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Notes on the diet of *Tyto alba* in two oceanic islands from the Mid-Atlantic, Porto Santo and Fogo (Aves, Tytonidae)

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Micromammals exclusive of the eastern Canaries, the extinct *Malpaisomys insularis* and *Crocidura canariensis*, were the main prey of Barn Owl (*Tyto alba*) during the Quaternary on Fuerteventura (Rando, 1993 [*in* Several authors. Dpto. de Biología Animal, Univ. de La Laguna. Unpublished report]). On other Macaronesian islands, however, the absence of this type of prey may have been compensated by capturing endemic reptiles (cf. Siverio *et al.*, 2007 [*Alauda* 75: 91-93]), insects and small birds (Hazevoet, 1995 [*The birds of the Cape Verde Islands*]). After the introduction by man (centuries ago) of small mammals, the few studies carried out in the Macaronesian archipelagos reveal the great importance of these alloctonous species in the present diet. In this regard, the murid *Mus musculus* is the taxon most preyed upon in the Canaries (Martin *et al.*, 1985 [*Ardeola* 32: 9-15]; Martín & Machado, 1985 [*Vieraea* 15: 43-46]; among others), and this also appears to be the case in Santiago, Santa Luzia (Cape Verde) (Rabaça & Mendes, 1997 [*Bol. Mus. Mun. Funchal* 49: 137-141]; Siverio *et al.*, 2007) and Madeira (Geyr von Schweppenburg, 1907 [*Ornithol. Jahrb.* 18: 39-43]; Sarmiento, 1948 [*Vertebrados da Madeira, 1º Volume*]). This is probably also the norm in the remaining Cape Verde islands, and even in the Madeira archipelago, although only brief references are available to date (Heim de Balsac, 1965 [*Alauda* 33: 309-322]). In an attempt to fill this gap, herein are reported the first data on the diet of *T. alba* on two Mid-Atlantic islands, Porto Santo and Fogo, some 2145 km distant from each other.

The island of Porto Santo (33° 04'N, 16° 20'W; 42.2 km²), some 40 km from Madeira, is characterised by the contrast between its relatively flat surface, where pastures predominate, and the presence of peaks more than 300 m. a.s.l. (max. 517 m). Contrarily, Fogo (14° 56'N, 24° 24'W; 476 km²), in the Sotavento group of Cape Verde, presents abrupt relief culminating in the 2829 m. a.s.l. of Pico Novo, the highest point and sole active volcano of the archipelago. Data on the diet were obtained from the analysis of pellets collected in the proximities of Cabeço da Ponta (SW Porto Santo) ($n = c.40$), in July 2000, and in two localities of the northern half of Fogo, Ribeira Gomes (São Lourenço, $n = 5$) and Sambango (Mosteiros, $n = 20$), in February 2005. The pellets and prey remains were deposited at the foot of cavities in use, localised in different environments: (a) an old quarry surrounded by dry pastures and buildings (Porto Santo), (b) a ravine near cultivated land, and (c) a volcanic cone surrounded by crops and scattered trees. In the prey inventoring, the minimum number of individuals (MNI) appearing in the broken pellets from the two islands and the intact pellets (mean \pm SD in mm = $42.58 \pm 8.01 \times 24.57 \pm 3.12 \times 19.18 \pm 1.28$ [high]; $n = 8$) from Fogo was taken into account. The standardised Levin's niche-breadth index (B_A) (Krebs, 1989 [*Ecological methodology*]), which defines whether

there was dietary specialisation (values close to 0) or, contrarily, whether there was a wide range (values close to 1), was used to compare the trophic diversity between the two islands. The contributed biomass has not been calculated because of the obvious restrictions of the customary assignment of weights (Zamorano *et al.*, 1986 [*Ardeola* 33: 3-9]; cf. Cortés, 1988 [*Doñana, Acta Vertebrata* 15: 99-109]; etc.).

| Prey taxa | Porto Santo | | Fogo | |
|------------------------------|-------------|-------|------|-------|
| | MNI | % | MNI | % |
| Mammalia | | | | |
| <i>Rattus rattus</i> * | 4 | 3.85 | | |
| <i>Rattus norvegicus</i> * | 1 | 0.96 | | |
| <i>Rattus</i> sp.* | 8 | 7.69 | 6 | 6.59 |
| <i>Mus musculus</i> | 38 | 36.54 | 66 | 72.53 |
| <i>Oryctolagus cuniculus</i> | 2 | 1.92 | | |
| Aves | | | | |
| <i>Apus alexandri</i> | | | 1 | 1.10 |
| <i>Passer hispaniolensis</i> | 9 | 8.65 | | |
| Reptilia | | | | |
| <i>Tarentola darwini</i> | | | 3 | 3.30 |
| <i>Teira dugesii</i> | 11 | 10.58 | | |
| Insecta | | | | |
| <i>Acheta domestica</i> | | | 4 | 4.39 |
| <i>Gryllus bimaculatus</i> | 29 | 27.88 | 3 | 3.30 |
| Acrididae | | | 8 | 8.79 |
| Coleoptera | 2 | 1.92 | | |
| Total | 104 | 100 | 91 | 100 |
| B_d | | 0.51 | | 0.14 |

Table I. Number, percent participation and diversity of prey taxa of Barn Owl on the islands of Porto Santo and Fogo. *Taxa grouped generically to calculate Levin's index.

Of the 10 prey species identified, four (the greater part introduced) are common to the islands of Porto Santo and Fogo, and three of these last species appeared in the respective diets (Table I). The most depredated is *M. musculus* in both islands, particularly in Fogo, where it exceeds 70% of total prey. Even considering local differences, the said species always attains the greatest percentage of depredation in all the Macaronesian islands where it is found (Tenerife, 70.3%, [Martín *et al.*, 1985]; El Hierro, 72.8% [Martín & Machado, 1985]; Santiago, 56.1%, [Rabaça & Mendes, 1997]; among others), with the exception of Alegranza (Canaries), where it was slightly surpassed by the endemic reptile *Tarentola angustimentalis* (51.72% vs. 46.48%, $n = 1278$ prey; Delgado, 1993 [*Vieraea* 22: 133-137]). Its great abundance and versatility, as well as the absence from the aforementioned islands of Microtinae and Soricidae, similarly sized prey species usually found in continental regions (cf. Cramp, 1985 [*The birds of the Western Palearctic*]), confer greater relevance here to this species. Although the combined 9.74% allocated to *Rattus* spp. appears to display a substantial contribution of biomass, the fact that these were mainly young individuals seems to leave this issue open to questioning. The often

disregarded selective depredation of *Rattus* by *T. alba*, pointing to weights around 55 g (Zamorano *et al.*, 1986), may have led to the biomass contributed by this group being generally overestimated.

Among the few birds consumed, with one species for each island, the most noteworthy is a single specimen of *Apus alexandri* on Fogo, since it represents one of the few examples of Apodidae as *T. alba* prey worldwide (cf. Herrera, 1974 [*Ardeola* 19: 359-394] and Rihane, 2005 [*Go-South Bull.* 2: 37-43]). It is known that birds are a secondary trophic resource, only taking on a significant role in exceptional circumstances (cf. Barbosa *et al.*, 1989 [*Ardeola* 36: 206-210]). Reptiles are also represented by a single taxon on each island. The fact that on Fogo only *T. darwini* appears and not other Gekkonidae cited (Schleich, 1996 [*in* Leyens & Lobin (eds.), *Primeira lista Vermelha de Cabo Verde*]) may be the result of an interspecific difference in habitat use. The quite considerable percentage of depredation of *Teira dugesii* on Porto Santo points more to a crepuscular habit of this Lacertid, perhaps induced by human activity (J. Jesus, *in litt.*), rather than the diurnal foraging of owls (pers. obs.). The absence from the Porto Santo diet of the Gekkonid lizard *T. mauritanica*, recently found on the island by Jesus *et al.*, 2008 (*Herpetozoa* 20: 175-177), would indicate introduction in the last few years. Orthoptera, with 95.7% of the total ($n = 44$), is the insect order most frequently captured on both islands, the most noteworthy being *Gryllus bimaculatus* on Porto Santo, since it is numerically the second most important prey. Its notable presence, as suggested on other islands of the Macaronesian region (Martín *et al.*, 1985; Martín & Machado, 1985), may be related to a case of annual demographic explosion. If we add to this consumption of *G. bimaculatus* the fact that on Porto Santo the values of depredation of *Rattus*, *Passer hispaniolensis* and *Teira* are around 10%, it comes as no surprise that, at least on this occasion, the diet here has not been so specialised as on Fogo (Table I). Even considering the restrictions of the analysed small sample size, it is again seen that the micromammals introduced by man now form the basic diet of *T. alba*.

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