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# Rainfall is associated with social behaviour in Seychelles warblers

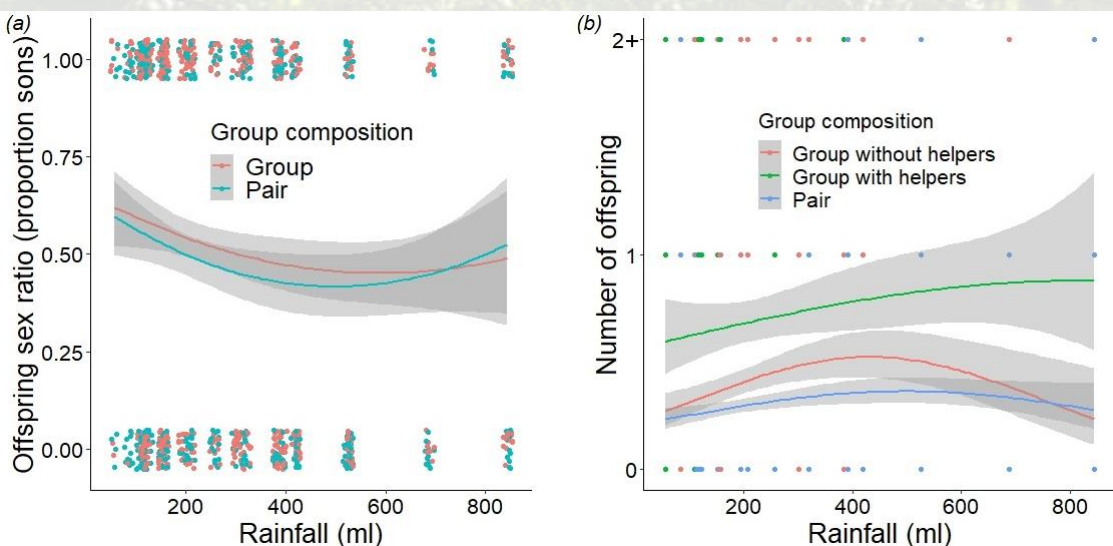
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Species are facing challenges caused by fast changing environments<sup>1</sup>. Understanding how behaviour is affected by these changes is important for conservation of species, as changes in behaviour help species to adapt. Cooperative breeding has been suggested as a mechanism to cope with harsh environments<sup>2,3</sup>. Therefore, we investigate whether the social behaviour of Seychelles warblers (*Acrocephalus sechellensis*) is associated with rainfall as more insect food is available with more rain<sup>4</sup>. We expect pairs will produce more daughters (the helping sex) in dry years, to assure helping in the future, and offspring production of groups with helpers to be independent of rainfall, while pairs will produce less in harsh years. We also expect subordinates to help more in dry years.

With 21 years of data (1995–2015), we studied the effect of rainfall on social behaviour in the insectivorous Seychelles warbler on Cousin Island, a facultative cooperative breeder, in which mainly female subordinates help dominants to raise offspring.



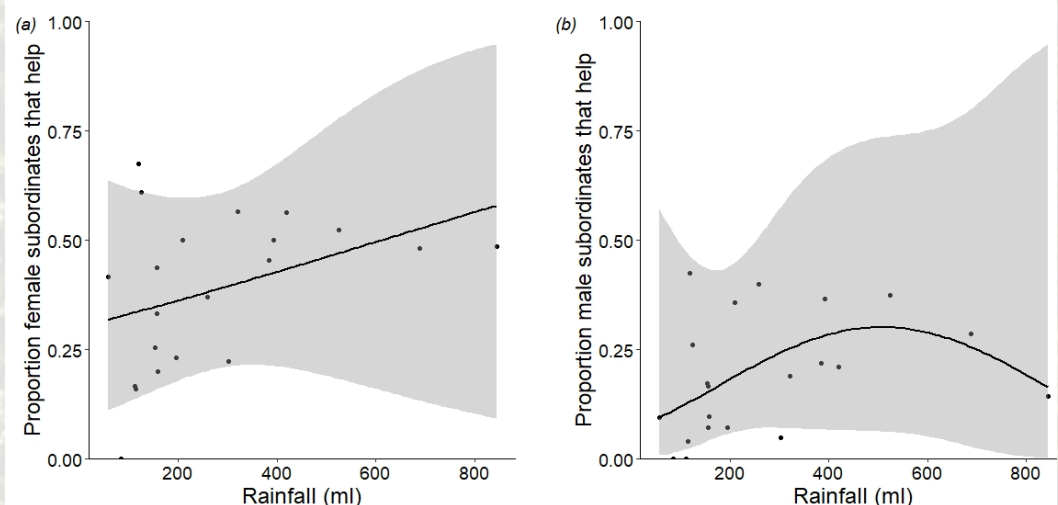
a) In dry years, more sons are produced, in wet years more daughters ( $p=0.03$ ). No difference was observed between groups (with and without helpers) and pairs ( $p>0.6$ ).

b) Most offspring were produced at intermediate rainfall ( $p<0.01$ ). Groups with helpers produced most offspring, and pairs least ( $p<0.01$ ).

Grey shades show the 95% confidence interval.

a) With higher rainfall, more female subordinates show helping behaviour ( $p<0.01$ ).

b) With higher rainfall, also more male subordinates help, but this proportion declines again with extreme rainfall ( $p<0.04$ ).



In favourable conditions, Seychelles warblers showed more cooperative behaviour, produced more offspring, and produced more daughters (the main helping sex). Thus, cooperative breeding might not be a mechanism to deal with harsh environments in the Seychelles warbler.

<sup>1</sup>Ummenhofer CC, Meehl GA, 2017. Extreme weather and climate events with ecological relevance: a review. *Philos Trans R Soc Lond B Biol Sci* 372. doi: 10.1098/rstb.2016.0135

<sup>2</sup>Rubenstein DR, Lovette IJ, 2007. Temporal environmental variability drives the evolution of cooperative breeding in birds. *Curr Biol* 17:1414-1419. doi: 10.1016/j.cub.2007.07.032

<sup>3</sup>Cockburn A, Russell AF, 2011. Cooperative breeding: a question of climate? *Curr Biol* 21:R195-197. doi: 10.1016/j.cub.2011.01.044.

<sup>4</sup>Komdeur J, 1996b. Seasonal timing of reproduction in a tropical bird, the Seychelles warbler: A field experiment using translocation. *Journal of Biological Rhythms* 11:333-346.