English summary

This dissertation offers a collection of age-based studies on plant demography focusing on the role of environmental variation. Demographic studies in plants have historically relied on size-structured models. Age-based plant demography has shown that size matters, but that age and environment also affect survival, growth and reproduction rates. Plant demographers now argue that plants age in a variety of ways.

Several important findings of this dissertation confirm that a large variation in ageing rates exists between species and that individual size and environment play fundamental and essential roles in explaining the variation in the observed demographic responses. Chapter one of this dissertation investigates the direct effects that the environment has on vital rates in the wild perennial *Plantago lanceolata*, from a dataset collected between 2014 and 2017. Chapter two explores life expectancy and actuarial ageing in 12 *Rhododendron* species, relying on the living collection plant records of the Royal Botanic Garden Edinburgh, UK, which are based on plant collection expeditions going back to the beginning of the 20th century. To test the indirect effect that the parental environment has on life history patterns exhibited by the individual plants cultivated in the UK, the author of this dissertation also examines CHELSA bioclimatic data of temperature and rainfall as well as elevation records of the seed collection locations from the Himalayas, North America, and Europe. The third chapter explores the role of the environment on survival and reproduction in the globally important spice crop, *Capsicum annuum*, cultivated in northern Ghana between 2017 and 2019.

All three chapters explore taxa from a range of lifespans differing in magnitude from the short-lived *Capsicum annuum*, often grown as an annual crop, to the long-lived *Rhodo-*

dendron rubiginosum, with an estimated life expectancy of approximately 200 years. In the *Rhododendron* study, the author shows that the field of demographic ageing can benefit from using natural history collections-based data. Living collections provide individual-level data as well as examples of evolutionary relationships between species, and contain details on the habitats where parents of the individuals evolved. This research shows that gradients of ecological variation in the ancestral environment can partially explain life expectancy and actuarial senescence in descendants grown elsewhere, suggesting that adaptations to the environment influence senescence patterns.

The author shows that sufficiently long-term demographic monitoring allows teasing apart of short-term environmental fluctuations and their interactive effects with age or with size from demographic trends. This dissertation also addresses how current agricultural practices can benefit from research on plant ageing. To reduce the consumption of pesticides and fossil fuels in agro-ecosystems, it is more desirable for farmers to grow crops perennially vice annually. To secure the support for this adjustment, the business advantages and the benefits on the ecosystem need to be justified. This dissertation offers fundamental answers to considerations concerning the practicability of this paradigm shift in farming. In conclusion, plants age in many different ways; the environment has both direct and indirect effects on how plant demographic rates change. The work presented in this dissertation offers important knowledge for our understanding of plant life history strategies and how they evolve.