MARIE SKLODOWSKA-CURIE - CAREER INTEGRATION GRANT

PROJECT: SEEDS (321794)

Fellow: Ruben Heleno

FINAL REPORT v.2

Publishable summary

Project SEEDS has been implemented as predicted and all objectives and milestones have been achieved in time. The overall impact of the project outputs (i.e. scientific, knowledge transfer and science communication outputs) largely exceeded the expectations and I have considerably increased my chances of establishing an independent research group, for which the MC-CIG has been absolutely pivotal.

Regarding the scientific production directly emerging from the MC-CIG working plan, I was able to deliver 14 papers in high profile journals (e.g. Global Ecology and Biogeography, Biology Letters, Journal of Biogeography, OIKOS, PLoS-One, Journal of Avian Biology). During these four years I was able to establish successful collaborations with many scientists from many countries and institutions, what is reflected in the over 30 co-authors of the outputs of this CIG. These outputs contributed with key advances for our knowledge of the structure, function and stability of seed dispersal networks and on the importance of plant traits and long-distance dispersal mechanisms for the colonization of islands. Importantly, this project help to dispel an established and erroneous idea that all dispersal largely determined by diaspores traits, and therefore many islands have likely been colonized by stochastic and non-standard processes. Also, I've showed that disperser's diversity and abundance are critical and synergistically contributing for the maintenance of seed dispersal services. I showed that continental networks might show some traits previously considered exclusive of insular networks, but that a robust sampling strategy is essential in order to detect meaningful community-level properties, and specifically network descriptors.

Regarding the establishment of an independent research group, the MC-CIG was also very important by providing me the opportunity to support the research were several students have been involved. I have established a dynamic research group currently formed by one post-doc, three PhD students and two master students with a vibrant research atmosphere.

The publication of high-impact scientific results raised the visibility of my research interests and expertise which further promoted collaboration opportunities in research projects and other activities. For example I have been invited to collaborate as a research member in six research projects, acted as reviewer for over 30 ISI journals, evaluated national project calls, gave 5 invited plenary talks in international conferences, co-organized international meetings, gave lectures on advanced masters/PhD courses, gave several science communication talks to general publics, etc. in this regard, the organization of the 1st international Symposium on Ecological Networks has marked a decisive inflection point. This symposium gathered 160 delegates and was a tremendous success, so much which it will likely turn into a periodic event in the field, hosted by the University of Bristol-UK in 2015 and by the University of Uppsala-Sweden in 2017.

Progress of professional re-integration and research career development

Since the beginning of the MC-CIG my prospects of a long-term career in science has been largely expanded with the output of high impact research and the establishment of a vibrant and highly productive research group and the establishment of several very strong collaborations with national and international scientists. I believe I have good chances of securing a permanent research position in a few years' time. I started out this Career Integration Grant with a 3+3 years Post-doc fellowship. Now I have been awarded a full-time research contract with the University of Coimbra until the end of 2018. Although this contract does not constitute a permanent position, I'm confident that I will be able to secure a permanent position in the near future. I'm currently waiting for the results of several applications.

Main scientific advances

This project has contributed significantly expand the state of the art in the fields of "Ecological networks", "Seed dispersal" and "Island biogeography". I outline briefly below some of the most significate contributions:

- I've discovered that only plants adapted to disperse via oceanic currents were favored during the colonization of the Azores by European plants, while the arrival of species dispersed by wind was negatively selected. These differences can explain the predicted disharmony of island biota.
- I helped to dispel an established and erroneous idea that all dispersal largely determined by diaspores traits, and that therefore many islands have likely been colonized by stochastic and non-standard processes.
- I've showed that disperser's diversity and abundance are critical and synergistically contributing for the maintenance of seed dispersal services.
- I showed that continental networks might show some traits previously considered exclusive of insular networks, but that a robust sampling strategy is essential in order to detect meaningful community-level properties, and specifically network descriptors.
- I've discovered that plants with unassisted diaspores still managed to colonize the Galapagos, Azores, Canaries and Hawaii with relatively ease.
- I've discovered that from the 15 native Azorean Fleshy fruited species, only those of *Corema alba* have the potential to be dispersed by oceanic currents, while the other 14 species are probably dependent of birds lo long-distance dispersal.
- I've discovered that the internal dispersal of seeds by birds (endozoochory) is several orders of magnitude than the dispersal of seeds externally (epizoochory).
- I've showed that fruit traits were importantly correlated with the mode of transport (internal/external) but that there were important and frequent exceptions to this rule.
- I've showed that the functional erosion of dispersal services due to the dispersers' crisis is largely buffered by the presence of resilient generalist dispersers, and the extinction order is very important.
- I've showed for the first time that bird pollination in Europe is not an anecdotic phenomenon, but is common and can have important ecological and economic consequences.
- I've revealed that seed dispersal networks that are sampled for less than 5 days might be severity under sampled, translating in artificial perception of interaction network structure.