

Chapter 7

Interannual precipitation and temperature variability near Mt. Panié wilderness reserve and its connection to kauri (*Agathis montana*) die-back

Analyse du régime des précipitations et des températures près de la réserve de nature sauvage du Mont Panié en lien avec le dépérissement du kaori *Agathis montana*

Joseph H. Casola and François M. Tron

SUMMARY

The microendemic and long-living Mt. Panié kauri (*Agathis montana*) currently encounters a significant and recent die-back with 18.1% mature trees already dead (DBH>10cm) and 27.6% of mature live trees in poor health condition. A number of factors have been identified as potentially contributing to this dieback, including drought, pathogens, insects and erosion related to the invasive feral pig growing population. This paper examines recent local precipitation and temperature variability, comparing it to longer-term record and discusses the relevance of the drought stress factor for Mt. Panié vegetation. Overall, the last 20 years were relatively dry, but still within the historical range of precipitation variability. The period between 2003 and 2007 was particularly dry, reflecting the influence of larger-scale climate variability related to El Niño-Southern Oscillation (ENSO) and the Interdecadal Pacific Oscillation (IPO) on rainfall in the region. We also note a warming trend over the last several decades, which may potentially exacerbate the impacts of drought stress on vegetation in the ecosystem. It is thought that the kauri die-back may be an easily detectable symptom of a wider conservation issue on this remarkable mountain ecosystem.

RÉSUMÉ

Le kaori microendémique du Mont Panié (*Agathis montana*) présente un dépérissement récent et significatif avec 18.1% des arbres matures (DBH>10cm) morts et 27.6% des arbres matures dépérissants. Les facteurs de dépérissement préliminairement identifiés incluent des ravageurs, des pathogènes, l'érosion causée par les cochons féroces et des épisodes de sécheresse. L'analyse d'un jeu de données à long terme révèle que les 20 dernières années apparaissent relativement sèches, plus particulièrement de 2003 à 2007, en relation avec El Niño et l'oscillation pacifique interdécennale. La tendance au réchauffement constatée sur ces dernières décennies peut par ailleurs exacerber les effets de sécheresses sur la végétation. Ces facteurs climatiques de stress peuvent se cumuler

et renforcer les effets de la perturbation du sol et de l'érosion liées aux cochons féroces, espèce exotique envahissante, dont les populations sont réputées s'accroître localement depuis une vingtaine d'années. Le dépérissement observé du kaori du Mont Panié pourrait être un symptôme aisément détectable d'un problème de conservation plus vaste de ce remarquable écosystème de montagne.

PRECIPITATION DATA AND THE MONTHLY CLIMATOLOGY OF PRECIPITATION

The precipitation data were taken from daily records at two meteorological stations, Galarino (*Météo France Station ID #98824002; latitude 20°31'S, longitude 164°46'E, elevation 4m*) and Hienghène (*Météo France Station ID # 98807001; latitude 20°41'S, longitude 164°57'E, elevation 22m*), respectively located at about 10 and 20 km from Mt. Panié summit (see Figure 1, page 26). The data records begin in August 1959 and January 1959 for Galarino and Hienghène respectively. For this analysis, observations up until December 2010 were used.

The daily data was summed for each month. The mean monthly climatology for the period for each station is shown in Figure 2, along with the standard deviation for each month. The graphs in Figure 2 show that the region receives most of its rainfall between December and April. They also demonstrate that the Galarino station (top panel) is considerably wetter than the Hienghène station (bottom panel) despite their relatively close geographic proximity and comparable elevations. The greater rainfall in Galarino reflects orographic enhancement of precipitation occurring on the eastern flanks of Mt. Panié: since the prevailing winds are from the east, the areas between the mountains range and the coast receive relatively more precipitation as air masses are forced to ascend, leading to cloud formation and condensation.

For all of the monthly averages, the interannual variability (i.e., year-to-year; the differences among the averages for a particular month) is relatively large, based on a comparison of the standard deviation to the mean (i.e., the values of the