rings, the maintenance of forest heterogeneity and the enhancement of periodical livestock grazing, as management practices for the benefit of the Reserve Orthoptera fauna. The question that arises next is «what is good for Orthoptera is also good for orchids, for amphibians, for reptiles, for woody plants or for passerine birds?» and vice versa. This big issue on biodiversity indicators is going to be discussed soon (Kati et al. *under revision*), in order to shed new light on the conservation management of this wonderful area of the Mediterranean.

For more information, read:

— Vassiliki K., Dufrene M., Legakis A., Grill A. and Lebrun P. Conservation management for Orthoptera in the Dadia reserve, Greece. *Biological Conservation*, in press.

VASSILIKI KATI

University of Ioannina, Department of Environmental and Natural Resources Management.
Seferi 2, 30100 Agrinio, Greece. vkati@cc.uoi.gr

Studying the diet of an insular herbivorous endemic pigeon by microhistological methods: implications for conservation

The Madeira Laurel Pigeon (*Columba trocaz*) is mainly restricted to the laurel forest areas located in the northern slopes of this island. Since its discovery in 1420, much of this relict forest has been cleared for agriculture and timber use. Nowadays, the laurel forest with 15 000 ha (about 20% of the total 737 km² of the island surface) is well protected by Nature Reserves. Although most of the pigeon population, estimated as 8,400 birds, is included within these areas, this species is threatened due to illegal hunting and poisoning.

The knowledge of some important biological aspects, nowadays poorly documented, as the food spectrum and its seasonal pattern variation, is basic for conservation and management of threatened species. The status of this pigeon as an island endemic bird requires that this basic information be obtained by applying non damaging methods. Most of the pigeons' diet in the world has been obtained by direct observation and it is subject to significant observational bias. According to this, we decided to use a microhistological analysis of faecal samples, a typical method used in herbivorous mammals, which may allow less biased quantification of the diet. This technique is based on the resistance of plant epidermal tissues after the digestion by the herbivore species and it requires a complete reference collection of leaves, stems, flowers and fruits for the main plant species present in the laurel forest (about 140).

Our aim was to study the composition and seasonal pattern of the diet of the Madeira Laurel Pigeon in relation to the availability of their native fruit resources in the laurel forest, and confirm the pigeon's role as seed disperser or predispersal seed predator, depending on the digestive treatment of seeds of each plant species. Furthermore, we evaluated the reliability of the microhistological methods for these kinds of studies.

The study took place in Ribeira da Janela (from spring 1996 through winter 1997), a well preserved laurel forest area (≈ 3366

ha) located in the north-western part of the Madeira Island (33°10' N, 15°50' W) where we collected a total of 224 faecal samples (Oliveira et al., 2002). Total percentage of optical fields ($n = 50$ per sample, at 10x magnification of microscope) containing a food type and their occurrence in the faecal samples were used to quantify the diet. Furthermore, fruit production from the five main tree species of the forest was assessed by the mean number of fruits per ha of foliage cover of each species and the proportion of trees with fruits.

The diet of the Madeira Laurel Pigeon included over 33 plant species. This bird is largely frugivorous, especially in autumn and winter, coinciding with the highest abundance of the main fruit species in the laurel forest. *Ocotea foetens*, *Laurus azorica* and *Persea indica* (basically fruits) were used in proportion to their importance, dominance and density in the forest, while *Ilex canariensis* (fruits and leaves) has a patchy distribution in the Madeira laurel forest. However, in the drier seasons (spring and summer), leaves and flowers of shrubs and herbs particularly, were the most consumed resources. These results showed that Madeira Laurel Pigeon behaved as an opportunistic bird, using available food items. The varied vegetarian diet composition has also been described for other insular forest fruit pigeons, such as the Chatham Island Pigeon, Henderson Island Fruit Dove, Bolle's Laurel and White-tailed Pigeon.

According to the external state of seeds found in the samples, the Madeira Laurel Pigeon acted as seed disperser of *Ilex canariensis*, *Myrica faya*, *Visnea mocanera*, *Ocotea foetens* and *Apollonia barbuja*, and as seed predator of *Persea indica* and especially from *Laurus azorica*. This differential digestive treatment of seeds by the pigeons could influence the composition and structure of laurel forest, which suggest an evolutionary relationship between this vulnerable endemic bird species and their unique forest habitat. Moreover, the presence of shrubs and herbaceous plants in the diet indicated that pigeons feed on the ground and at the edges of the forest. So, conservation of the species depends on preserving all habitat types required to meet their resource needs throughout the year. The diet detailed information presented here may help to understand the food needs of these pigeons in the laurel forest, their movements and habitat use.

Finally, we suggest that the microhistological techniques provide an acceptable level of accuracy, that they are appropriate for the study of herbivorous pigeon diet, and that they may be extensible to other bird species that consume abundant plant food.

For more information read:

— OLIVEIRA P., MARRERO P. & NOGALES M., 2002.
Diet of the endemic Madeira Laurel Pigeon and fruit resources availability: a study using microhistological analyses.
Condor 104: 811-822.

PATRICIA MARRERO¹, MANUEL NOGALES¹ & PAULO OLIVEIRA²

1. Departamento de Biología Animal (Zoología), Universidad de La Laguna, 38206, Tenerife, Canary Islands, Spain. e-mail: mnogales@ull.es
2. Serviço do Parque Natural da Madeira, Quinta Bom Sucesso, Caminho do Meio, 9050 Funchal, Madeira, Portugal.