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Estimation of Food Consumption from Pellets Cast by Captive Ural Owls (*Strix uralensis*)

Aki Higuchi and Manabu T. Abe<sup>1</sup>

*Abstract.*—There is considerable data in the literature on the diet of the Ural Owl (*Strix uralensis*) based on pellet analysis. Though it is possible to identify prey items by this method, the volume of food consumption is still unknown. The population of Ural Owls in Japan is declining due to the reduction of old-growth forest and the concurrent loss of natural nest cavities in older trees. More information, including dietary requirements, is needed to conserve suitable habitat and manage for this species. In this study, ingested food and cast pellet mass were quantified to determine if food consumption could be predicted from pellet mass for captive Ural Owls. Three caged adult owls were acclimatized for 2 months. Three common and natural Ural Owl prey species were fed to the captive owls: *Microtus montebelli*, *Apodemus speciosus*, and *A. argenteus*. There was no significant difference in the caloric value for each prey species used. Therefore, the body weight (mass) of prey species was considered a suitable index of food energy. The energy intake by owls was positively correlated with dry pellet weight: estimated calorie intake (kcal) =  $33.82 \times \text{dry pellet mass (g)} + 7.38$ . The influence of owl activity and seasonal changes in energy budgets on this relationship need to be determined.

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The population of Ural Owls (*Strix uralensis*) in Japan is declining due to reduction of old-growth forest. Ural Owls nest in natural tree cavities found in this forest type. It is difficult to directly observe Ural Owls because they are completely nocturnal and their habitat is typically dense forest. But their diet in Japan has been recorded through stomach and pellet analysis (Ikeda and Imaizumi 1949, Imaizumi 1968, Matsuoka 1977). Experiments have shown that Ural Owls cast about one pellet per day (M.T. Abe, unpubl. data). Though it is thus possible to identify individual prey items, the volume of food consumed is still unknown (M.T. Abe, unpubl. data). To better manage Ural Owl populations, it is necessary to understand their habitat and food requirements. As a first step, we performed laboratory studies to determine if the volume of food consumption could be predicted from dry pellet mass.

#### METHODS

Three healthy, but permanently crippled adult Ural Owls, obtained from a rehabilitation center at Niigata, Japan, were used in this experiment after acclimation for 2 months. The owls were kept in small cages (1.5 x 1.5 x 1 m), and fed weighed amounts of three common and natural prey species at a fixed time (17:00 p.m.) daily. The prey species used in this study were *Microtus montebelli*, *Apodemus speciosus*, and *A. argenteus*. These are considered to be principal food items for Ural Owls in Japan (Ikeda and Imaizumi 1949, Imaizumi 1968, Matsuoka 1977).

Prey species used to feed the captive owls were snap-trapped in the field, weighed and then frozen at -20°F. The rodents were thawed at room temperature, then fed to the owls. Pellets from the owls were picked up, dried and weighed. Thus we determined the relationship between food consumption and dry pellet weight. This study was conducted from 21 November 1994 to 14 February 1995.

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<sup>1</sup> Graduate School of Science and Technology, Niigata University Ikarashi 2-8050, Niigata, 950-2181, Japan Tel/Fax: +81-25-262-7380 email: aki@gs.niigata-u.ac.jp

The quality of each prey species used was evaluated as a caloric value per individual. We sampled five each of the three species. After measuring their fresh body weights, they were dried at 70°F for at least one day. Caloric values were measured by a Nenzen type adiabatic bomb calorimeter on two samples of 1g dry weight. Caloric values were converted to calories per 1g of fresh weight.

#### RESULTS

For captive Ural Owls, dried pellet mass was positively correlated with the fresh weight of ingested food ( $r^2 = 0.83$ ,  $p < 0.01$ ). This relationship is expressed as:

1. Dried pellet mass (g) =  $0.0412 \times$  mass of ingested food (fresh weight in g).

The caloric values per gram fresh weight of the three prey species were not significantly different ( $r^2 = 0.98$ ,  $p < 0.01$ ). This suggests that body weight is a sufficient index of the quality of each prey species. Prey body weight was positively correlated with caloric value as follows:

2. Caloric value =  $1.5762 \times$  fresh prey body weight (g) + 0.28.

From these two linear regressions (equations 1 & 2 above) we obtained an equation for estimating caloric intake from pellet weight as follows:

3. Estimated calorie intake (kcal) =  $33.82 \times$  pellet dry weight (g) + 7.38.

We can thus estimate the food consumption of captive Ural Owls from the mass of dry pellets. The effect of owl activity and seasonal changes in energy budgets in this relationship need to be determined before applying it to Ural Owl pellets collected in the wild.

#### ACKNOWLEDGMENTS

We would like to thank Professor K. Ishibasi, Dr. Y. Fukuma, and Mr. H. Ito, for their helpful advice on energy analysis. We are grateful to the Niigata Prefectural Bird Protection Center for providing the owls. We would also like to thank Dr. James R. Duncan and Dr. Robert W. Nero for their encouragement and review of this manuscript.

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