

Winter breeding of the Lesser Egyptian Jerboa *Jaculus jaculus* (Linnaeus, 1758) in Southern Morocco

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An expedition to a remote area of Morocco's Atlantic Sahara region was undertaken from February 13 to 26, 2015. The main aim of the expedition was to evaluate the occurrence of winter breeding in desert rodents in this region. In this short communication we provide new data of winter breeding on *Jaculus jaculus* (Linnaeus, 1758), a Saharan desert specialist species (Figure 1). We identified a high number of reproducing females in the most north-western part of the species distribution (Aulagnier *et al.* 2009; Ben Faleh *et al.* 2012; Boratyński *et al.* 2014). Our data also suggests that the suitable area for breeding may be fragmented and restricted to the most productive patches of landscape of the Atlantic Sahara. Confirmation of this pattern will require further intensive investigation, including regular monitoring of population density and

characterization of individual breeding status. This finding increases limited knowledge of species reproductive biology (Aulagnier *et al.* 2009; Boratyński *et al.* 2012) and highlights the potential of the winter season for population growth, previously noted in some birds (Qninba *et al.* 2011; Amezian *et al.* 2015).

The Atlantic Sahara is a distinct region of North Africa, exposed to strong ecological gradients shaped by north-south (cold-hot) and east-west (dry-humid) climatic interactions (Kröpelin *et al.* 2008). This effect, together with frequent, relative to geological time-scales, climatic fluctuations shaped biological diversity of the region and exposed organisms to distinct selection regimes. Previous research suggested that the area plays a key role in generating Saharan biodiversity (Brito

et al. 2014). Considering the recent weather events, namely intensive rain falls during the end of 2014 and beginning of 2015, the expedition was timed to estimate intensity of breeding efforts of jerboas in the region of: Tan-Tan, Tarfaya, Laayoune and Smara (Figure 2). Night capturing of jerboas with spotlights and hand nets and identification of road carcasses were the sampling methods. All specimens were photographed and geographic locations of the captures were identified with a GPS (Nomad, Trimble). Five females were euthanized with an anesthesia overdose and dissected (along with one road carcass in good condition) to identify their breeding status. Specimens are preserved at the Natural History Museum of the Département de Zoologie et Ecologie Animale, Institut Scientifique de Rabat, Morocco. All procedures were approved by le Haut Commissariat des Eaux et Forêts et de la Lutte Contre la Désertification (Direction de la Lutte Contre la Désertification et la Protection de la Nature 3, rue Haroun Arrachid, Agdal Rabat, decision no: 42/2014).

During the expedition we captured a total of 14 individuals and found 11 road-kill specimens of *J. jaculus* (Figure 1 and 2). Of the six dissected females all were reproductively active: five were lactating (identified by enlarged mammary glands and the presence of milk; Figure 1), two were pregnant (carrying 6 and 3 embryos), and one was both lactating and pregnant (with 6 embryos). All live-captured females (7 out of 14 captured animals) were in reproductive condition (Table 1).

Table 1. Data on live-captured animals. Body mass – average, minimum and maximum of body mass was calculated for males and for non-pregnant females; N – number of measured (and captured) individuals.

	Body mass (g)	N	Lactating	Pregnant
females	65.4 (61-72)	5 (7)	6	2
males	63.8 (59-76)	6 (7)	-	-

In the north-western part of its distribution, and in particularly, Morocco, *J. jaculus* inhabits variable types of habitats, from rocky plateaus through sandy areas with dunes to compacted soil type zones, with coastal Atlantic vegetation (Aulagnier *et al.* 2009; Boratyński *et al.* 2014).

During this field survey, we identified the highest population density in an area with relatively high amounts of vegetation (Figure 1 and 2). All the captured females from this area were reproducing. This reflects that the high primary productivity of habitat, probably influenced by the recent intensive rain falls, triggered reproduction of jerboas, consequently increasing population density. Alternatively, individuals from surrounding areas may have been attracted to this productive habitat. Further investigation is required to test the possibility of seasonal movements of jerboa's based on primary productivity, and if habitat selection is related to genetic variability in this species (Boratyński *et al.* 2012).

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Figure 1. Photographs of habitats (left) where individuals of lesser Egyptian Jerboas, *Jaculus jaculus*, were captured (photographs by ZB and top-right indicating lactating female by AH).

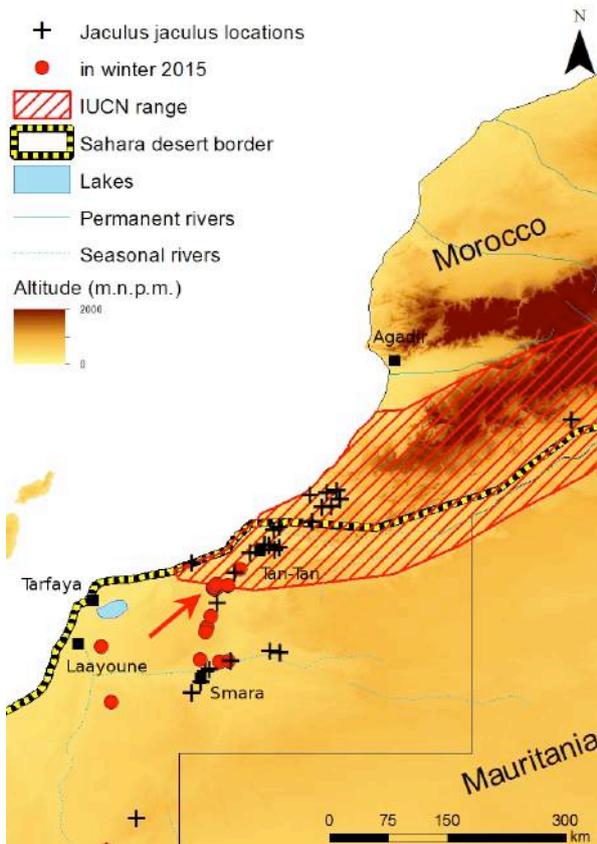


Figure 2. Distribution map of *Jaculus jaculus* in Moroccan Atlantic Sahara. Red circles represent detected locations of species occurrence during the winter 2015 expedition. Red arrow indicates the detected location of intensive breeding. Black crosses represent species occurrence detected in previous expeditions. Hypothetical distribution based on IUCN data (red line filled area)

References

- Amezian, M. ; Bergier, P. & Qninba, A.** 2015. Autumn-winter breeding of Cream-coloured Courser *Cursorius cursor* is more common than previously reported. *Wader Study Group Bulletin* 121: 177-180.
- Aulagnier, S. ; Haffner, P. ; Mitchell-Jones, A.J. ; Moutou, F. & Zima, J.** 2009. *Mammals of Europe, North Africa and the Middle East*. London. A&C Black Publishers.
- Ben Faleh, A. ; Granjon, L. ; Tatard, C. ; Duplantier, J.M. ; Dobigny, G. ; Hima, K. ; Said, K. ; Boratyński, Z. & Cosson, J.F.** 2012. Phylogeography of two cryptic species of African desert jerboas (*Dipodidae: Jaculus*). *Biological Journal of the Linnean Society* 107: 27-38.
- Boratyński, Z. ; Mappes, T. & Brito, J.** 2012. The origin of two cryptic species of African desert jerboas (*Dipodidae: Jaculus*). *Biological Journal of the Linnean Society* 105: 435-445.
- Boratyński, Z. ; Brito, J.C. ; Campos, J.C. ; Karala, M. & Mappes, T.** 2014. Large spatial scale of the phenotype-environment color matching in two cryptic species of African desert jerboas (*Dipodidae: Jaculus*). *PLoS ONE* 9(4): e94342.
- Brito, J.C. ; Godinho, R. ; Martínez-Freiria, F. ; Pleguezuelos, J. ; Rebelo, H. ; Santos, X. ; Vale, C.G. ; Velo-Anton, G. ; Boratyński, Z. ; Carvalho, S.B. ; Ferreira, S. ; Goncalves, D.V. ; Silva, T.L. ; Tarroso, P. ; Campos, J.C. ; Leite, J.V. ; Nogueira, J. ; Alvares, J. ; Sillero, N. ; Sow, A.S. ; Fahd, S. ; Crochet, P.A. & Carranza, S.** 2014. Unravelling biodiversity, evolution and threats to conservation in the Sahara-Sahel. *Biological Reviews Cambridge Philosophical Society* 89: 215-231.
- Kröpelin, S. ; Verschuren, D. ; Lézine, A. ; Eggermont, H. ; Cocquyt, C. ; Francus, P. ; Cazet, J. ; Fagot, M. ; Rumes, B. ; Russell, J.M. ; Darius, F. ; Conley, D.J. ; Schuster, M. ; von Suchodoletz, H. & Engstrom, D.R.** 2008. Climate-driven ecosystem succession in the Sahara: the past 6000 years. *Science* 320: 765-768.
- Qninba, A. ; Radi, M. ; Amezian, M. ; Ibn Tattou, M. ; Khayya, M.L. ; Samlali, M.L. ; Khalil, M.L. & Hammia, A.** 2011. Nidifications automnales d'oiseaux sahariens dans la région d'Oued Ad-Dahab – Lagouira (Maroc méridional). *Go-South Bulletin* 8 : 21-34.