Título: REDES MUTUALISTAS PLANTA-ANIMAL EN ECOSISTEMAS INSULARES. INTEGRACIÓN E IMPACTO DE LAS ESPECIES INVASORAS

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Resumen: In the following chapters of this thesis, different perspectives are used in the investigation of biological invasions, which are considered a major cause of biodiversity loss. Many alien plants depend on the interactions with other species to be integrated into native communities and these local species contribute to the spread of alien species. Once integrated, they could affect both composition and ecosystem functioning. Mutualistic networks constitute useful tools to investigate this kind of problem, as they offer different and complementary perspectives to the more classical studies. The analyses of both bimodal and unimodal networks produce complementary information about the overall complexity of species interactions in the communities. Different Opuntia species are used as study examples, both in island and continental areas. Opuntia species are integrated into native communities by means of mutualistic interactions with both native and alien dispersers and flower visitors. Although with heterogeneous effects, either type of disperser potentially contributes to the spread of these alien cacti in the recipient areas. The role of lizards as promoters of the invasion in the Canary Islands is probably substantial considering that they consume large amounts of Opuntia fruits and are effective dispersers.

Opuntia species modify the number of links between plants and flower visitors, but seem not to affect the general interaction pattern in the bimodal networks. In the plant unimodal networks, species with many links tended to connect to species with few links. By linking to generalist natives, Opuntia remained peripheral to network topology, and this is probably why native network properties were not affected, at least in Tenerife. Network structural parameters remain remarkably constant, regardless of network size and latitude, and the same occurs with the numbers of plants, animals and interactions, but species composition and interactions change from one year to another, the turnover of flower visitors and interactions being particularly high, which suggests that floral visitation networks are, to some extent, robust against factors affecting species occurrence. A consistently small or even null impact of the alien on the native communities studied on Tenerife and Menorca is found both under weighted or unweighted approaches. The two approaches may be similarly useful to address specific questions, such as the impact of an invasive species on the community using bimodal networks. Although the influence of invasive plant species on native community composition is well-documented, only a few studies have examined the effects of an invasive plant on fruit and seed set of native species. In Mallorca, insects do switch directly from Carpobrotus to natives, pollen is transferred to native stigmas and this invasive pollen is able to affect seed production. In areas where Carpobrotus is highly abundant, pollen transfer can affect seed production in natives, but these effects are likely to be species specific, depending on the recipient native plant species and on the species identity of shared flower visitors. Unimodal networks are very useful in the identification of the native species most likely to be affected by the presence of aliens, as this kind of network represents maps of competition or facilitation for resources between species. Projection methods including link weight data showed different perspectives from the simplest projections including only presence or absence of the interactions. As weighted networks are more realistic than unweighted, using link weights in further applied studies is the best option when selecting the local species more likely to be affected by the arrival of aliens in the community. Nevertheless, studies focused on the particular role of a species in terms of its importance in the transactions within the community (its betweenness centrality), unweighted analyses could be sufficient to unravel the situation of a given natural community. On the other hand, simulation of the introduction of new species into communities of interacting plants and flower visitors provides interesting hypotheses to test through empirical studies. By performing these simple simulations before studies with real data, research would be more robust, both theoretical and practically. Lastly, the majority of studies have been performed only in the introduced range of the alien species and little is known about even the best-studied aliens in their native range. Biogeographical approaches considering the native ranges are necessary and are expected to be very helpful. The description of floral visitation networks in both native and invaded areas of Opuntia, at species and network level and then focusing on Opuntia attributes in relation to the rest of plants in the communities is a first attempt to the inclusion of native ranges in the study of plant invasions within a community level approach, although with important limitations, mainly due to the low number of replicates and the intrinsic characteristics of the study areas. In general, the study of biological invasions using the tool of mutualistic networks, offers us new perspectives on this globally significant issue that we are faced with today. These novel tools, together with more classical views on the same problem, will provide us with better knowledge of natural systems and the processes taking place within them, such as the integration and impact of alien species.