

Body Weight as an Indicator of Vulnerability to Domestic Cat Predation for Juveniles of Three Species of Cottontail Rabbits (*Sylvilagus* spp.) in Colorado, USA: Implications for Release Criteria

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ABSTRACT: Cottontail rabbits (*Sylvilagus* spp.) are frequently admitted to wildlife rehabilitation facilities due to predation by domestic cats (*Felis catus*). Our retrospective study (2015–19) of three species (*Sylvilagus audubonii*, *Sylvilagus floridanus*, and *Sylvilagus nuttallii*) indicated that once juveniles reached a weight over 220 g, they were unlikely to present due to domestic cat interactions. This information should be incorporated into release criteria for these species.

Cottontail rabbits (*Sylvilagus* spp.) are some of the most common species admitted to wildlife rehabilitation facilities, with predation by domestic cats (*Felis catus*) a frequent reason for their admission (Mcruer et al. 2017; Santos 2018). At our facility, the Colorado Wild Rabbit Foundation (Erie, Colorado, USA), almost a third (28%, 891/3,178) of cottontail rabbit patients received from 2015 to 2019 were victims of domestic cats. Most of these patients were infants and juveniles. Domestic cat predation is unique in that it often does not result in the death and consumption of the victim. Instead, injuries of various severities are inflicted, allowing humans to intervene and rescue these animals. To determine if there is an age at which young cottontail rabbits become less vulnerable to predation by domestic cats, we conducted a retrospective study to assess the weights at intake of juvenile cat-attacked patients and of those admitted for other reasons during the 5 yr period from 2015 through 2019.

We reviewed patient records for all juvenile (eyes open, less than 600 g) cottontail rabbits received at the Colorado Wild Rabbit Foundation between 1 January 2015 and 31 December 2019. All patients were from the Colorado Front Range area. Of these, 40% (708/1,752) had interactions with a domestic

cat prior to intake, and 60% (1,044/1,752) were admitted due to other causes. We defined cat interaction to include cases where a cat was seen interacting with a rabbit in any way (including reports described as attacking, chasing, stalking, and staring at), as well as rabbits found inside homes where an indoor-outdoor cat lives. In some standard taxonomies, these would include cat attack–confirmed and cat attack–suspected. Common non–cat-related reasons for intake included orphaning, nest displacement, other predator attacks (e.g., dogs, birds), and entrapment (e.g., window wells).

Of the 708 juvenile cat-attacked individuals, 592 were desert cottontail rabbits (*Sylvilagus audubonii*), 106 were eastern cottontail rabbits (ECT; *Sylvilagus floridanus*), and 10 were mountain cottontail rabbits (*Sylvilagus nuttallii*). At birth, these species weigh 23–33 g, and adults weigh from 900 to 1,500 g, with ECTs slightly larger than the other two species (Lafeber Vet 2013; Smith et al. 2018).

Since it is difficult to accurately determine the age of juvenile cottontail rabbits once they have left the nest, we used body weight as a proxy for age, as is common practice when assessing young juveniles in wildlife rehabilitation. We have observed that the correlations between age and weight are similar for the three species, and all species fit the same general patterns of susceptibility to cat predation and other causes of admission for rehabilitation. The ultimate causes of susceptibility to predation likely involve endogenous factors such as speed and agility, environmental awareness, and innate and learned escape strategies. Exogenous factors include measures related to density of sheltered areas and food sources. The current study involved only the endogenous parameters: we can summa-

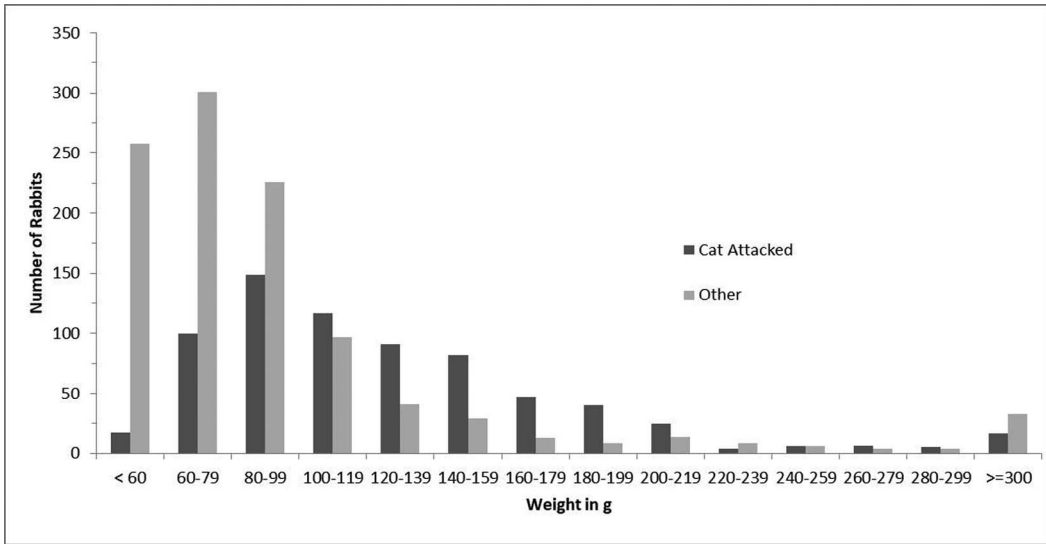


FIGURE 1. Weights at intake of three species of juvenile cottontail rabbits (*Sylvilagus audubonii*, *Sylvilagus floridanus*, *Sylvilagus nuttallii*) received at the Colorado Wild Rabbit Foundation, USA, between 2015 and 2019, comparing rabbits that were attacked by cats (*Felis catus*) to all other admission causes.

size these as being related to maturity, often assessed as age. In our study, we used weight as a proxy for all likely endogenous parameters associated with susceptibility to cat predation.

Our data showed that once cottontail rabbits in the wild reached approximately 220 g of body weight, they were unlikely to present due to domestic cat interactions (Fig. 1). More specifically, they were not likely to be caught by a cat, injured, and brought in for rehabilitation. Nest destruction-displacement (e.g., due to construction and landscaping activities) and orphaning were the primary causes of admission for the youngest rabbits (<80 g). As the rabbits aged and began leaving the nest, cat attacks became the predominant reason for intake. From about 100 g to 220 g, cat attacks outnumbered all other causes combined; above 220 g, intakes for all causes (cat-related and other) were low. Most of the juveniles over 300 g that were cat-caught ($n=17$) had predisposing conditions such as coccidiosis (Paul and Friend 2019) or other infections. Other causes of admission for juveniles over 300 g ($n=33$) included vehicular trauma and disease. These trends held true for all three species of cottontail rabbits examined, as indicated by the cat-related

intakes for desert cottontail rabbits and ECTs (Fig. 2); we did not include mountain cottontail rabbits in this graph due to their low numbers in this study.

Our study did not explicitly assess all potential factors determining how vulnerable cottontail rabbits are to cat predation, but it does suggest that the easily measurable body weight provides essential information for assessment. Specifically, a weight above 220 g may be an important criterion for releasing recovered or captive-reared cottontail rabbits of these species back into their habitat, especially where cat predation may be significant.

While a minimum body weight is often specified as a component of release criteria for recovered cottontail rabbits, the weight range often used by wildlife rehabilitators (90 to 150 g; Orr 1998; Oberly 2015; Principati et al. 2020) may leave patients vulnerable to predation by domestic cats. While this commonly used weight range roughly corresponds to the weaning age of most cottontail rabbits, they may not be sufficiently mature at this point to successfully evade capture by cats.

Since outdoor cats are ubiquitous in the landscape, we recommend that wildlife reha-

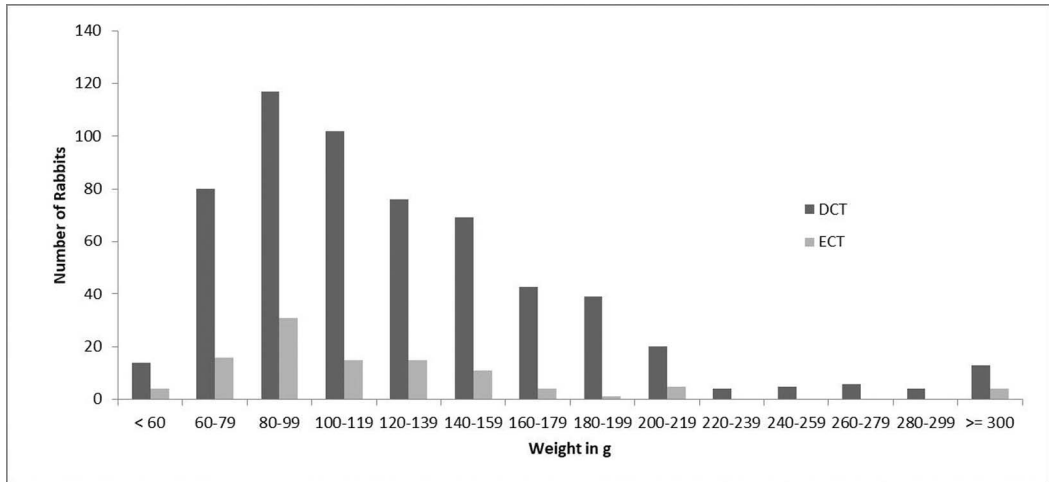


FIGURE 2. Weights at intake for two species of juvenile cottontail rabbits (*Sylvilagus audubonii*, DCT; *Sylvilagus floridanus*, ECT) attacked by cats (*Felis catus*), received at the Colorado Wild Rabbit Foundation, USA, between 2015 and 2019.

bilitators and anyone releasing captive reared cottontail rabbits include in their release criteria a minimum body weight that reduces the risk of domestic cat predation. This study suggests that a minimum of 220 g at release for desert, eastern, and mountain cottontail rabbits is necessary to lower the risk.

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