Announcing the RMG Carrying Capacity Model version 1.0 for black rhinos

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Estimating the ecological carrying capacity (CC) of an area for black rhino is important. It allows the rhino population to be managed at around 75% of the CC level. This minimizes density-dependent effects such as reduced calving success and increased mortalities, and it allows rhino population productivity to be maximized. With knowledge of an area's CC, introductions to new areas can be planned at well below CC densities, to minimize rhino social problems and maximize their future breeding potentials. Assessing CC is therefore central to biological management of the black rhino, but its estimation has not been straightforward. Estimates of CC have differed widely between different people, and in particular non-experts have tended to grossly overestimate CC.

Based on the need to improve CC estimation to facilitate biological management of black rhino, Keryn Adcock has been investigating the broad-scale determinants of black rhino carrying capacity and performance. The focus to date has been on 13 South African and 2 Namibian baseline areas, which range in rainfall and habitat from deserts to moist coastal forests and cover a variety of soil types. The research has taken place through the Rhino Management Group in collaboration with relevant national, provincial and private black rhino conservation authorities. Initial work was funded by Wild Solutions and WWF-SA. Building on these investigations, the SADC Regional Programme for Rhino Conservation has funded the production of an RMG Carrying Capacity Model (version 1.0).

The model provides software and a practical and theoretical framework for understanding and roughly determining the carrying capacity of an area for black rhino. Six variables—annual rainfall, rainfall concentration, minimum July temperature, soil fertility, browse availability, and browse suitability—are used in the model to predict a black rhino CC density that would be similar to what experts in the field would predict (fig. 1). Predicted CCs can also then be used to estimate the likely average home range size of an adult male black rhino and the likely numbers of dominant bulls that can reside in the area (fig. 2).

The software and accompanying manual indicate how to gather raw field data for CC assessment and guide how to enter data into the computer program. Substantial guidelines are provided on how to evaluate southern African soil fertility and geology, what are the known black rhino dietary profiles and preferences in different kinds of habitats, and the theoretical background behind the CC concept and CC determinants as used in the model. Sound ecological knowledge is, however, still required to use the model.

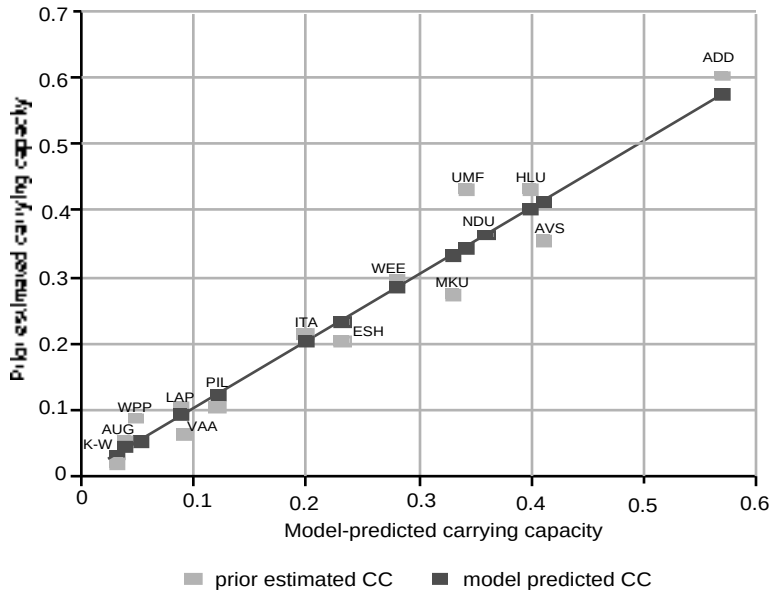

Figure 1. Regression line of 15 areas as computed by the RMG Carrying Capacity Model version 1 compared with prior carrying-capacity estimates made by experts in the field. The regression is highly significant, with an adjusted *r*-square of 0.879.

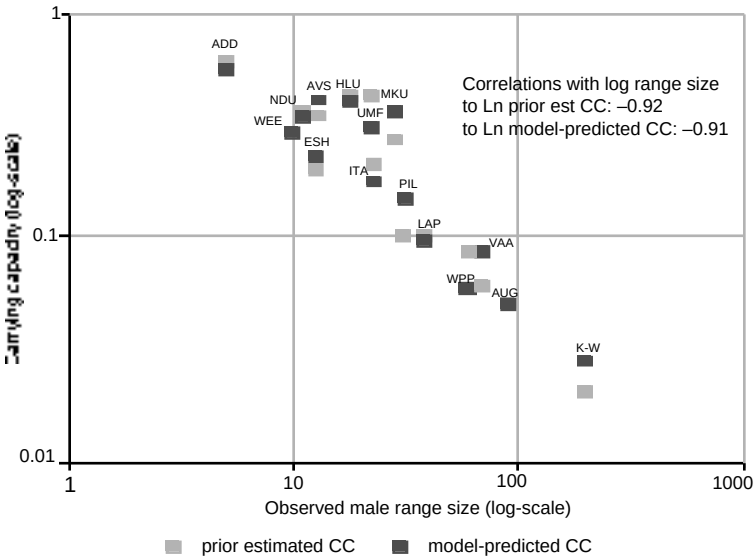

Figure 2. Relationship between CC estimates made by experts and model-predicted CC, and estimates of average male home range sizes. This strong relationship acts as independent confirmation of the general appropriateness of the carrying-capacity model.

As this is the first comprehensive CC estimation model for black rhino, several prominent workers in black rhino ecology and conservation or browser ecology are to evaluate the model and make suggested improvements. Additional work to refine the model is being funded by the SADC Regional Rhino Programme. This will include improvement of the browse-availability index used in the model, and it will incorporate better data from several of the benchmark sites where other workers have recently completed more detailed studies of black rhino. Zimbabwean and Kenyan rhino conservation workers have also indicated they plan to undertake similar research and model building, to cover CC predictions for black rhinos in their areas. In future, we hope to expand the model to cover an even wider range of habitat types.

WILDb rhino database

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A new rhino database, WILDb, has been produced by the SADC programme and is currently being field tested in several rhino areas in Zimbabwe, including populations in government IPZs and conservancies. The database comprises components for use in monitoring and tracking the performance of individual rhino populations both locally and nationally. It is designed so that it can be readily customized for use in different rhino population areas in SADC rhino range states. Anyone interested in obtaining a copy should contact Dr Rob Brett at the above address.

RHINO rewrite: an update

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Since 1991, RHINO Bayesian Mark-Recapture software has been used in an increasing number of populations, to produce annual rhino population estimates (with confidence levels) by analysing sighting data