Developing Models for Studying Fish Taxa Composition and Size Selection Using Bones Obtained from Otter (Mustelidae) Scats in Kenya

Caroline Wambui Muriuki

Department: Zoological Sciences

Supervisors:

Prof. Callistus K.P.O. Ogol
Prof. Thomas L. Serfass
Dr. Mordecai O. Ogada

The study of otters and their diet has been highly dependent on scat analyses because they are reclusive animals, very difficult to observe in the field. Otters are largely opportunistic fish predators, but their diet may change depending on the changes in the availability of prey in their environment. However, mere identification of prey species is not sufficient. There is need for additional information on the size of prey in order to determine whether there is spatial or temporal selection and variations of prey sizes. Most of the studies done to date have made use of scales, cranial and post-cranial skeleton, otolith and vertebrae retrieved from scats to back-calculate the size of fish consumed by otters. This study adopted a similar technique to develop models for studying the fish taxa and size selection by otters using opercular bones (opercle, cleithrum, preopercle and palatin) retrieved from otters scats obtained from Lake Victoria (Rusinga island, Dunga beach, Ndere island) and lower Ewaso Nyiro river (Mpala), and also investigate the dynamics in the otter diet composition. A total of 300 scats samples were collected and analysed between January 2006 and September 2007. The relative importance of various prey items in the diet was estimated using the frequency of occurrence analysis which showed variations corresponding to the availability of prey in the different sampling sites. Spotted-necked otter (Lutra maculicollis) scats from Rusinga were dominated by fish (86.6%), while those from Dunga and Ndere were dominated by crab remains (94.4% and 100% respectively). Cape clawless otter (Aonyx capensis) scats analysis indicates presence of fish (67.3%), crayfish (89.8%) and crab (3.1%). However, the presence of crab disappeared towards the end of the sampling period and the diet was dominated by fish and crayfish in almost equal proportions. This shows that otters switch their prey according to availability and abundance within their home ranges. Three main fish taxa were considered in this study based on the ability to identify them in scats from their opercular bone structures.
that were used to develop models. Whole fish samples from the study sites were dissected and their opercular bones dimensions used to establish a relationship with the standard length expressed as: $y = a + \beta x$. The Selection of morphological features used in the models was based on the width of information that could be obtained per bone, and the level of error in the measurements. The best predictor models were selected based on the strength of the coefficient of determination ($r^2$) value. A total of 28 regression equation models were obtained for the relationship between different morphometric dimensions of diagnostic bones and standard length of fish. All regressions models were highly significant ($P<0.0001$) and all gave coefficients of determination ($r^2$) between 66.4% and 99.1%. The best predictor model for Cichlidae was sub-opercle bone ($4A; SL=3.73+14.76x; r^2=92.8\%$), *Lates niloticus* was pre-opercle ($2C; SL=2.84+7.31x; r^2=99.1\%$), and Cyprinidae was ($3A; SL=7.98+9.78x; r^2=90.4\%$). Results showed that Spotted necked otters select cichlidae and *Lates niloticus* fish of approximate maximum total length 21.91cm and 50.29cm respectively. Cape clawless otters select fish of cichlidae and cyprinidae approximate maximum total length 14.09cm and 11.91cm respectively. This study found that scat analysis is useful in constructing a basic description of otter diet particularly when other methods are difficult or when one needs background information for planning broader studies of behavioral ecology.