For livestock losses, a conservation scientist's 'exceptional' may be a farmer's 'unacceptable': a commentary to Ballejo et al. (2020)

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The persecution of threatened predators is often driven by perceptions of actors such as livestock farmers, fishers and hunters. For this reason, quantifying the ecological evidence of perceived predation is an important step in addressing conflicts and conserving predators. However, when presenting results, we suggest that conservation scientists acknowledge not just the presence of a conflict (Zuluaga et al., 2020), but also how predator impacts may be evaluated differently by those 'at the sharp end' of human-wildlife interactions.

In their recent study on the conflict around birds of prey and sheep farming in Patagonia, Ballejo et al. (2020) investigate a pressing predator-livestock interaction and present timely and interesting results. They detail the proportions of farmers that consider each species harmful as well as their management actions and preferences. Critically, they also conduct field observations and report that black vulture (*Coragyps atratus*), southern caracara (*Caracara plancus*) and Andean condor (*Vultur gryphus*) killed 4.35% of lambs during 138 births – predation that the authors estimate accounted for 12-14% of lamb neonatal mortality. The authors note that these predation events, by both facultative and obligate scavenger birds, were contrary to their expectations.

Despite these findings, Ballejo et al. (2020) conclude that "*bird scavengers do not seem to play a relevant role in livestock mortality*" and that these predation events were *"only exceptional*". This prompts the question - exceptional for whom? Although the study presents the percentage of respondents that consider each bird species as harmful/not harmful it did not quantify farmers' perceptions of percentage losses to these species, nor did it look at the economic impact that such losses might incur (e.g. Guerisoli et al., 2017). Moreover, we suggest that it is unlikely that many farmers would consider losing 1 in 23 livestock during birth as 'relevant'. There is also uncertainty in the predation rates reported. First, the 4.35% estimate reported has an associated confidence interval of 2.0 - 9.2% (95% Wilson's score Confidence Interval calculated using Epitools, http://epitools.ausvet.com.au). Second, alongside the 6 confirmed predation events, the authors report an additional 19 cases (13.8% of births) where they could not determine if the birds killed the lamb they were consuming. It is likely therefore that the reported predation rate is conservative. Taken together, this suggests a more serious situation

than the authors acknowledge, especially considering other research on sheep predation (by puma *Puma concolor)* in Argentina, which found losses within this range can have significant economic impacts and drive intense conflicts (Guerisoli et al., 2017).

A conservation scientist and a farmer might also interpret the predator behaviour in different ways. In their discussion of their findings, Ballejo et al. (2020) dwell on the "*clear inefficiency*" of the lamb-killing species as predators, apparently illustrated by the extended length of time it took groups to kill each lamb (3h 26' on average). Analysing livestock predation through this lens (an evolutionary ecology perspective) ignores the human aspect of predator conflicts. For example, perceptions of predator 'cruelty', and the associated suffering of livestock, can cause additional anxiety to those charged with their protection (Ecker et al., 2017; Heikkinen et al., 2011). This emotional response is likely to further influence how actors respond to predators.

In sum, while we commend Ballejo et al. (2020) on their pairing of social and field data to explore an important predator/scavenger - livestock conflict, we think more care should be taken with the interpretation of these findings. iInferring the level at which livestock losses become economically or personally relevant to farmers requires a more detailed, nuanced, and sympathetic analysis than is presented here. This is particularly the case if scientists hope to meaningfully engage farmers with alternate methods for mitigating livestock losses.

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