# INCUBATING TO COOL: EXPLORING DAILY INCUBATION PATTERNS AND SEX-RELATED DIFFERENCES IN THE RED-NECKED NIGHTJAR (*CAPRIMULGUS RUFICOLLIS*)

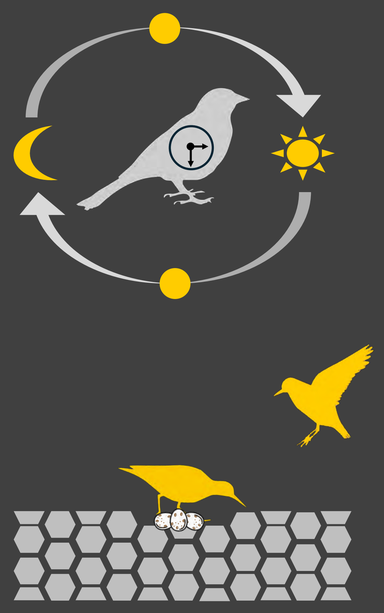
**José M. Zamora-Marín[1,2,4,✉], Antonio Zamora-López[2,3,4], Carlos Camacho[5], Martin Sládeček[6], Adrián Lax-Hernández[2,4], Mario León-Ortega[4], Pedro Sáez-Gómez[7], Mariángeles Lozano-Arnaldos[8], Sarah Díaz-García[2,4], José A. Sánchez-Zapata[1] & Martin Bulla[6]**

[1]Dpt. of Applied Biology, Miguel Hernández University, Elche, Spain. [2]ANSE Bird Ringing Group, Association of Southeastern Naturalists, Murcia, Spain. [3]Dpt. of Zoology and Physical Anthropology, University of Murcia, Murcia, Spain. [4]Ulula Association for Owl Study and Conservation, Murcia, Spain. [5]Dpt. of Ecology and Evolution, Doñana Biological Station (CSIC), Seville, Spain. [6]Faculty of Environmental Sciences, Czech University of Life Sciences, Prague, Czech Republic, [7]Terrestrial Ecology Group, Dpt. of Ecology, Autonomous University of Madrid, Madrid, Spain. [8]Veterinary Association for Wild and Exotic Fauna Assistance (AVAFES), Spain

✉ j.zamora@umh.es

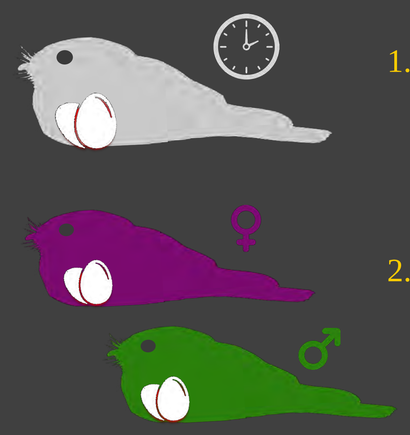
## INTRODUCTION

- Over the last decade, huge advancements in **remote sensing** and wildlife **tracking technology** have greatly increased our understanding on avian **chronobiology**[1].
- However, most of our current understanding on avian **biorhythms** comes from a **restricted** set of **model species**, such as passerines or shorebirds[2].
- This scenario can overlook the diversity of **evolutionary** or **behavioural** mechanisms exhibited by global avifauna, particularly by ecologically singular and understudied avian groups, such as **nightjars**[3].



## STUDY AIMS

The **Red-necked Nightjar** (*Caprimulgus ruficollis*) is a crepuscular and ground-nesting bird species breeding in warm regions of Iberian Peninsula and N Morocco. Here, we used a nightjar population breeding in an agricultural landscape from a semiarid region (Murcia, SE Spain) to:



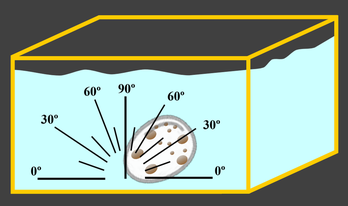
1. Determine the **incubation pattern** and nest attendance rate to this avian group.
2. Assess **sex-related differences** in incubation bouts, as well as the timing of incubation recesses across the circadian cycle (24h).

## FIELD METHODS

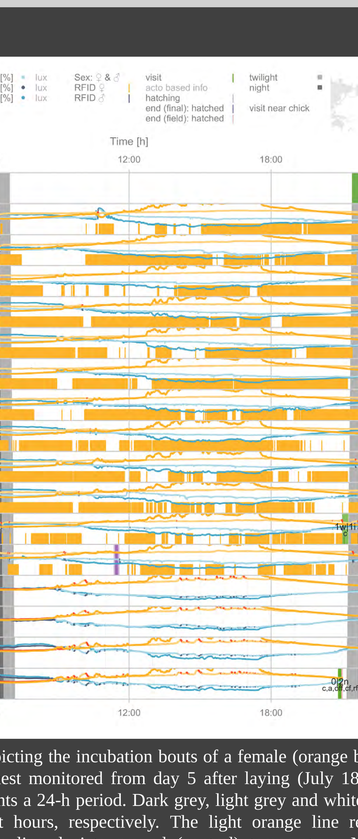
Field surveys covered the whole breeding season (May-August) of **2022** and **2024**.

1. **Active nest searching** through flashlighting every **two weeks**.

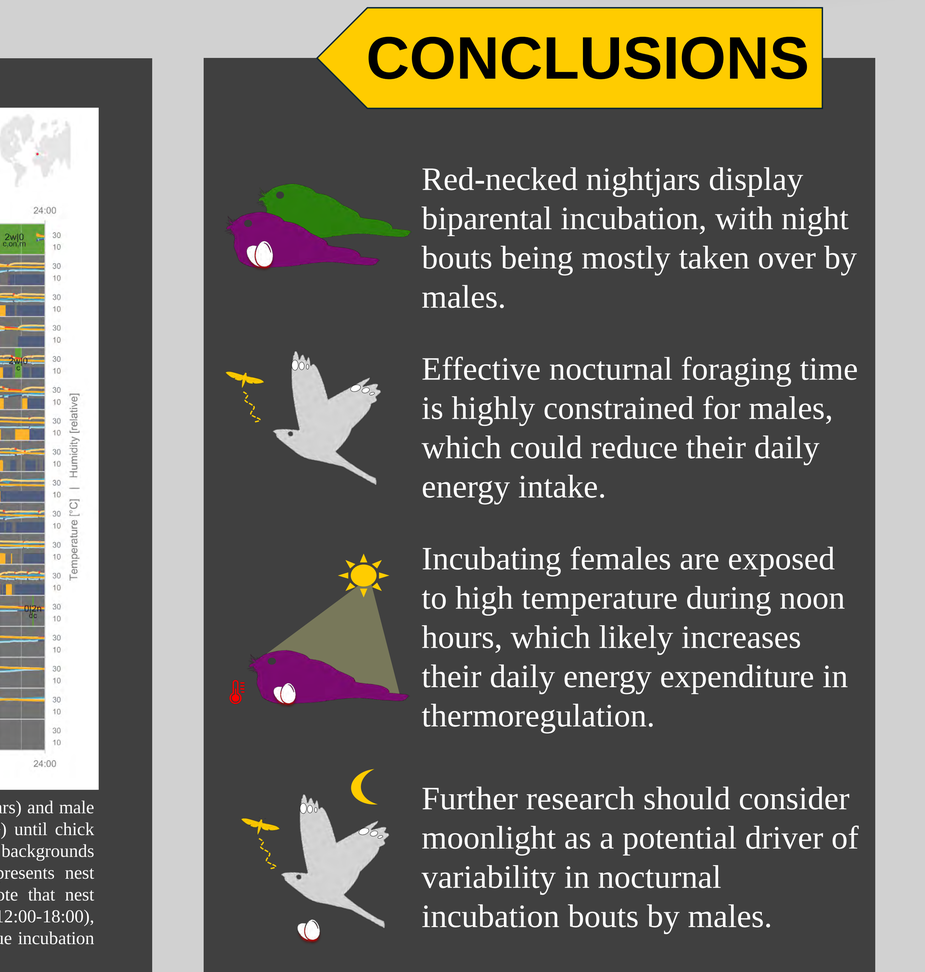
2. The **egg-flotation test**[5] was conducted to ascertain **laying dates**.




3. MSR **temperature loggers** were **d**eployed in nests during the first half of the incubation period (day 1-10).




4. Incubating adults were mist-netted and tagged with **PIT tags** (0.09gr, Biomark) attached to the metal ring. **RFID** systems were installed in nests to record the **identity** of the incubating bird.



## PRELIMINARY RESULTS

- **MSR** (i.e. temperature) and **RFID** data were obtained for **27** and **15** nests, respectively.
- Red-necked nightjars display **biparental incubation**: female incubates during all day and both sexes during night.
- **Males** contributed **more** than females to night incubation doubts, though this pattern is dinamyc between and within breeding pairs.
- Nest **attendance** rate was **very high** (> 90 %). Incubation **recesses** were **scarce** and mostly restricted to **twilight**.
- During the hottest hours of the day, **nest temperature** was considerably **lower** than **ground temperature**.
- Midday ground temperature exceded 60º C for most nests, demonstrating that incubating females are exposed to extreme thermal conditions.




**Figure 1.** Representative actogram depicting the incubation bouts of a female (orange bars) and male (dark blue bars) nightjar at a single nest monitored from day 5 after laying (July 18th) until chick dispersal (July 30th). Each row represents a 24-h period. Dark grey, light grey and white backgrounds represent night, twilight and sunlight hours, respectively. The light orange line represents nest temperature, whereas the dark orange line depicts ground (control) temperature. Note that nest temperature remains lower than ground temperature during the hottest hours of the day (12:00-18:00), thus supporting the nest cooling behaviour of the incubating female. Please, note that true incubation recesses are likely only represented by bar gaps coinciding with red lines.

## CONCLUSIONS



Red-necked nightjars display biparental incubation, with night bouts being mostly taken over by males.



Effective nocturnal foraging time is highly constrained for males, which could reduce their daily energy intake.



Incubating females are exposed to high temperature during noon hours, which likely increases their daily energy expenditure in thermoregulation.



Further research should consider moonlight as a potential driver of variability in nocturnal incubation bouts by males.

## ACKNOWLEDGEMENTS

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## REFERENCES

[1]Dominoni et al. 2017 *Methods in Ecol. & Evol.*, [2]Bulla et al. 2016 *Nature*, [3]Braun & Huddleston. 2009 *Mol. Phylogenet. Evolution*, [4]Liebezeit et al. 2007 *Condor.*