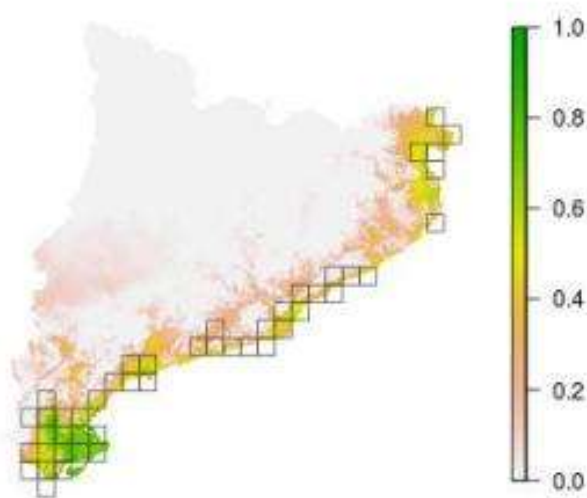


11/2013

Use, modelling and organization of biodiversity data



Oxalis pes-caprae distribution model

A doctoral dissertation presented at CREAM, at the UAB, proposes an information system through the use of species distribution models, of interest for conservation species and exotic invasive species with the aim of generating maps useful in the conservation of biodiversity. The aim of this information system is time tracking of protected areas, of changes in boundaries over time and those occurring during the process of legal procedures.

This dissertation makes a contribution on how to deal with constraints in biodiversity data and species' occurrences in order to produce maps which are useful for conservation planning and management through the use of species distribution modelling (SDM). It focusses on the distribution modelling of species of conservation interest (SCI) and of invasive alien species (IAS) since this can be aimed at two complementary objectives: preserving values and avoiding threats. Protected areas represent a crucial tool in the protection of biodiversity, while keeping track of changes in their boundaries represent an

information management challenge. This dissertation proposes an information system as a tool for monitoring biodiversity protection, bridging the analysis of spatial patterns of biodiversity with its protection.

Biodiversity conservation needs data on species' occurrences and analytical tools in order to gain knowledge on which to base wise policies. Most data at hand are problematic: scarce, biased, not extensive, often at coarse resolutions and with accuracy problems. However, recent advances in statistics, computer science and information technologies have provided researchers with a plethora of tools to tackle this problem. SDM offers a wide array of statistical analysis and algorithms aimed at different kinds of species' occurrence data and research objectives.

This dissertation first analyzes the use of SDM to generate range maps of SCI distribution when the species' Extent of Occurrence (EOO) is well-known and there is scarce, but of high quality, occurrence data. Seven endemic vascular plants of the western Mediterranean are used as an example. Derived binary maps of potentially suitable areas (PSA) in combination with the EOO can be used to assess species' conservation and protection. Valuable information for conservation assessment (PSA, EOO, Areas of Occupancy, degree of protection) is provided for this set of species.

Second, the use of already existing data in biodiversity databases for conservation is explored. Most of these data are at resolutions too coarse to be useful in conservation planning, while fine-resolution data are scarce. By combining both sets, coarse and fine, fine-resolution reliable maps for conservation planning can be produced. Abundant reliable coarse resolution data can be used to cross-scale validate distribution maps generated at finer resolution with scarce dubious data. Ten IAS are used as a study case. The spread of IAS is an important factor affecting native biodiversity. Maps of areas vulnerable to invasion are needed in biodiversity conservation.

Finally, an information system aimed at monitoring protected area coverage over time, a surrogate indicator of biodiversity protection, is proposed. It can keep track of historical changes in protected areas' boundaries as well as interim changes made during the legal approval administrative process. The system can help in assessing biodiversity protection and in discovering the socio-economical reasons that govern the delineation of protected areas' boundaries.

Despite the many problems that species' occurrence data have, SDM tools represent a valuable asset for providing distribution maps useful in conservation. However, in the case of poor or unknown quality data, a target benchmark on which to compare is always necessary. In contrast, when good quality data is available, resulting models can be accepted as our best approximations to species' ranges. Assumptions are inherent to SDM. When data uncertainty is unknown, the only way out is to be as rigorous as possible and use results as our best educated guesses; a better solution than not having any information. Not doing so would render all this wealth of information useless. Conservation cannot afford to wait for perfect data. Sensible use of data and modelling techniques at hand can give value to existing biodiversity data in providing good information tools for conservation.

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References

“A contribution to the use, modelling and organization of data in biodiversity conservation”,
Arnald Marcer Batlle doctoral thesis, read at the CREA in the UAB and supervised by Dr.
Joan Pino and Dr. Xavier Pons.

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