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Influence on Pellet Egestion Time in Individual Great Horned Owls Allowed to View Egestion in Other Owls

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When a raptor, or other carnivorous bird, eats the whole body of its prey, it must then deal with the indigestible fur or feathers and bones of that prey item. Raptors typically deal with these wastes by forming them into a pellet in their stomach (gizzard) and egesting the pellet orally (Duke 1985). For several years, research in our laboratory has concentrated on, first the mechanism, and then the regulation, of the egestion process. Regulation has been studied by determining meal to pellet intervals (MPI) with various diets and feeding schedules. In strigiforms, MPI is directly related to meal size (Duke et al. 1976), to the nature of the meal (Duke and Rhoades 1977) and to feeding schedules (Fuller and Duke 1979).

These previous investigations of MPI in owls did not consider the possible influence of subjects being housed together (in view of each other) on digestion time. It was assumed for these investigations, however, that such influences probably would have been less than influences imposed by other aspects of the protocol such as changes in diet or feeding schedules. Therefore, the only objective of the present study was to examine whether MPI may be altered when Great Horned Owls (*Bubo virginianus*) are placed in view of each other. We hypothesized that because this species is typically not social (except during breeding), the presence of other individuals may affect digestion time.

Three healthy, but permanently crippled Great Horned Owls, obtained from the rehabilitation clinic at The Raptor Center, University of Minnesota, were used. They were males weighing 1070–1230 g, respectively, and were trained to eat 65–75 g of fresh-frozen thawed mice between 1000–1015 H daily. The owls were weighed weekly to monitor their health; all maintained, or slightly gained body weight.

Experiments were performed in two identical animal holding rooms between 1 April to 20 October 1990. Lights were automatically turned on in these rooms from 0800–2200 H daily and temperature and relative humidity were maintained at 20–22°C and 45–50%, respectively. Access to the rooms was limited to three individuals who regularly fed the birds and maintained the rooms. Chambers in which owls were kept and automatic egestion timing devices have been previously described (Duke et al. 1976, 1980).

The order of experiments and arrangement of owls was: Room 1, Owl #1 alone; Room 1, Owl #1 facing Owl #2; Room 1, Owl #1 facing Owls #2 and #3; Room 1, Owl #2 facing Owl #3 (#1 removed); and simultaneously in Room 1, Owl #2 alone and in Room 2 Owl #3 alone. Thus, each owl was tested alone and with one or two other owls for 30–40 d in each situation and 25–40 pellets were collected from each owl in each situation. The influence of housing treatment and time of exposure to that treatment on MPI were examined by split-plot analysis of variance (Snedecor and Cochrane 1980). Where the ANOVA was significant, comparison of means was performed using Tukey's test (0.05 level). Generally, MPI data for the first 5–7 d of the treatment were not used because owls did not eat the entire meal. Only 20 d of data were entered into the ANOVA, the maximum number of levels of comparison for the program.

The mean MPI for Owl #1 alone was significantly longer ($P < 0.0001$) than its MPIs when it was with other owls (Table 1). The mean MPI for Owl #2 when alone was significantly shorter ($P < 0.002$) than its MPIs when it was with other owls. The MPIs for Owl #3 were not significantly affected ($P < 0.176$) by being with other owls (Table 1). The different response of each owl to each situation was also evident as a significant ($P = 0.0001$) interaction between treatments and birds shown in the analysis of variance. Statistical analysis further indicated that MPIs obtained when these birds were together were significantly different than MPIs obtained from single birds or from two birds housed together ($P = 0.0001$). Lastly, there was no significant change in MPI over time in any of the situations ($P = 0.626$), MPIs apparently changed almost immediately when housing situations were changed.

We had hypothesized that four possible responses could occur when owls were housed with other owls versus when they were kept alone: 1) MPI may become shorter when housed with other owls. This would be a suitable response if an owl "wanted" to digest a meal, egest a pellet and have an empty stomach so it could set off to hunt before other owls. This would be a competitive response. 2) MPI could become longer due to the stress of association with other owls. Because Great Horned Owls are usually solitary, such associations could be stressful. Stress, involving

adrenergic responses, would slow digestion. 3) Owls might synchronize their rates of digestion and have similar MPIs. This response would benefit the group rather than the individual as in response number one. 4) Owls may have no response to being housed with other owls. Again the group would benefit because no individual would be disadvantaged or gain an advantage.

MPI in Owl #1 shortened in response to being with other owls as proposed in hypothesis 1. MPI in Owl #2, however, was lengthened in response to other owls (hypothesis 2) and MPI was unaffected in Owl #3 in response to other owls (hypothesis 4). Thus, while the response was varied between these three owls, it appears that in laboratory studies, housing owls together may significantly affect their digestion and thus, their MPI. Future research on factors affecting MPI and perhaps other physiologic processes must take this possibility into account. Whether free-flying owls similarly affect each other is unknown.

Table 1. Mean (±SD) meal-to-pellet intervals in hours for three Great-horned Owls (*Bubo virginianus*) housed with or without other owls.[1]

Owl No.	Treatment		
	Alone	With 1 Owl	With 2 Owls
1	17.04[2]	16.37[3]	14.69[4]
	±0.71	±1.91	±0.65
2	14.39[2]	15.75[3]	14.99[4]
	±0.85	±1.32	±0.94
3	17.69	17.68	17.01
	±1.90	±1.14	±1.01

[1] n = 20 d.

[2,3,4] Means in the same row with different superscripts are significantly different ($P < 0.05$).

RESUMEN.—Anteriores estudios concluyen que el intervalo entre la ingestión de alimento y la emisión de egagrópila (MPI) en buhos, está relacionado con la cantidad y la naturaleza de la comida ingerida, así como de las horas del día en que ocurre la ingestión. Sin embargo, la posible influencia en el MPI de la presencia de individuos a la vista el uno del otro, todavía no ha sido investigada. Cuando tres buhos de la especie *Bubo virginianus* fueron mantenidos solos, o en compañía de uno o dos más, el intervalo fue acortado en un buho, alargado en otro y mantenido igual en el tercero. Estos posibles efectos deben ser considerados en la conducción de estudios de laboratorio con buhos de esta especie.

[Traducción de Eudoxio Paredes-Ruiz]

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