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# FUTURE DOMINANT FOREST TREES COULD BE WAITING IN THE CANOPY

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Study Description

While exploring the canopies of Chilean temperate rainforests, we observed numerous seedlings and saplings growing on the tree crowns. A big tree fallen around 2014 was covered by woody saplings that survived the tree fall and started growing upright. Further research showed that this form of advanced regeneration was common in Chilean rainforests and that some saplings growing in the canopy reached 114 years old! Canopy saplings later colonize the gap created by the fall of same tree, thereby influencing long-term forest dynamics. This advanced regeneration in the canopy represents an unrecognized but apparently widespread, mechanism of forest regeneration.

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Photo 1. Photograph (taken in 2007) of the large, canopy-emergent tree *Eucryphia cordifolia* that fell during a windstorm around 2014. On the crown branches of this tree, after its fall, we found seedlings and saplings established in the canopy that were later dominant in the tree-fall gap. Photo credit: Iván A. Díaz.



Photo 2. Photograph of a 48-year-old, small tree of *Drimys winteri* established in the canopy of *Eucryphia cordifolia*. After the large tree fell to the ground around 2014, the main stem of the *D. winteri* curved upwards and developed upright stems that became part of the dominant regeneration inside the tree-fall gap. Note the growth of adventitious roots of *D. winteri* (photo taken in 2019). Photo credit: Iván A. Díaz.



Photo 3. Small tree of *Nothofagus dombeyi* (see arrow) growing from inside a cavity of the dead limb of a large old canopy-emergent tree in the Andean temperate forest of southern Chile. We frequently observed small trees such as this belonging to a variety of species, with various shade tolerances, growing at different heights along the main trunk of the host tree, occurring on living and dead limbs. Photo credit: Iván A. Díaz.

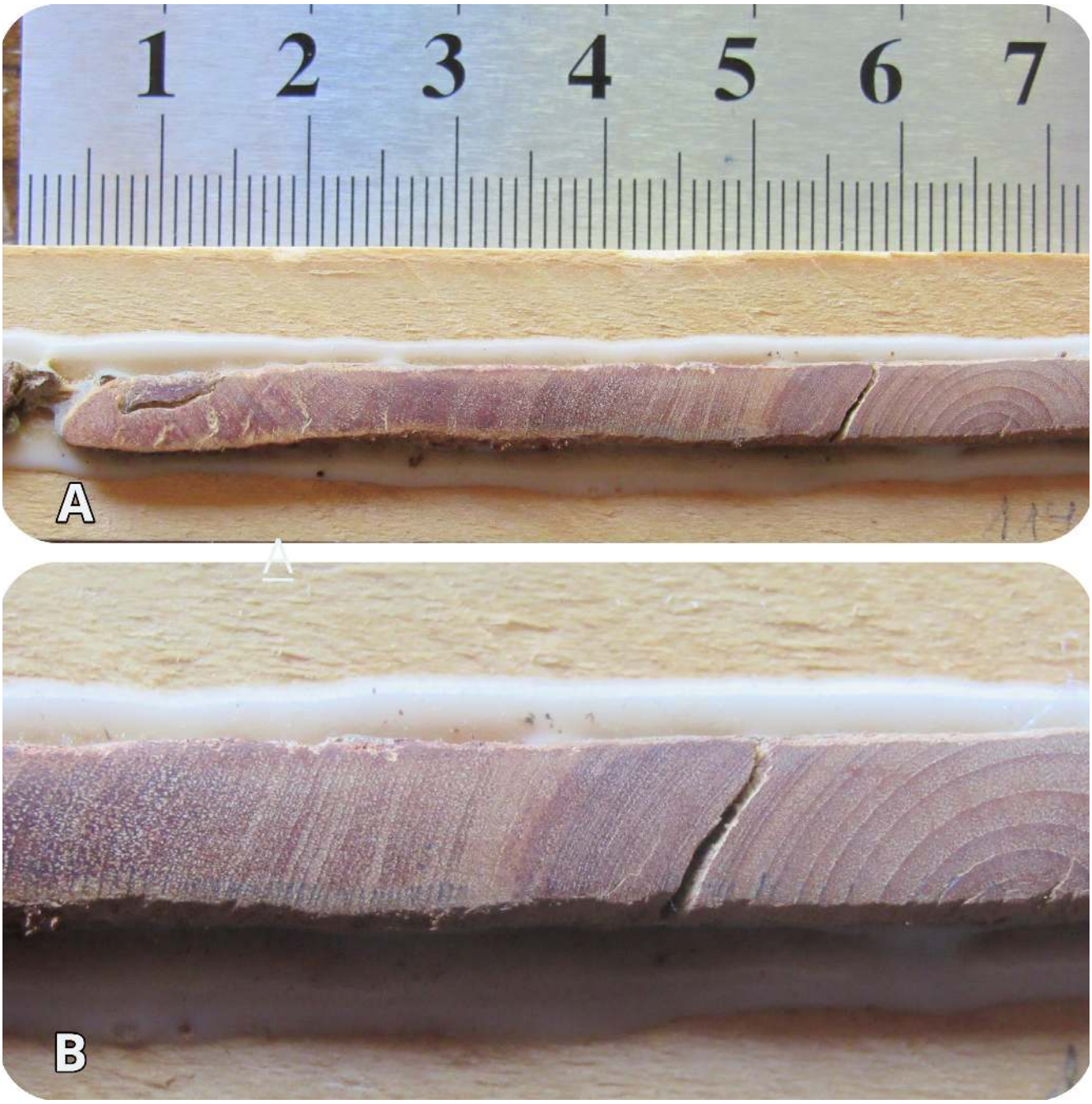



Photo 4. Core of the oldest tree found regenerating in the forest canopy, a small *Nothofagus nervosa* stem that was 114 years old, found 8.4 m above the ground; the stem had a 10-cm basal diameter, but was less than 1 m tall. (A) Complete tree core, and (B) close-up of the same core, where we can appreciate the very slow growth of this small tree (zone with very compact rings) while in crown of the host tree. Photo credit: Iván A. Díaz.



Photo 5. Field sampling in the crown of two different temperate forest types in Chile. Left: Gabriel Ortega-Solís climbing a canopy-emergent (about 30 m tall) tree in the Coastal forest in Chiloé Island (41°S). Right: Iván Díaz (see arrow) climbing at about 30 m in the tree crown of the Andean rain forest at Bosque Pehuén Park (39°S). Photo credits: Iván Díaz (left) and Javier Godoy-Güinao (right).

These photographs illustrate the article "Advanced canopy regeneration: an unrecognized mechanism of forest dynamics" by Iván A. Díaz, Javier Godoy-Güinao, Daniela Mellado-Mansilla, Ricardo Moreno-González, Emilio Cuq, Gabriel Ortega Solís, Juan J. Armesto, published in *Ecology*. 10.1002/ecy.3222.