

BATS: BIRD-EATERS OR FEATHER-EATERS? A CONTRIBUTION TO DEBATE ON GREAT NOCTULE CARNIVORY

GIANNA DONDINI, SIMONE VERGARI

c/o Museo di Storia Naturale, sez. Zoologia, Università di Firenze, Via Romana 17
50125 Firenze (Italy); E-mail: gianna.dondini@tin.it – svergar@tin.it

RIASSUNTO – *Chiroteri ornitofagi o mangiatori di penne? Un contributo al dibattito sulla carnivoria della nottola gigante.* In un recente dibattito sulla carnivoria nella nottola gigante *Nyctalus lasiopterus* (Schreber, 1780) sono stati sollevati alcuni dubbi sulla possibilità di cattura di piccoli passeriformi. Alcuni autori ipotizzano che la nottola gigante sia condannata, dalla bassa risoluzione del suo impulso ultrasonoro, a catturare erroneamente penne fluttuanti nell'aria. Il presente contributo vuole evidenziare come la specie risulti predare effettivamente piccoli uccelli sebbene occorra approfondire molti degli aspetti legati alla sua ecologia trofica e predatoria.

Parole chiave: *Nyctalus lasiopterus*, carnivoria, Chiroptera.

A recent debate between Bontadina and Arlettaz (2003) and Ibáñez *et al.* (2003) concerned the presence of carnivory in Greater noctule *Nyctalus lasiopterus* (Schreber, 1780). The former authors maintained that there are other explanations for the presence of bird feathers in the droppings of this species. We believe that our comments on this debate are appropriate since, although the authors did not acknowledge it, we were the first to provide a clear demonstration of this feeding behaviour in *N. lasiopterus* (Dondini and Vergari, 2000).

First, we will summarize the case made by Bontadina and Arlettaz (2003). According to them, the main problems with the hypothesis that the *N. lasiopterus* captures small passeriforms are:

1) the absence of bone fragments in the droppings;

2) the difficulty in accepting the hypothesis of Ibáñez *et al.* (2003) on the capture and consumption in flight of small birds during the two main migrations;

3) the finding of bat droppings with feather fragments mixed with arthropod fragments;

4) the fact that in a sample of *N. noctula* droppings, 0.7% of the droppings contained feather fragments.

From this series of observations, Bontadina and Arlettaz (2003) formulated the following hypothesis: while foraging, the *N. lasiopterus* commits an error of identification and, instead of catching insects, ingests bird feathers floating in the air during the migration periods. The logical consequence is that the *N. lasiopterus* is condemned by the low resolution of its echolocation calls to eat feathers. However, on the basis of

the principle of parsimony and the data provided by Dondini and Vergari (2000) and Ibáñez *et al.* (2001), it would be much easier to accept the idea that the *N. lasiopterus* captures birds than that it is a casual feather-eater.

Nevertheless, let us examine the above-mentioned points. Regarding the absence of bone fragments, apparently, Bontadina and Arlettaz (2003) have overlooked that the presence of bone fragments had been reported by Dondini and Vergari (2000). In fact, on page 234, third-from-last line of the Results, we reported that: “*Many bone fragments of birds were also found*”. To demonstrate definitively and without any doubt the presence of fragments of bird bones, we conducted a scanning electron microscope (SEM) examination of a small sample of the bone fragments (Fig. 1). It clearly proves their origin. In addition to the lamellar structure, one can also see the osseous canals and surfaces with smoothed



Figure 1 - Micrography of the bone (x1200). The fracture morphology is not very evident and the surface presents rounded edges. This can be attributed to digestive processes. The typical biconvex lens shape of the osseous canals (indicated by the arrows) and the lamellar structure are very evident.

angles, typical signs of passage through the digestive tract. The bone fragment in Figure 1 belongs to a series of 14 ones found in 9 droppings collected directly from the bat in September and October 2003 (for methods, see Dondini and Vergari, 2000); the mean value of the maximum length of the fragments is 1.3 mm (SD: ± 0.55 ; min-max: 0.55 - 2.3 mm, N = 14).

We trust that this further data will remove any doubts about the capture of small passeriforms by the *N. lasiopterus*.

Why did Ibáñez *et al.* (2001) not find bone fragments? Perhaps because they are very small, translucent and not easy to identify, as they could be mistaken for material of different origin. Thus, we can reasonably hypothesize that when examining hundreds or thousands of droppings the accuracy might not be very high.

The second point raises doubts about the hypothesis of catching and eating birds in flight. Therefore, why not consider the ability of the *N. lasiopterus* to find bird prey on roosts in forest areas and consume it there?

The third point concerns the fact that feather fragments are sometimes associated with arthropod fragments. However, it is not so difficult to hypothesize that the *N. lasiopterus* is basically insectivorous and that it evolved its peculiar bird-eating behaviour in response to particular eco-physiological and energetic requirements. Not all of its predation attempts on birds are successful and thus it occasionally turns to insects. Alternatively, birds and insects might be captured at different times of the night. First it catches

insects, because it doesn't find other prey, and later manages to capture a bird.

The fourth observation reported by Bontadina and Arlettaz (2003) concerns the fact that feather fragments have been found in *N. noctula* droppings, which is interpreted as an error made by some individuals in catching and eating floating feathers. This leads the authors to hypothesize that the same behaviour occurs in *N. lasiopterus*. But how common is this error in *N. noctula*? In fact, feathers were found in only 3 of 435 droppings analysed (i.e. in 0.7% of the cases). So far, we have examined 79 *N. lasiopterus* droppings: feather fragments were present in all droppings and were estimated to form more than 95% of the volume in 78% of the droppings. Comparable results were reported by Ibáñez *et al.* (2001). Hence, a correct interpretation of the data demonstrates that the presence of feathers in *N. noctula* and in *N. lasiopterus* is due to completely different causes.

In conclusion, there is no doubt that *N. lasiopterus* catches small passeriforms. Further studies of the ecology of this mysterious bat are required to answer several questions: How does it catch its prey? What interpretation must we give to the capture of small birds? How did

this predatory behaviour evolve? The answers to these questions will provide new and interesting perspectives on the general biology of this bat.

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