Behavioral Ecology, Vol 9, 193-200, Copyright © 1998 by International Society for Behavioral Ecology

Seasonal variation in the effect of cache pilferage on cache and body mass regulation in Carolina chickadees: what are the trade-offs?

J Lucas and D Zielinski
Department of Biological Sciences, Purdue University, West Lafayette, IN 47907, USA; Department of Biology, Wabash College, Crawfordsville, IN 47933, USA

Current dynamic optimization models predict that animals should respond to cache pilferage by decreasing the probability of caching food and by increasing internal fat storage to compensate for a reduction in cache size. We tested these predictions under laboratory conditions with variable food access (four 14-min intervals/day). Carolina chickadees (*Poecile carolinensis*) were subjected to two environments under pilferage conditions, one-quarter of their cached seeds were stolen every 0.5 h, and under no-pilferage conditions, seeds were left in place. Half the birds started with pilferage conditions and were then switched to the non-pilferage condition; the other half started with no pilferage and were then switched to pilferage conditions. The birds responded to seed pilferage by taking more seeds from a feeder, suggesting that they monitored cache availability. Alternatively, the birds may have taken additional seeds from the feeder in response to increased hunger caused by a loss of cached food. Contrary to our predictions, birds cached a higher percentage of seeds from the feeder when cached seeds were pilfered than when caches were left in place. Treatment order also affected caching behavior for all but the summer birds: chickadees initially subjected to pilferage stored a higher proportion of seeds than those initially subjected to no pilferage. Caching percentages in the summer were unaffected by cache pilferage. Caching rates (number cached/day) also followed the same trends; rates were higher when seeds were pilfered than when seeds were not pilfered, and there was a treatment-order effect for all but the summer birds. Variation in body mass also failed to match predicted trends. All birds exhibited a monotonic increase in mass as the experiments proceeded, irrespective of treatment order. Controlling for this monotonic increase in mass, an analysis of residual variation in body mass indicated that birds gained less weight when seeds were pilfered than when seeds were left in place. Finally, birds tested in the fall and spring were heaviest than those tested in the summer. These results fail to support the relationship between cache maintenance and body mass regulation predicted by current models of energy regulation. We discuss the applicability of three hypotheses for the observed trends.

Keywords: body mass, cache behavior, cache pilferage, chickadees, energy regulation, fat regulation, food storing, foraging behavior, hoarding behavior, *Poecile carolinensis*, seasonal variation, tits.