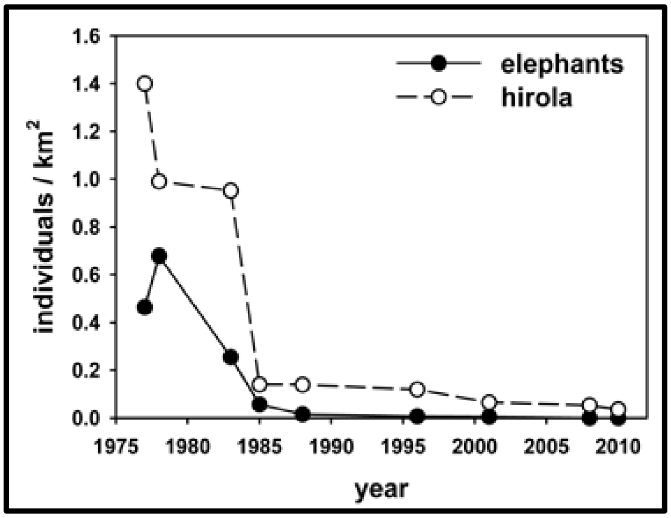


Fig 1: Estimates of hirola and elephant densities in northeastern Kenya (then Garissa, Ijara, and Fafi Districts), 1976-2011. Data from DRSRS.

Question 1: How did the landscape change for hirola over the past 30 years?

Range degradation from tree encroachment negatively impacts both wildlife and livelihoods of pastoralists. Studies have documented that tree encroachment results from a combination of excessive grazing, fire suppression, and changing browsing regimes. The elephant population in the historic (native) range of the hirola declined by over 98% since the mid-1970s (Fig.1) and this coincided with increasing human populations in the area. To understand how tree cover changed over this same time period, we classified Landsat images of hirola's historic range (1985 to 2012) to provide a 27-year time series of changes in tree cover and open grassland. For each image, we trained and classified remotely-sensed data into tree cover and grass cover. We then used a random forest classification scheme to implement a change detection analysis as applied in Program R (R development core 2012).

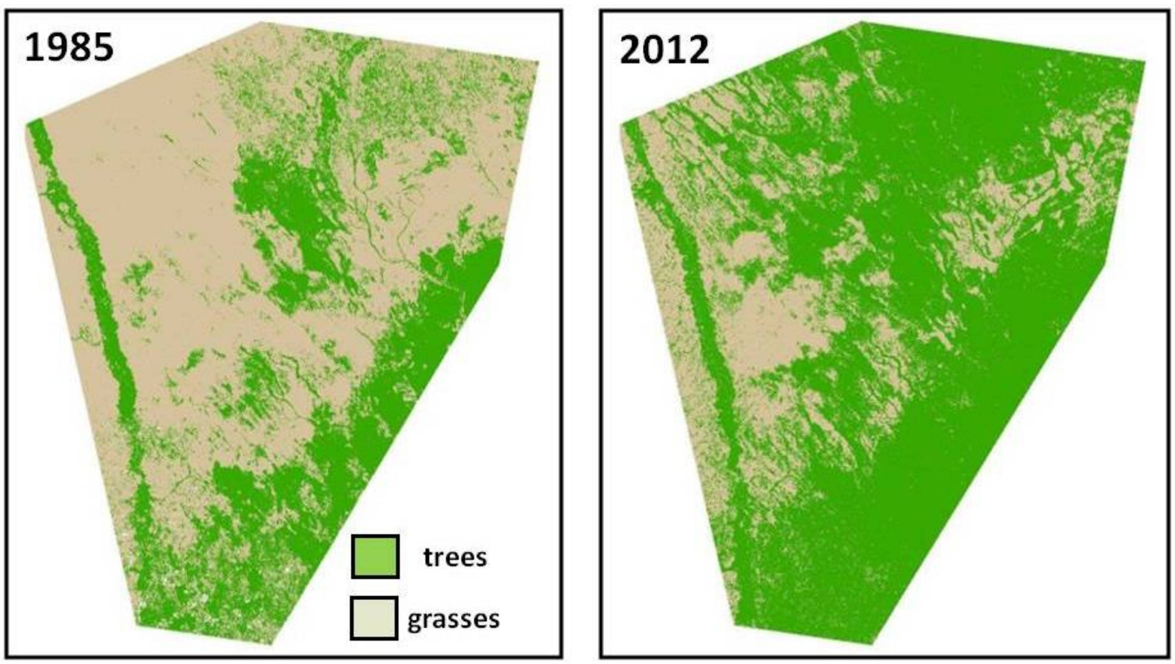


Fig 2: Changes in tree cover across the hirola's historic range from 1985 to 2012. Green represents tree cover and brown represents grasslands. The green linear feature at the west of both images is the Tana River. Note the stark increase in tree cover between 1985 and 2012.

The geographic range of hirola has collapsed over the past 27 years with increasing tree cover. Between 1985 and 2012, the historic range of hirola has experienced a >250% increase in tree cover (Fig. 2) such that less than 20% of the historic range is still available as grassland. Hirola subsist almost entirely on grasses and understory forbs; therefore, any factors shifting open, grass-dominated savanna to tree-encroached woodland have the potential to negatively impact populations. These data strongly suggest that the geographic range of hirola has contracted because of increasing tree cover in Ijara and Fafi Districts, Garissa County, Kenya. While factors such as disease might have triggered hirola decline, habitat loss stemming from increased tree cover is likely to be preventing contemporary recovery. Factors such as predation and competition with livestock are mediated by habitat. Therefore, we believe recovery of hirola in its historic range is unlikely unless measures are taken to improve range quality in targeted areas of Ijara and Fafi Districts.

Question 2: What environmental factors drive hirola habitat selection and movement?

To understand how increases in tree cover affected habitat selection and movements of hirola, we constructed resource selection functions (RSFs) based on historical (1985) and contemporary (2012) factors (Fig. 3). Using a combination of GPS telemetry, aerial survey data, and GIS layers for habitat features, we compared historical and contemporary habitat selection of hirola. We were particularly interested in whether the amount of high-quality habitat (as defined by selection for habitat by GPS telemetered hirola) had changed between 1985 and 2012. If so, we were also interested in identifying the areas in which high-quality habitat still occurs.

We evaluated habitat selection based on distance to the nearest village, distance to water, distance to roads, and tree cover, and combined this with movements from GPS-telemetered hirola to identify high-quality habitat. As expected, hirola strongly avoid tree cover, and select for grasslands. Hirola also avoid roads and villages. Between 1985 and 2012, changes in tree cover affected the amount and

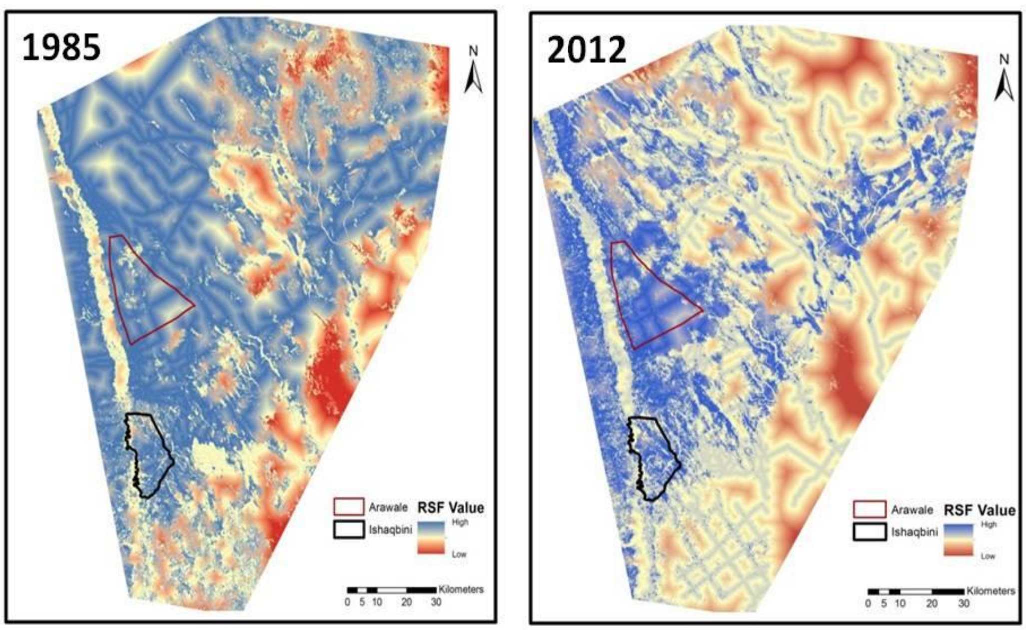


Fig 4: Historical (1985) and contemporary (2012) predictions of high-quality habitat for hirola during the wet season. High-quality habitat is represented in blue; low-quality habitat is represented in red. Note the contraction of high-quality habitat from 1985-2012, and the persistence of high-quality habitat in the southwest parts of the hirola's native range. Arawale National Reserve is outlined in red; Ishaqbini Community Conservancy is outlined in black.

distribution of high-quality habitat for hirola; currently, only the southwestern portion of the hirola's historic range (most notably around Arawale National Reserve and Ishaqbini Community Conservancy) represents high-quality habitat.

We expect that Arawale and Ishaqini are necessary but insufficient for hirola conservation in the long-term. These are "core" areas to which hirola retract in the wet season. However, our data on hirola movements demonstrates that hirola expand their home ranges in the dry season, so full potential for long-term conservation can only be realized if range is restored outside Arawale and Ishaqbini.

To our understanding, the overreaching motivation of translocating individuals in the predator proof sanctuary on Ishaqbini was to serve as a source for future reintroductions. Our efforts provide a "map" of where such reintroductions are most likely to be successful, based on the best data that currently are available. These sites should be considered as starting points for potential reintroduction. We believe that this analysis will help to ensure that hirola are not relegated to a "put and take" strategy in which individuals are reintroduced with little hope of survival in their historic range.

Question 3: What range management practices are permissible to local Somali communities that might offset the negative effects of tree encroachment on hirola?

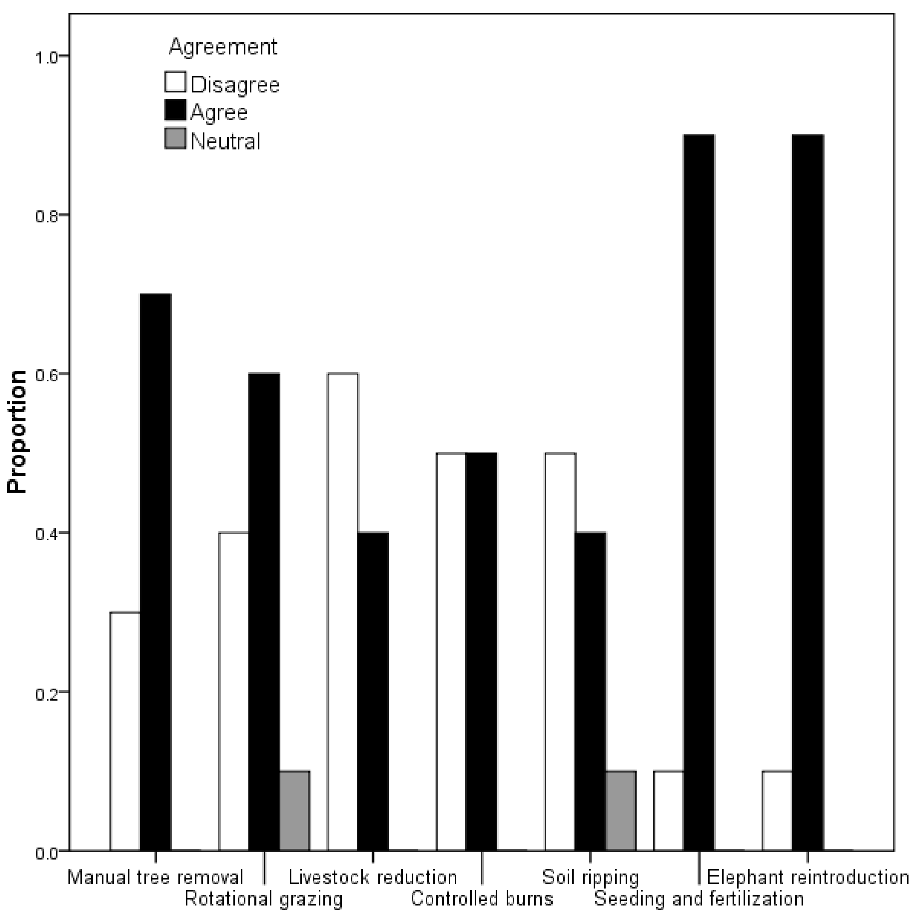


Fig 4: Levels of agreement for the various range management options. Data were collected from questionnaires to Somali communities within the historic range of hirola.

Possible management strategies to reverse range degradation include manual removal of trees, rotational grazing, livestock reduction, controlled burns, elephant reintroductions, soil ripping, seeding and fertilization. Before attempting to implement any of these interventions, we must first take into account the perspectives of local Somali communities. We administered questionnaires to villages within the hirola's historic range and built classification and regression trees (CART) to understand the predictor variables (age, gender, education, livestock number, length of residency) that best accounted for community perceptions.

Locals expressed strong support for manual removal of trees, seeding and fertilizing, elephant reintroductions, and rotational grazing (Fig. 4). Locals are ambivalent about controlled burning, and oppose livestock reduction and soil ripping as range restoration options. Livestock numbers and education level are the main predictors accounting for community perception. Community members with more formal education generally favor all efforts to restore range. Community members with more livestock generally oppose range restoration efforts.

Recommendations for Recovery

We hope that our efforts provide 1) scientific backing to the factors underlying hirola population declines; and 2) a starting point by which this long-neglected species can be restored in its historic range.

While range degradation might be the ultimate factor driving the declines, it is likely that some combination of predation, competition with livestock, and range degradation are responsible for the apparent inability of hirola to recover in its historic range. We make the following recommendations for recovery of hirola. The extent to which these recommendations are realized depends on participation by local communities, communication and cooperation among other stakeholders, and sustained financial backing.

- We strongly recommend reinstatement and restoration of Arawale National Reserve as a priority area for hirola conservation, in addition to restoration of grassland corridors between Arawale and Ishaqbini. Historically, Arawale was considered a critical hirola habitat (our RSF analyses support this claim), but enthusiasm for its conservation waned in the 1980s due to weak local involvement and financial constraints. By virtue of its size, remote locale, vegetative composition, and abundances of tsetse flies (that exclude livestock), Arawale may represent the last hope for long-term hirola conservation in its historic range. Arawale also occurs in close proximity to other swaths of grassland. This may facilitate colonization beyond reintroduction sites and enhance connectivity between Arawale and Ishaqbini. Importantly, there are no large urban centers nearby, and Arawale contains few roads.
- We believe the use of RSF maps provide an objective, data-driven means of identifying high-priority areas in which to release sanctuary-bred individuals. Our study identifies areas that hirola select in order to target reintroductions.
- Active management of remaining herds is crucial. Hirola herds occurring outside Arawale and Ishaqbini should still be viewed as high priorities for conservation. We suggest the establishment of anti-poaching teams to monitor these herds. Communities such as Gababa, Sangailu, Dagega, and Galmagala also house hirola herds. These communities are keen to participate in hirola conservation, but lack coordinated communication and connectivity to Arawale and Ishaqbini. We suggest some combination of 1) community education and outreach in an attempt to minimize poaching; 2) training anti-poaching squads; and 3) gradual development of tourism sites across these areas. Continued strong local involvement is absolutely crucial. There is a

need to develop additional community conservancies and train more Somalis as scouts, technicians, and biologists to foster long-term community engagement.

- Range degradation is a real threat to the long-term survival of hirola. Future management efforts should focus on a combination of facilitating natural recolonization by elephants (or even elephant reintroductions, if this is deemed realistic), manual removal of trees (which would have the knock-on benefit of providing charcoal to communities), and/or rotational grazing in an attempt to improve range under a high level of local support. If and when elephants recolonize Arawale/Ishaqbini naturally, the establishment and maintenance of anti-poaching squads will be crucial. Ishaqbini already houses herds of elephants that moved in following it is recent protection. Anti-poaching squads should be implemented along with an integrated livestock-wildlife management plan for the area.

- Predation pressure on hirola appears high. We must ask the question "how did predators (wild dogs, lions, etc) and hirola coexist for millennia without human interventions?". Answering this question is likely to hold to the key for understanding if and how predation is more intense relative to historic levels.

  To some extent, we can ameliorate predation pressure by encouraging the recovery of alternative prey species, while creating spatial separation between hirola and alternative prey. It is likely that predators choose to hunt either 1) where primary prey such as zebras, topi and warthogs are abundant (hirola themselves are probably too rare to influence the spatial distribution of predators); or 2) where prey are more catchable, given high levels of tree cover. In the event of the former, our telemetry data provide information on where hirola occur throughout the year, so we can potentially use soil ripping to create grazing hotspots attractive to primary prey that "pull" predators away from hirola. In the event of the latter, any management interventions that reduce tree cover should not only improve habitat for hirola, but should reduce predation pressure on hirola.

- Finally, we recommend the establishment of a long-term hirola recovery plan using data we generated from this project and from other sources as starting point and implemented in phases over the next 20-30 years.

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