How Species Distribution Modeling (SDM) Can Improve Decision Making in Conservation Planning

Participants

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Summary

Katia introduced the concepts and definitions of terms. The name of the algorithm used in the Species Distribution Models is MAXENT.

SDMs - Species Distribution Models; use of high quality, accurate and recent data; use of specialist field observers, model inputs; steps of model building;

Data: Presence records and environmental layers (temperature, precipitation, elevation, % forest cover, deforestation rate, etc) > distribution map + suitability map that coincide

Great number of papers on SDM per year, but very few used for conservation purposes. But Katia's work was all in the grey literature. Now published as good example of using SDM for improving conservation in practice (Tulloch et al. 2016).

Bridging the gap between academic research and conservation decision makers.

Katia has modelled 11 species as part of Action Plans (10 with CENAP/ICMBio and one for CBSG). These are: jaguar, puma, 6 Brazilian small cats, maned wolf, bush dog, Chacoan peccary.

Collaborative Network for Conservation established in Brazil - linking academics and practitioners.

Modeling workshops - Research specialists (data), modelers (iterations, removal of false positives and negative), conservation decision makers (output).

SDMs are used in Brazilian National Action Plans (since 2009) - current range, predict changes, key areas, corridors, priority areas, assessment, population viability analysis.

Examples

Jaguars	Model has been used for the design of new protected areas, identifying existing and new corridors, designating Jaguar Conservation Units, jaguar predation on cattle along trans-Amazon highway.
Chacoan Peccary	Model determined overlap between suitability map and current distribution; highlighted suitability decrease due deforestation (incorporated in the modeling).

Puma	Local government officials pleased to have suggestions for new restored areas - corridors, with the evidence

What are the opportunities of using MAXENT for CBSG toolbox? Discussion, Q&A

Metamodel manager should be the key to use data sharing with Vortex/input to PHVA

Onnie - **Katia's SDM model fits perfectly into CBSG ethos and processes**. Eg: Chacoan Peccary was a CBSG workshop, into which SDM fitted perfectly.

Katia: The model can be used to look for species in places identified as suitable habitat, but not previously so identified.

Bengt - **What data are needed in advance of the workshop**? Katia: Presence data, some info on species' biology.

Jorge - How will it work (in computer sense)? OB: Easily! Jorge likes visual output (as does Luis).

Luis: We're *always* trying to **create corridors** - thinks this model will be really good for that; also **designing National Park extensions**.

Onnie: How can this be allowed to be **most easily available**? It's free, with lots of people already trained to use it (mostly in Brazil) - will require Katia and Bob to have a deep conversation about data exchange.

Bengt - what maps do you use? Source? **Base map** is 1sqk resolution; then many **overlays** with environmental (human population density, accessibility cost, cattle ranching), and geophysical information (distance to water, drainage, land use, deforestation rates, etc).

Sonia: How about **human animal conflict** input? Coexistence landscape, tolerance landscape; what are the factors that create these landscapes? Maps can show property sizes, palm oil plantations, hunting pressure, etc. The model can be used to predict depredation risk (e.g., along the trans-Amazon highway). The map can be used to show the best places to attempt to mitigate the human/animal conflict.

Katia showed a map of Jaguar in the Atlantic forest, and the **identification of priority areas for conservation (using the suitability map) and possible corridors** (paper under revision).

It is important that the **decision makers** buy into model's output and recommendations, to get approval for any physical changes that are needed.

Anne: Could this be used in an **aquatic environment**? Yes, if you have the layers at the proper resolution - 1 sqk is the base pixel resolution, but the model will work at the best resolution available.

Jo: Are **multi-species model**s possible? Yes, model each species separately, then combine. Model a prey species, then insert into the predator model as a component of the suitability map.

Kristin: Meta Model Manager is clever and sexy, but the output of Maxent could be used to influence construction of a Vortex model.

How to integrate SDM into CBSG's workshop processes?

Katia presented a **possible structure** that would enable this to happen (in particular bridging the gap between specialists and decision-makers, using the modeler as the bridge). [Two figures from Guisan *et al* (2013)]

How does this **alter the workshop structure and scheduling?** Answer seems to be 'not much' - the Maxent modeling can be done at the same time as the Vortex modeling, whether just in parallel or as part of MMM.

There must be a **training program** for Maxent modelers, to be integrated into the CBSG workshop process. (Webinar, online training?) Katia will help identify the right people to train from within the current CBSG community, and from without who are interested in working with CBSG. GIS skills are required. Let potential candidates shadow Katia (learn by experience) as well as formal training courses.

Katia will also help to find **new organizations and modelers** willing to join the CBSG community.

CBSG should look at current schedule to **identify suitable workshops** to incorporate SDM into the workshop process.

Next steps

Katia and Bob to work out the best way that this integration of SDM into CBSG workshop processes can be achieved.

Katia and Kristin to meet to develop the program of events over the next 12 months - suitable workshops, training ideas, people to bring in, etc.