CSIRO PUBLISHING
Wildlife Research, 2020, **47**, 244–248
https://doi.org/10.1071/WR18200

Please come again: attractive bait augments recapture rates of capture-naïve snowshoe hares

Melanie R. Boudreau [A,D,*], *Jacob L. Seguin* [A,*], *Sophia G. Lavergne* [B], *Samuel Sonnega* [A], *Lee Scholl* [A], *Alice J. Kenney* [C] *and Charles J. Krebs* [C]

[A]Environmental and Life Sciences, Trent University, Peterborough, Ontario K9J 0G2, Canada.
[B]Centre for the Neurobiology of Stress, University of Toronto Scarborough, Toronto, Ontario M1C 1A4, Canada.
[C]Department of Zoology, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada.
[D]Corresponding author. Email: melanieboudreau@trentu.ca

Abstract

Context. Capture–recapture sampling is one of the most commonly used methods for monitoring population demographics and is needed in a wide variety of studies where repeat sampling of individuals is desired. Although studies employing capture–recapture methods often assume unbiased sampling, it is well established that inherent capture biases can occur with these methods, including those related to baits. Reducing sources of sampling bias and augmenting recapture reliability is necessary for capture-dependent studies. However, few studies have examined the efficacy of baits on individuals with variable capture experience.

Aims. To investigate the use of an attractant-augmented bait in enhancing capture–recapture probabilities for snowshoe hares (*Lepus americanus*).

Methods. To examine the efficacy of different attractant-augmented bait types, a variety of baits were created, with bait preference tested on a captive hare. Because a strawberry jam-based bait was preferentially consumed (in comparison with other tested baits), the effectiveness of this attractant in enhancing capture–recapture rates was subsequently examined in wild hares, using paired live-trapping field trials ($n = 6$ trials).

Results. Live-trapping trials showed that although overall hare capture rates were not affected by the use of a jam-based bait, recaptures were 33.1% higher in capture-naïve individuals exposed to our attractant. This was not the case for hares with prior capture experience; such hares had an equal likelihood of being recaptured regardless of the bait type used.

Conclusions. The tested attractant improved recapture rates of capture-naïve hares.

Implications. Studies relying on high recapture rates should use methods that maximise recapture rates wherever possible, including the use of baits that may augment recaptures in capture-naïve animals.

Additional keywords: capture-dependent studies, CMR, *Lepus americanus*, strawberry jam.

Received 23 December 2018, accepted 23 November 2019, published online 13 May 2020

Introduction

Capture–recapture sampling is one of the most widely used methods for monitoring population demographics (Nichols 1992), and is needed for a wide variety of studies in which repeat sampling of individuals is desired (Butler *et al.* 2004; Thomas *et al.* 2011). Many population estimators (e.g. Jolly–Seber, Lincoln-Peterson) assume that captures are random, and therefore a population sample is unbiased (Smith *et al.* 1995). However, it is well established that inherent capture biases can occur, including those related to sex and age (Ream and Ream 1966; Smith *et al.* 1995), body mass (Rodda *et al.* 2007), condition (Bisi *et al.* 2011), capture method (Ream and Ream 1966; Bisi *et al.* 2011), encounter rates (Boulanger *et al.* 2004), season of capture (Poole *et al.* 2001), personality (e.g. being trap-shy; Biro and Dingemanse 2009) and bait types used (Grayson and Roe 2007; Silva *et al.* 2012). Clearly, reducing sources of sampling bias and augmenting the reliability of recaptures are important in capture-dependent studies.

Bait type is one methodological choice that may introduce a major source of live-trapping bias through unequal capture rates (Grayson and Roe 2007; Silva *et al.* 2012). For example, more attractive baits could potentially augment capture rates as a function of bait novelty (Churchfield *et al.* 2000), or aid in the detection of shy or near-satiated individuals (Grayson and Roe 2007; Bisi *et al.* 2011). In contrast, baits may also result in fewer captures due to bait fidelity (Molsher 2001) or due to sampling

[*]Co-first authors.

bias towards the bold or hungry (Grayson and Roe 2007; Bisi *et al.* 2011). Although there are a variety of factors that influence bait effectiveness, it is clear that bait choice can impact capture–recapture rates (Noyce *et al.* 2001). Bait adjustments, therefore, are inherently valuable to capture-dependent studies despite the potential for increased labour and cost (Thorn *et al.* 2009), because they may augment capture–recapture rates, reduce sampling effort and mitigate sampling biases (Grayson and Roe 2007; Silva *et al.* 2012). However, these potential drawbacks necessitate that bait effectiveness be tested before large-scale implementation. Although appropriate baits have been shown to mitigate capture bias in a variety of studies in wildlife ecology (Howard *et al.* 2002; Grayson and Roe 2007; Silva *et al.* 2012), few studies have directly assessed the efficacy of baits on the capture–recapture rates of individuals with variable capture experience.

Snowshoe hares are a keystone species in the North American boreal ecosystem (Krebs *et al.* 2001), because they affect not only the abundance and growth of herbaceous and woody vegetation but also the population dynamics of the predator community (Hodges *et al.* 2001). Long-term monitoring efforts via live-trapping of hares have occurred for >40 years as part of the Community Ecological Monitoring Program (CEMP) in the Kluane Region, Yukon, Canada (CEMP 2016*a*). Because of notably low capture–recapture rates during summer months (June–August; M. Boudreau and J. Seguin, unpub. data), we created an attractant-augmented bait designed to potentially increase capture–recapture success in hares compared with the conventional bait type, which had been in use since the project's inception. We predicted that this bait would result in: (1) a higher number of overall captures; and (2) greater recapture rates in new individuals that had not been previously captured in live traps using the conventional bait.

Methods

Study site

Our study was conducted near Kluane Lake in the Shakwak Trench in south-western Yukon, Canada in two study areas located ~5 km apart (hereafter referred to as 'Chitty' (60.931°N, 137.969°W) and 'Sulfur' (60.954°N, 138.045°W)). The study region receives <30 cm of precipitation annually, mostly as rain during summer, and summer and winter (November–February) temperatures average 12°C and –17°C respectively (Environment Canada 2017). The region is dominated by white spruce (*Picea glauca*), with a mixed understory of grey willow (*Salix glauca*), bog birch (*Betula glandulosa*), soapberry (*Shepherdia canadensis*) and other herbaceous plants (Krebs *et al.* 2001). Regional land use includes mining and recreation (Krebs *et al.* 2001), but anthropogenic disturbance at our sites was minimal.

Bait selection

In June 2014 we created three baits, two with a strong odour as the attractant and one with high sweetness. We used a mixture of rabbit chow, water, molasses and oats (see Bait recipe, available as Supplementary material to this paper) as a base, and added typical attractants previously used in other studies (see Schlexer 2008), either almond extract, vanilla extract or strawberry jam.

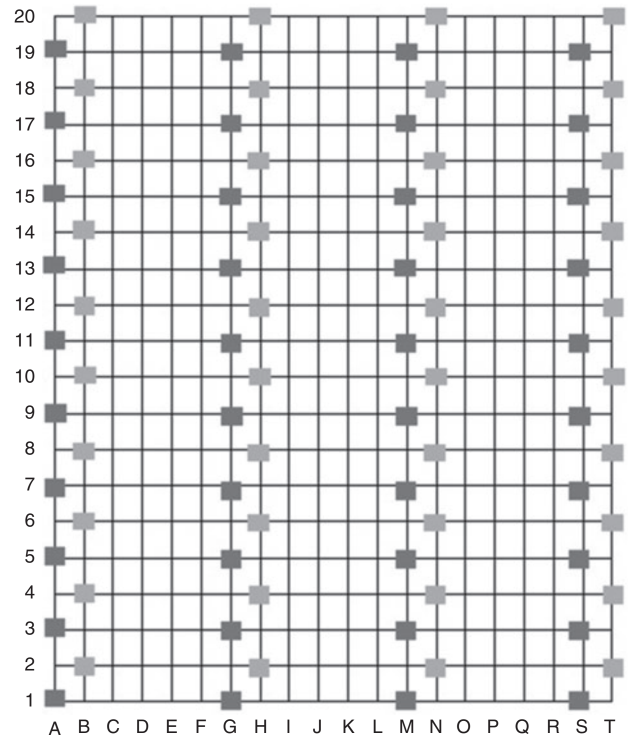

Fig. 1. Paired lines associated with live-trapping field trials. Lines with traps in dark grey received conventional bait and lines with traps in light grey received jam-based bait. Spacings between letters and numbers are 30 m.

An adult hare being held in captivity for a concurrent study (University of Toronto protocol 20010858) was simultaneously offered the three baits and natural willow browse as part of its daily feeding regime and observed via GoPro camera to see which bait was chosen first. In the single trial performed, the hare ate the jam-based bait within 1 min of it being offered and then switched to eating natural willow browse; the other two bait types were eaten only after the natural browse had been consumed. Although we recognise the limited sample size of the initial captive trial, the preference shown for the jam-based bait dictated its use in our comparison with conventional bait in subsequent field trials.

Field trials

In September 2015, after the height of the reproductive period, we live-trapped snowshoe hares at both study sites over the course of 3 days. Each area consisted of eight lines ($n = 4$ pairs; Fig. 1) of 10 live traps (Tomahawk Live Trap Co., Tomahawk, WI, USA). Paired lines were spaced 30 m from each other, and 150 m from another pair (Fig. 1). On each pair, one of the lines was baited with the conventional bait (two alfalfa cubes and a handful of commercial rabbit chow; CEMP 2016*b*), and the other was baited with the jam-based bait (Fig. 1). All live traps also received a slice of apple, which provides hydration for hares when captured and is consistent with the trapping protocol for the region (CEMP 2016*b*). We pre-baited the traps with apple and their respective baits for 3 days before trapping sessions began.

Table 1. Number of recaptures on the subsequent day when the first capture was either a conventional bait or a jam-based bait for previously untagged hares and hares tagged in previous censuses

Variable	Untagged hares, $n = 41$		Hares tagged in previous censuses, $n = 37$	
	n	%	n	%
Conventional bait				
Recaptured	7	19.5	11	29.7
Not recaptured	19	43.9	9	24.3
Jam-based bait				
Recaptured	9	22.0	10	27.0
Not recaptured	6	14.6	7	18.9

During trapping sessions, live traps were set at 2000 hours and checked at 0600 hours (CEMP 2016*b*). On checking traps, non-consumption of bait was noted, and hares that had not been previously captured and tagged received an ear-tag (National Band and Tag Co., Newport, KY, USA). Live-trapping and hare-handling procedures followed established guidelines (Sikes *et al.* 2011) and were approved by the University of British Columbia (protocol A13-0136).

Statistical analysis

Capture probability estimates were calculated for each study area using the equation:

$$\hat{p} = n/tN,$$

where $\hat{p}$ is the probability of capture, n is the total captures in a trapping period, t is the trapping period in days, and N is the population estimate using a population estimator (Boulanger 1993). Population estimates (N) were calculated for both study sites using a Jackknife estimator in the program CAPTURE (per Krebs *et al.* 2011). Of the 101 total hares captured, hares with a history of trap fidelity (i.e., a hare that always came back to the same live traps) were not included in our results because they were unlikely to participate in bait choices ($n = 3$). Hares newly captured on the third day of live-trapping were also excluded because they had no chance of recapture ($n = 20$). We examined the likelihood of baits being consumed and the influence of bait on recapture : non-recapture rates for all hares, previously censused (tagged) and not (untagged), using chi-square tests. Effect sizes were calculated as odds ratios and all analyses were conducted in R ver. 3.4.1 (R Core Team 2017).

Results

In total, we recorded 140 hare captures over the course of our trapping sessions on both sites. Of the hares captured, we had 32 (23 F, 9 M) and 46 (23 F, 23 M) hares on Chitty and Sulfur respectively. Adult hares comprised 56.4% and young of the year comprised 42.3% of the captured population. Untagged individuals comprised 52.5% of all hares captured, with 11 and 30 individuals being adults and young of the year respectively. Capture probabilities were similar between trapping areas (Chitty, $\hat{p} = 0.179$; Sulfur, $\hat{p} = 0.184$), and both baits had an equal likelihood of being eaten by hares (OR = 0.68, $\chi^2 = 0.29$, $P = 0.59$). Overall, of the 140 capture events, number of captures was not higher for the jam-based bait, with only 37.8% of all captures coming from this bait type.

Of the hares previously censused, 29.7% were initially captured with the conventional bait and 27.0% were initially captured with the jam-based bait (Table 1). Of the untagged hares, 19.5% and 22.0% were initially captured with the conventional and jam-based bait respectively (Table 1). We found no effect of the bait present at the initial capture on recapture rates of previously tagged hares (OR = 0.86, $\chi^2 = 0.05$, $P = 0.82$; Table 1). In contrast, new hares showed a higher recapture rate when they were first captured with jam-based (60.0%) rather than the conventional (26.9%) bait (OR = 4.07, $\chi^2 = 4.37$, $P = 0.037$; Table 1).

Discussion

Our live-trapping trials revealed that although our overall capture rates were not increased by the jam-based bait, among new hares, those initially caught with the jam attractant were more likely to be recaptured. This differs from hares captured before our experiment (identified by existing ear tags), who had an equal likelihood of being recaptured regardless of the bait type used. Our results show that the probability of recapture is already higher for previously tagged animals (i.e., 56.8% in previously tagged versus 39.0% untagged; Table 1). Such individuals may be either habituated to live-trapping, or have bold personalities and thus be less affected by the experience (Grayson and Roe 2007; Bisi *et al.* 2011), and therefore not be influenced as readily by alternative baits. In capture-naïve individuals, however, trap habituation may be facilitated by the attractant because it may provide stronger incentive for capture than would conventional means. Thus, it is possible that an animal's prior experience with the reward informs its decision to enter in subsequent capture sessions.

Strawberry jam seems to be an effective attractant for hares. Attractants (whether they be baits or scent, sound or visual lures; Schlexer 2008) have been used in wildlife ecology studies to augment capture or visitation rates across a variety of taxa (e.g. mammals, Schlexer 2008; birds, Castro *et al.* 2003; insects, Mashaly *et al.* 2013). Although evidence of bait preference from our initial captive trial was limited (i.e., only one hare), our field trial indicates that there is some benefit to the jam attractant. Strawberry jam-based baits are not uncommon and have been used to augment capture rates of a variety of mammalian species (e.g. mustelids, Sullivan *et al.* 2017; rodents, Witt 1991; primates, Evans *et al.* 2015; procyonids, Wehtje 2009). There is therefore precedence in mammals for this type of bait preference, and it is reasonable that lagomorphs would also have a similar tendency (Williams *et al.* 1986). We thus advocate that this type of attractant be employed in future trapping efforts, particularly with lagomorphs, to augment recapture rates in capture-naïve individuals.

Study designs requiring individual time-series data are dependent upon a high level of recapture probability in order to facilitate repeated measures (Williams *et al.* 2016). For example, unit retrieval is often required for studies using GPS or biologging technology (Ropert-Coudert and Wilson 2005; Thomas *et al.* 2011). Also, some techniques require recapture of given individuals at specific times (e.g. field metabolic rate; Butler *et al.* 2004), and studies that examine temporal comparisons (Wilmers *et al.* 2015), or aspects of demography (Messier 1991) may all require high recapture rates. Additionally, increased likelihood of individual recapture is critical for capture–mark–recapture methods, because increased sampling effort in resampling increases the precision of population estimates (Mahoney *et al.* 1998). Despite arguments that increased trapping efforts are costly (Bradley and Wilmshurst 2005; Sharma *et al.* 2010), we argue that the mitigation of trapping bias through alternative methods is worthy of exploration. Indeed, if recapture rates can be increased without greater expense or person-hours by simply employing more effective baits, such methods should be employed whenever possible.

Conclusion

We conclude that effective attractants can be used to augment recapture rates. Our results demonstrate how the addition of an inexpensive and readily available attractant – strawberry jam – to conventionally used bait can allow for higher recapture rates of individuals with no prior capture experience. We thus advocate for capture-dependent studies to make efforts to preliminarily test bait effectiveness, and to deploy effective attractants when high capture–recapture rates are desired.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

We thank Allison Seguin for her baking advice and Tom Hossie for his statistical input. We appreciate Kluane First Nation and Champagne–Aishihik First Nations for allowing us to work on their land. This research did not receive any specific funding.

References

Biro, P. A., and Dingemanse, N. J. (2009). Sampling bias resulting from animal personality. *Trends in Ecology & Evolution* **24**(2), 66–67. doi:10.1016/j.tree.2008.11.001

Bisi, F., Newey, S., Nodari, M., Wauters, L. A., Harrison, A., Thirgood, S., and Martinoli, A. (2011). The strong and the hungry: bias in capture methods for mountain hares *Lepus timidus*. *Wildlife Biology* **17**(3), 311–316. doi:10.2981/10-133

Boulanger, J. (1993). Evaluation of capture–recapture estimators using a cyclic snowshoe hare population. M.Sc. Dissertation, University of British Columbia, Vancouver, Canada.

Boulanger, J., Stenhouse, G., and Munro, R. (2004). Sources of heterogeneity bias when DNA mark–recapture sampling methods are applied to grizzly bear (*Ursus arctos*) populations. *Journal of Mammalogy* **85**(4), 618–624. doi:10.1644/BRB-134

Bradley, M., and Wilmshurst, J. (2005). The fall and rise of bison populations in Wood Buffalo National Park: 1971 to 2003. *Canadian Journal of Zoology* **83**(9), 1195–1205. doi:10.1139/z05-106

Butler, P. J., Green, J. A., Boyd, I. L., and Speakman, J. R. (2004). Measuring metabolic rate in the field: the pros and cons of the doubly labelled water and heart rate methods. *Functional Ecology* **18**(2), 168–183. doi:10.1111/j.0269-8463.2004.00821.x

Castro, I., Brunton, D. H., Mason, K. M., Ebert, B., and Griffiths, R. (2003). Life history traits and food supplementation affect productivity in a translocated population of the endangered hihi (stitchbird, *Notiomystis cincta*). *Biological Conservation* **114**(2), 271–280. doi:10.1016/S0006-3207(03)00046-6

Churchfield, S., Barber, J., and Quinn, C. (2000). A new survey method for water shrews (*Neomys fodiens*) using baited tubes. *Mammal Review* **30**(3-4), 249–254. doi:10.1046/j.1365-2907.2000.00074.x

CEMP (2016*a*). Community Ecological Monitoring Program (CEMP). Available at http://www.zoology.ubc.ca/~krebs/kluane.html [verified May 2017].

CEMP (2016*b*). Community Ecological Monitoring Program: Yukon Ecological Monitoring Protocols. Available at http://www.zoology.ubc.ca/~krebs/downloads/field_manual_2016-long.pdf [verified May 2015].

Environment Canada (2017). Canadian monthly climate data and 1981–2010 normals: Burwash A, Yukon Territory. Environment Canada, Ottawa, Ontario. Available at http://climate.weather.gc.ca/climate_normals/index_e.html [verified January 2017].

Evans, T. S., Barry, P. A., Gilardi, K. V., Goldstein, T., Deere, J. D., Fike, J., Yee, J., Ssebide, B. J., Karmacharya, D., Cranfield, M. R., and Wolking, D. (2015). Optimization of a novel non-invasive oral sampling technique for zoonotic pathogen surveillance in nonhuman primates. *PLoS Neglected Tropical Diseases* **9**(6), 0003813.

Grayson, K. L., and Roe, A. W. (2007). Glow sticks as effective bait for capturing aquatic amphibians in funnel traps. *Herpetological Review* **38**(2), 168–170.

Hodges, K. E., Krebs, C. J., Hik, D. S., Stefan, C. I., Gillis, E. A., and Doyle, C. E. (2001). Snowshoe hare demography. In 'Ecosystem Dynamics of the Boreal Forest: The Kluane Project'. (Eds R. Boonstra, S. Boutin, and C. J. Krebs.) pp. 141–178. (Oxford University Press: New York, NY.)

Howard, M. E., Zuercher, G. L., Gipson, P. S., and Livingston, T. R. (2002). Efficacy of feces as an attractant for mammalian carnivores. *The Southwestern Naturalist* **47**(3), 348–352. doi:10.2307/3672492

Krebs, C. J., Boutin, S., and Boonstra, R. (Eds) (2001). 'Ecosystem Dynamics of the Boreal Forest: The Kluane Project.' (Oxford University Press: New York, NY.)

Krebs, C. J., Boonstra, R., Gilbert, S., Reid, D., Kenney, A. J., and Hofer, E. J. (2011). Density estimation for small mammals from livetrapping grids: rodents in northern Canada. *Journal of Mammalogy* **92**(5), 974–981. doi:10.1644/10-MAMM-A-313.1

Mahoney, S. P., Virgl, J. A., Fong, D. W., MacCharles, A. M., and McGrath, M. (1998). Evaluation of a mark–resighting technique for woodland caribou in Newfoundland. *The Journal of Wildlife Management* **62**(4), 1227–1235. doi:10.2307/3801986

Mashaly, A. M. A., Al-Mekhlafi, F. A., and Al-Qahtani, A. M. (2013). Foraging activity and food preferences of the samsum ant, *Pachycondyla sennaarensis*. *Bulletin of Insectology* **66**(2), 187–193.

Messier, F. (1991). The significance of limiting and regulating factors on the demography of moose and white-tailed deer. *Journal of Animal Ecology* **60**(2), 377–393. doi:10.2307/5285

Molsher, R. L. (2001). Trapping and demographics of feral cats (*Felis catus*) in central New South Wales. *Wildlife Research* **28**(6), 631–636. doi:10.1071/WR00027

Nichols, J. D. (1992). Capture–recapture models. *Bioscience* **42**(2), 94–102. doi:10.2307/1311650

Noyce, K. V., Garshelis, D. L., and Coy, P. L. (2001). Differential vulnerability of black bears to trap and camera sampling and resulting biases in mark–recapture estimates. *Ursus* **12**, 211–225.

Poole, K. G., Mowat, G., and Fear, D. A. (2001). DNA-based population estimate for grizzly bears *Ursus arctos* in northeastern British Columbia, Canada. *Wildlife Biology* **7**(3), 105–115. doi:10.2981/wlb.2001.014

R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Available at http://www.R-project.org/ [verified 16 March 2020].

Ream, C., and Ream, R. (1966). The influence of sampling methods on the estimation of population structure in painted turtles. *American Midland Naturalist* **75**(2), 325–338. doi:10.2307/2423395

Rodda, G. H., Savidge, J. A., Tyrrell, C. L., Christy, M. T., and Ellingson, A. R. (2007). Size bias in visual searches and trapping of brown tree snakes on Guam. *The Journal of Wildlife Management* **71**(2), 656–661. doi:10.2193/2005-742

Ropert-Coudert, Y., and Wilson, R. P. (2005). Trends and perspectives in animal-attached remote sensing. *Frontiers in Ecology and the Environment* **3**(8), 437–444. doi:10.1890/1540-9295(2005)003[0437:TAPIAR]2.0.CO;2

Schlexer, F. V. (2008). Attracting animals to detection devices. In 'Noninvasive Survey Methods for Carnivores'. (Eds R. A. Long, P. MacKay, J. Ray, and W. Zielinski) pp 263–292. (Island Press: Washington, DC)

Sharma, R. K., Jhala, Y., Qureshi, Q., Vattakaven, J., Gopal, R., and Nayak, K. (2010). Evaluating capture–recapture population and density estimation of tigers in a population with known parameters. *Animal Conservation* **13**(1), 94–103. doi:10.1111/j.1469-1795.2009.00305.x

Sikes, R. S., Gannon, W. L., and Animal Care Use Committee of the American Society of Mammologists (2011). Guidelines of the American Society of Mammologists for the use of wild mammals in research. *Journal of Mammalogy* **92**(1), 235–253. doi:10.1644/10-MAMM-F-355.1

Silva, P. D., Vaz-de-Mello, F. Z., and Di Mare, R. A. (2012). Attractiveness of different bait to the Scarabaeinae (Coleoptera: Scarabaeidae) in forest fragments in extreme southern Brazil. *Zoological Studies* **51**(4), 429–441.

Smith, G. C., Pugh, B., and Trout, R. C. (1995). Age and sex bias in samples of wild rabbits, *Oryctolagus cuniculus*, from wild populations in southern England. *New Zealand Journal of Zoology* **22**(2), 115–121. doi:10.1080/03014223.1995.9518028

Sullivan, T. P., Sullivan, D. S., and Sullivan, J. H. R. (2017). Mammalian responses to windrows of woody debris on clear cuts: abundance and diversity of forest-floor small mammals and presence of small mustelids. *Forest Ecology and Management* **399**, 143–154. doi:10.1016/j.foreco.2017.05.028

Thomas, B., Holland, J. D., and Minot, E. O. (2011). Wildlife tracking technology options and cost considerations. *Wildlife Research* **38**(8), 653–663. doi:10.1071/WR10211

Thorn, M., Scott, D. M., Green, M., Bateman, P. W., and Cameron, E. Z. (2009). Estimating brown hyaena occupancy using baited camera traps. *South African Journal of Wildlife Research* **39**(1), 1–10. doi:10.3957/056.039.0101

Wehtje, M. (2009). Response of raccoon spatial and social behavior to the presence of an experimentally clumped food resource. M.Sc. Dissertation*,* University of Missouri, Columbia, MO, USA.

Williams, J. M., Bell, J., Ross, W. D., and Broad, T. M. (1986). Rabbit (*Oryctolagus cuniculus*) control with a single application of 50 ppm brodifacoum cereal baits. *New Zealand Journal of Ecology* **9**, 123–136.

Williams, C. T., Barnes, B. M., and Buck, C. L. (2016). Integrating physiology, behavior, and energetics: biologging in a free-living arctic hibernator. *Comparative Biochemistry and Physiology. Part A, Molecular & Integrative Physiology* **202**, 53–62. doi:10.1016/j.cbpa.2016.04.020

Wilmers, C. C., Nickel, B., Bryce, C. M., Smith, J. A., Wheat, R. E., and Yovovich, V. (2015). The golden age of bio-logging how animal-borne sensors are advancing the frontiers of ecology. *Ecology* **96**(7), 1741–1753. doi:10.1890/14-1401.1

Witt, J. W. (1991). Fluctuations in the weight and trap response for *Glaucomys sabrinus* in western Oregon. *Journal of Mammalogy* **72**(3), 612–615. doi:10.2307/1382145