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| Degree sought: | PhD | No. of words in the main text of thesis: | | ~25000 |
| Title of thesis: | **Taxonomic complexity in eyebrights (Euphrasia L., Orobanchaceae) and the British flora** | | | |

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| Many plant groups are taxonomically complex with species that are difficult to distinguish. The main factors driving this complexity include apomixis, selfing, hybridisation, and polyploidy. Plant parasitism is a potential driving force of taxonomic complexity that has, however, been largely overlooked. In this thesis I use two main systems to explore these factors; the British flora and a hemiparasitic genus of plants, Euphrasia. The British flora is an excellent system with a wealth of large and comprehensive ecological and genetic data sets available, while Euphrasia is a tractable experimental system exhibiting rampant hybridisation, variation in ploidy level and mating system, and able to parasitise a wide range of plant species. The main aim of this thesis is to understand the role of hybridisation, polyploidy, and parasitism in driving taxonomic complexity in Euphrasia and the British flora. I first review the frequency and importance of cross ploidy hybridisation across plants, and based on a literature review and survey of the British flora find it to be more common than usually appreciated. Next, I investigate how hybridisation is affected by phylogenetic relationships and genetic distance between species across the British flora. I find that the probability of hybridisation is impacted mainly by parental genetic distance, ploidy level differences, and the extent of geographical overlap. Then, I investigate a single contact zone between a diploid and tetraploid species of Euphrasia, and find little evidence of contemporary hybridisation, however demographic modelling supports a model with low levels of gene flow. In the second part of the thesis, I use common garden experiments to understand the nature of species differences in the taxonomically complex, hemiparasitic genus Euphrasia. I show that firstly, traits used to identify species in Euphrasia are plastic, and change depending on the host plant species used. I go on to show that Euphrasia exhibit both conserved and host specific interactions across many different host species, which potentially reveals cryptic specialisation. This thesis shows how integrated analyses incorporating genetic and ecological data can be used to explore the many and diverse factors underlying taxonomic complexity in plants. |