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Weight Loss by Birds When Held for Banding

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Do different species of birds react differently when held for banding? Banders I have helped were all concerned with the welfare of their birds and tried to limit stress to the birds they band. However, none had ever investigated what aspect of banding stresses birds, or whether birds are stressed equally when handled during banding. While birds are held, the experience of captivity and lack of food both contribute to weight loss. Measuring of weight loss is easily done on birds while they await banding. Weight loss is the feature of banding stress I have studied.

Banders usually process birds in the order captured and some birds must therefore wait before being banded. Many banders believe that it can be dangerous to hold birds for an overly long time (B.I.R.D. Manual 1977; Schaeffer 1980) and try to release the birds within an hour of their capture. An experiment I conducted in 1991, on weight loss in House Sparrows *(Passer domesticus),* focused on the method of "holding" birds while they await banding: which container for temporary storage resulted in the least weight loss? I concluded that weight lost by House Sparrows during holding was measurable. In addition, holding birds in opaque cloth bags was less stressful than holding birds in either mesh bangs or screen cages. I found that two hours was not a dangerously long time to hold House Sparrows. Average loss of body mass was 4.27%; the maximum 7.4%. House Sparrows lost the most weight during the first half hour they were held. This suggested that birds become accustomed to their surroundings and are not as stressed after that.

Do these results hold true for species other that House Sparrows? E. P. Odum (1941) stated that "House Sparrows are . . . very hardy and 'thrive' in captivity as well as or better than other birds." Data I collected on House Sparrows may not apply to other species. It would be interesting, as well, to see if age and sex affect weight loss. Sturkie (1965) found that there was a difference in the metabolic rates of chickens of different ages and sexes. Lasiewski and Dawson (1967) devised a formula comparing the metabolic rates of passerines and non-passerines. Their formulas showed that the metabolic rate in passerines was 50% higher than in non-passerines of equal mass, so I compared differences in weight loss between species.

I tested several hypotheses with the following expectations: 1) smaller birds, with a higher metabolic rate, will be more stressed than larger birds; 2) younger birds will be more stressed; and 3) Passeriformes, in general, will be more stressed than Piciformes.

METHODS

Birds were captured in my yard with nylon mist nets and wire live traps baited with a mixture of seeds. Immediately after capture I weighed birds to the nearest 0.01 g on an electronic scale and recorded a fat score using a 0 to 5 scale. I recorded age, sex, species, other measurements and notes on plumage and eye coloration. I held birds for 120 min in cloth bags hung on a line in my garage and recorded weight and fat score every 30 min. After the 2 hr, birds were banded with a numbered, U.S. Fish and Wildlife Service aluminum leg band and released. The flight of each bird was observed to verify its health. I determined age and sex using standard references (Pyle et al. 1987; Wood and Beimborn1980; Anonymous 1980). If birds had not been handled during the previous nine months, I considered them naive subjects and used them in the experiment. Weight lost between 0 and 30

min, between 30 and 60 min, and total weight loss over the 2 hr holding period were determined for each bird as a percent of its initial body mass. I chose these intervals because my earlier House Sparrow study suggested that the differences would be most apparent during these periods. I created an R:Base 3.1 database to store date and aid in statistical analysis. I used t-tests (SPPC System 4.70, by Walmeyer Publishing Co., Tempe, Arizona) to compare group means.

RESULTS AND DISCUSSION

Traps were used for a total of 357.1 trap hours and mist nets used for 73.3 net hours. I captured 174 birds between 18 August and 28 October 1992; 30 birds were captured more than once. No birds died or were seriously injured as a result of this experiment. Two apparently healthy birds were seen at a feeder two months after these experiment, showing that the treatment to the birds was not harmful.

Some weight loss trends seen in my House Sparrow experiment were also present in this work. Greatest proportionate weight loss occurred during the first half hour of captivity for all passerine species excepting Red-eyed Vireos (see Fig. 1 and 2). In addition, no birds from either year gained weight, and all birds (except one House Sparrow) lost weight steadily throughout the experimental period.

I made seven comparisons to detect whether differences in weight lost existed between different groups of birds. Except for Comparison 5, only data from the initial capture of each bird was used. The following paragraphs describe each comparison and statistical significance of observed differences in weight loss.

Comparison 1: Young vs. old birds. Hatching year (HY) birds and after-hatching year (AHY) birds of three species with the largest sample sizes were compared: Black-capped Chickadees (sample sizes: 11 HY and 4 AHY), Downy Woodpeckers (5 HY and 8 AHY), and American Goldfinches (8 HY and 12 AHY). None of these comparisons were statistically significant. In Black-capped Chickadees, HY birds lost proportionately more mass than AHY birds, which was hypothesized. In American Goldfinches this trend was reversed, although it was less exaggerated than in chickadees. Finally, young Downy Woodpeckers seemed to lose the same percentage of weight as the older ones. Because of the differences among these three species, and lack of statistical significance, no general pattern is evident.

Comparison 2: Passeriformes vs. Piciformes. I found that Passeriformes lost a significantly higher total percent of weight than the Piciformes ($p = 0.015$) and a significantly higher percent of weight during the first 30 min of their treatment ($p = 0.009$). Although percent of weight lost during the second 30 min was not significantly different between the two groups ($p = 0.676$), I conclude that Passeriformes are more likely to lose weight from stress than Piciformes (see Fig. 3). This conclusion supported the original hypothesis 3.

Comparison 3: Different sizes of birds. I expected smaller birds to show more stress-induced weight loss than larger birds because of their higher metabolic rate. To test this hypothesis, I compared three sizes of birds: those that weighed less than 15 g ($n = 43$), between 15 and 35 g ($n = 58$), and more than 35 g ($n = 43$). Small birds (< 15 g) lost proportionately less mass during the first 30 min than large birds (> 35 g). This difference was near statistical significance ($p = 0.072$) and was opposite of expectation. In each of the other tests for this comparison (small birds vs. medium birds [15 - 35 g] and medium birds vs. large birds), p values were very high. The general trend for these comparisons was that all birds lost about the same percent of weight each half hour, except that the large birds lost more weight in the first 30 min. Small birds are less stressed, apparently, than large birds, contrary to the original hypothesis 1.

Comparison 4: Migrants vs. non-migrants. Here I compared two species: Northern Cardinals ($n = 21$), which remain in Minnesota year round, and White-throated Sparrows ($n = 26$), which were migrating through my study area when captured. This comparison was made to see if birds who needed extra energy to migrate would be stressed more than birds who would not need this energy. Both

groups lost the greatest percent of weight during the first 30 min. For the remainder of the experiment both species lost about the same percent of weight. I expected that migrant White-throated Sparrows would lose a higher percent of weight than non-migrant Northern Cardinals. However, this comparison was not statistically significant. From this comparison I concluded that there is no difference in stress-related weight loss between migrants and non-migrants.

Comparison 5: New birds vs. birds retrapped more than once during the experiment. Black-capped Chickadees, with 15 initial captures, provided the greatest number of retraps (n = 18). These data allowed me to see if chickadees caught a second time during my two month experiment would be more adapted to the handling stress and thus lose less weight than chickadees never previously captured. I expected recaptured birds to lose a lower percent of weight than the newly captured birds. However, both groups showed almost identical patterns of weight loss. From this I concluded that both new and recaptured chickadees are equally stressed by banding.

Comparison 6: Different species of birds. I compared weight loss among 7 species with n > 9: American Goldfinches, White-throated Sparrows, Black-capped Chickadees, Northern Cardinals, Slate-colored Juncos, Downy Woodpeckers, and Common Grackles. I compared those species with n > 15 (American Goldfinches, Northern Cardinals, White-throated Sparrows, and Black-capped Chickadees). I found, comparing White-throated Sparrows to Black-capped Chickadees, that chickadees lost a significantly lower total percent of weight than the sparrows ($p = 0.034$), and also a significantly lower percent of weight during the first 30 min ($p = 0.002$; see Fig. 4). This was contrary to the hypothesis 1. Some banders consider chickadees to be strong birds that are not stressed as easily as other species. Although the percent of weight lost by cardinals and goldfinches was not significantly different, goldfinches lost a lower percent of weight than the cardinals, mainly due to differences in weight loss in the first 30 min. For all comparisons the smaller species lost proportionately less weight than the two larger species, in agreement with comparison 3.

Comparison 7: Males vs. females. Three species with high numbers of both male and female birds were used in this comparison: Northern Cardinals (9 males and 12 females, American Goldfinches (10 males and 10 females), and Downy Woodpeckers (7 males and 6 females). No comparison was statistically significant. In Downy Woodpeckers, the two sexes had lost the same percent until 90 min, when the males had lost about 0.5% more than the females. Both male and female Northern Cardinals lost almost the same percent of weight over the entire experiment. In the American Goldfinches, however, the trend was that the males lost a higher percent of weight during the first 30 min and over the entire experiment, but the differences were not significant. Because these three species showed different patterns of weight loss, I make no general conclusion.

CONCLUSIONS

1) Birds lose weight over the entire time (up to 2 hr.) that they are held.

2) Birds lose more weight during the first 30 min of their captivity than during the next 90 min.

3) For the species I tested, holding birds for up to 2 hr. prior to being banded was not harmful.

4) There was no difference in weight loss between young and adult birds of three species: Black-capped Chickadees, Downy Woodpeckers, and American Goldfinches.

5) Passeriformes lose significantly more weight when held for banding than do Piciformes.

6) Birds weighing less than 15 g tend to lose more weight than birds weighing more than 35 g, but the difference is not significant.

7) There was no difference in weight loss between migrant White-throated Sparrows and non-migrant Northern Cardinals.

8) There was no difference in weight loss between Black-capped Chickadees being handled for the first time and Black-capped Chickadees being handled for a second time in about two months.

9) Back-capped Chickadees lost significantly less weight than White-throated Sparrows, and American Goldfinches lost less weight than Northern Cardinals.

10) There is no difference in weight loss between male and female birds of three species: Northern Cardinals, American Goldfinches, and Downy Woodpeckers.

ACKNOWLEDGMENTS

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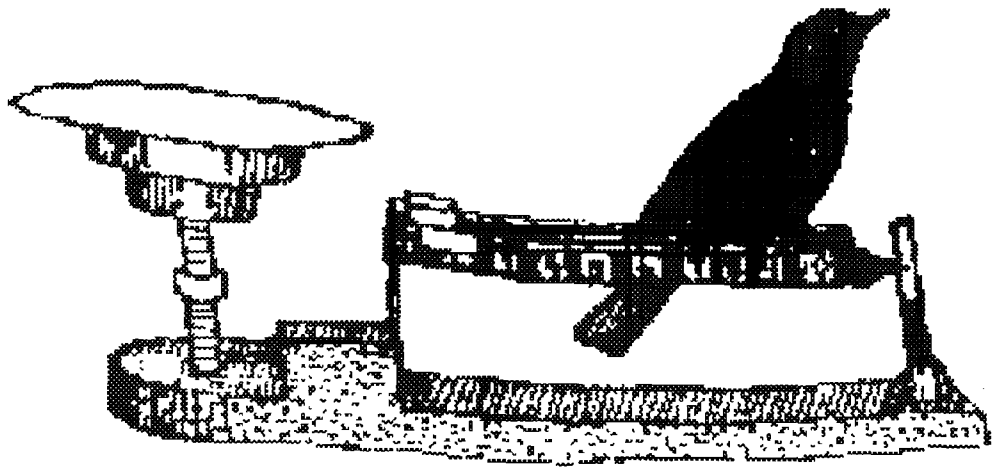

Fig. 1. Mean weight loss per 30 min. intervals, as percent of initial capture weight, for 16 passerine species.

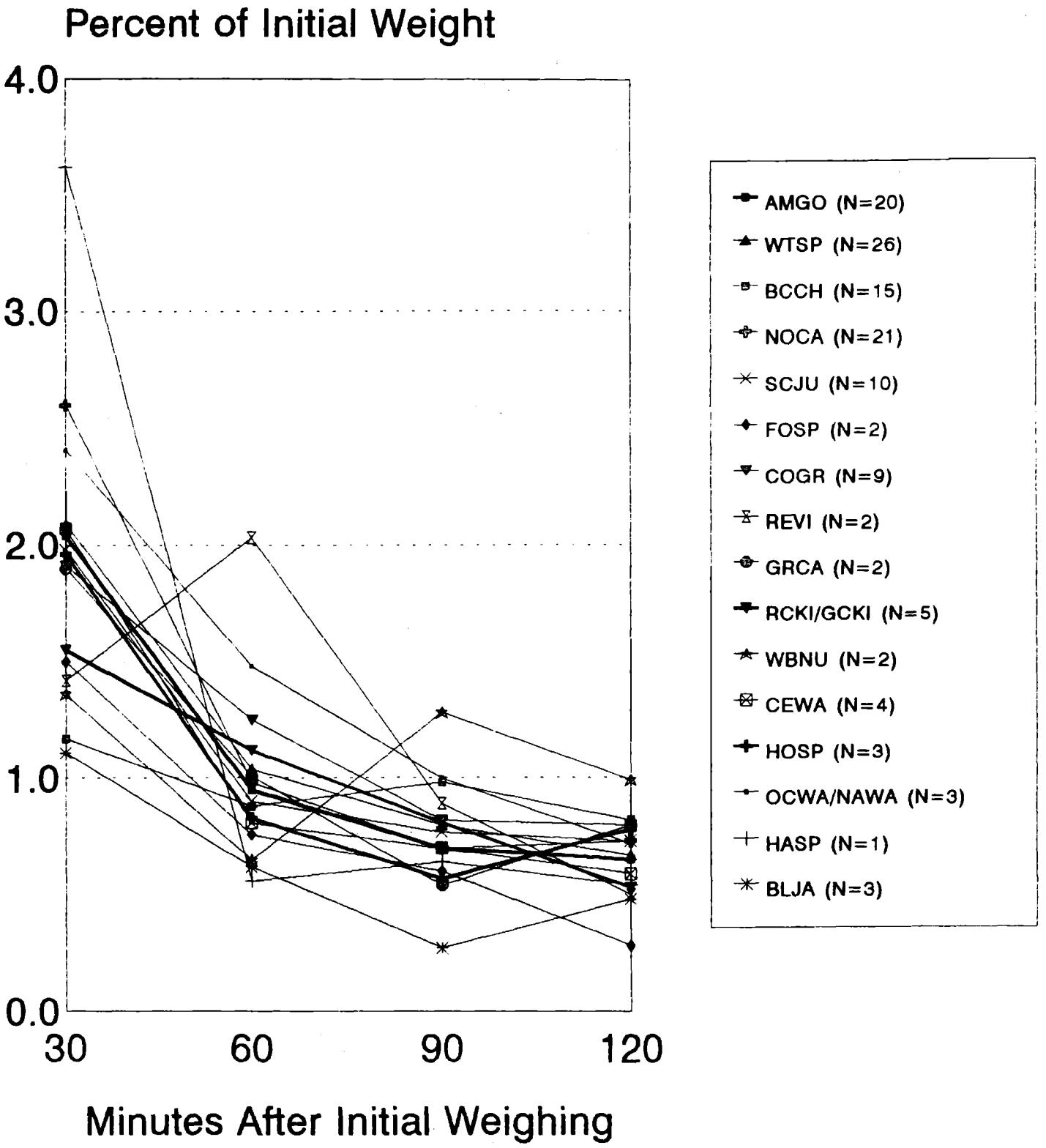

Fig. 2. Mean weight loss per 30 min. intervals, as percent of initial capture weight, for 3 non-passerine species.

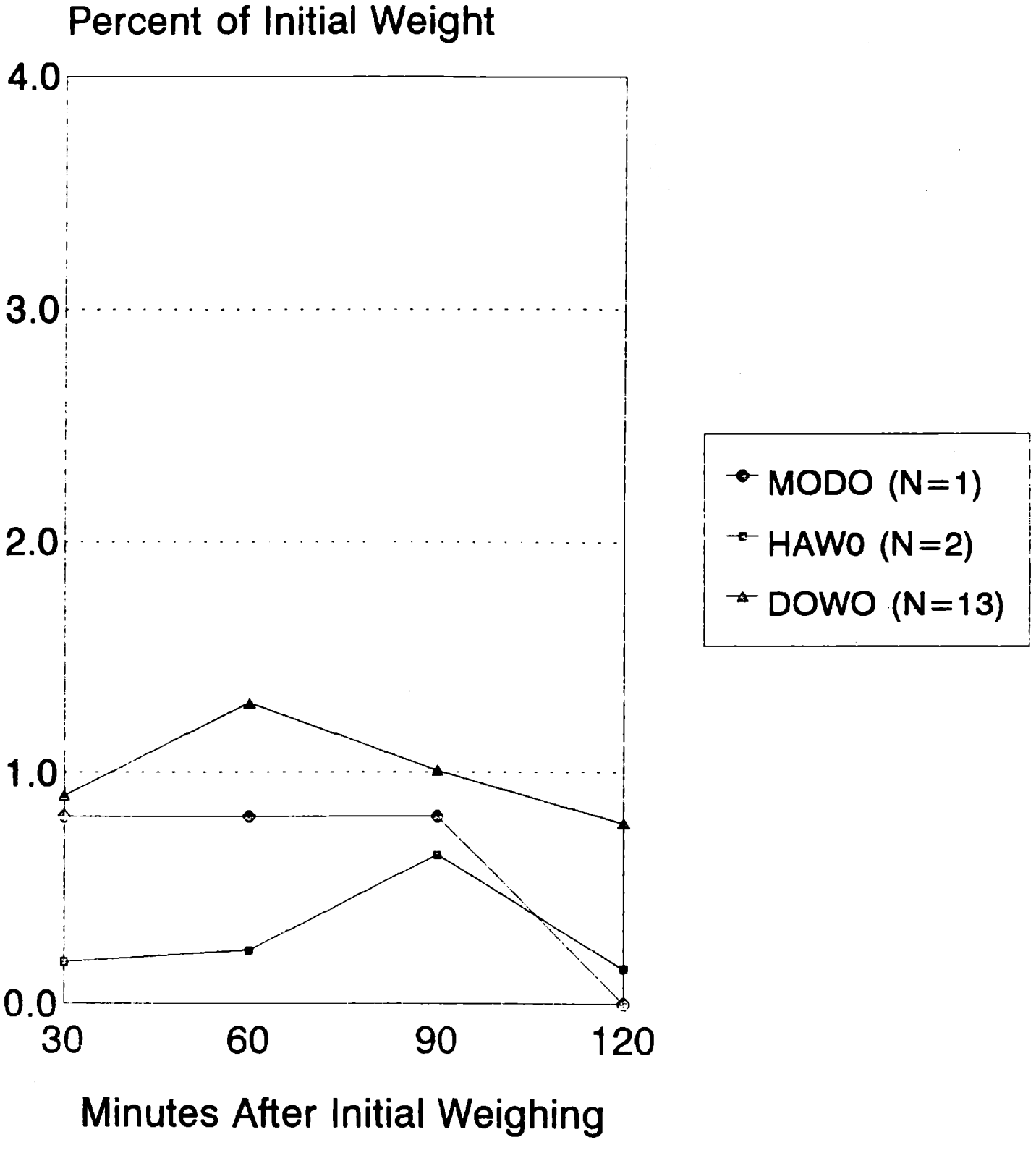

Fig. 3. Comparison of Passeriformes and Piciformes in cumulative and interval weight loss, as percent of initial capture weight, by 30 min. intervals.

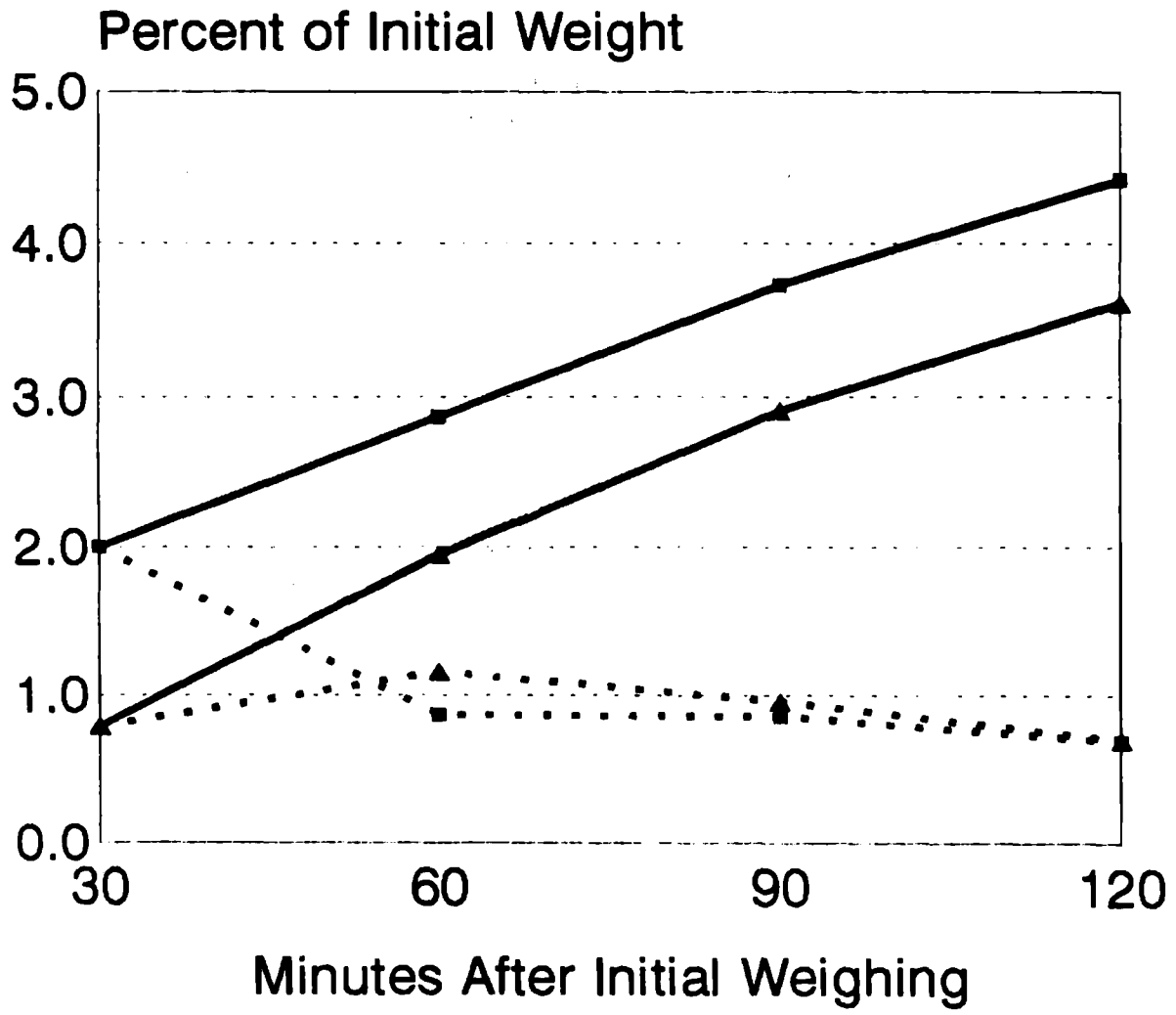

Fig. 4. Comparison of cumulative and interval weight loss, as percent of initial capture weight, by 30 min. intervals for 8 species.