



ABSTRACT

Spatially explicit models and statistical analyses for studying hyper-diverse biological communities. An application to tree communities in the wet tropical forests of the mountains of South India.

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To elucidate the processes which can explain the existence and the perpetuation of hyper-diverse biological communities is of major interest to theoretical ecology, as well as the applied field of conservation biology. The census of species and the description of biotopes, although considered to be too slow compared to the immediate needs of conservation and durable land use, continue at a rate which generates a considerable amount of data and in varied forms.

On the other hand, the analysis and modelling of species assemblages are still inadequate, which makes it difficult to use this data efficiently in order to answer the current key scientific questions or policies to be adopted by decision makers. In fact the full scope of the spatial scales (and implicitly temporal) implied in these questionings (macro-ecology; Bell 2001) requires us to infer the processes through the observed structures. To proceed thus, within an effective and reliable framework, needs specific methodological approaches in modelling (Couteron 2006). One can in fact notice the need to develop spatially explicit models that can take into account a large number of species abundances (“holistic”), and require only a limited number of parameters which can be robustly inferred from field data.

As a result the “neutral” theory of species assemblages (Hubbell 2001) recently stirred a lot of interest, as it represents the first simple holistic model (two parameters) predicting a family of species abundance distributions. The theory in itself is based on highly debatable assumptions (the equivalence of species and individuals vis-à-vis the spatiotemporal variations of the environment; Chave 2004), but goes on to show that simple models are capable of generating common species distributions which can be used to compare with the observed data (approach of the null hypothesis).

This doctorate aims to continue the work undertaken at the French Institute of Pondicherry, with the help of the comprehensive field data held by the IFP on the wet tropical forests of the south-west of India (the Western Ghats).