

Climatic cues for secondary growth and cone production are sex-dependent in the long-lived dioecious conifer *Araucaria araucana*

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Trees? growth responses to climate may depend on tree age and site conditions. In dioecious species, sex adds an extra level of complexity due to differential reproductive effort between the sexes and potentially sex-related dimorphic growth. *Araucaria araucana* is a long-lived dioecious conifer with outstanding morphological and functional adaptations considered an excellent model to explore interactions between radial growth, climate variability and reproductive effort. We assessed the potential dimorphism of growth rates of the sexes, the effects of site, tree age and sex on the individual climatic responses, and the growth-climate-cone production relationships of *A. araucana* in two environmentally contrasted sites at the Andes of south-central Chile. We quantified tree-ring growth, its dependence on weather variability, and the relationships of cone production with growth and climate. We found site-dependent sexually-dimorphic growth rates, with females growing more in the warmer site while males growing more in the colder site. Resource allocation to growth was dependent on weather conditions prior to the growing season. Clear effects of site conditions, tree sex and age on the responses of individual tree growth to climate were identified. A more resilient response to drought stress occurred in the colder site and female trees? growth showed tighter limitations by winter snow cover. Warm conditions in spring and summer exerted an age-dependent detrimental effect on growth, which is coherent with earlier xylogenesis resumption in younger trees. Cone production was strongly dependent on antecedent weather conditions up to seven years prior to seed dispersal that induced female cone primordia formation and favoured fertilization of female

cones and soil nutrient uptake. The revealed lagged connections between vegetative growth, weather cues and cone production point towards a long-term life strategy for *A. araucana*.