REPORT FROM A BOU-FUNDED PROJECT

Henderson, I., Hunter, D. & Conway, G. 2018. Comparing moth abundance between the breeding and foraging locations of the European Nightjar *Caprimulgus europaeus*, in Thetford Forest A BOU-funded project report. BOU, Peterborough, UK.

Ian Henderson and Greg Conway were awarded £1,636 by the BOU in 2016.

Comparing moth abundance between the breeding and foraging locations of the European Nightjar *Caprimulgus europaeus*, in Thetford Forest

IAN HENDERSON[1], DAVID HUNTER[2] & GREG CONWAY[1]

[1] British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK

[2] Centre for Wildlife Assessment and Conservation, School of Biological Sciences, University of Reading RG6 6AS, UK

* ian.henderson@bto.org

BACKGROUND

Despite a national population recovery (Conway & Henderson, 2005), the Breckland population of Nightjars in Norfolk has declined since 2004 from 349 churring males in the 2007 to 240 in 2010. The reasons for this decline are uncertain, but may be related to breeding habitat availability within Thetford Forest and/or food availability. The nest nearest neighbour distances of Nightjars in Thetford Forest are low compared to a breeding site at Dersingham Bog, also in Norfolk, suggesting that the breeding habitat of Thetford Forest may not be saturated. Meanwhile, a tracking study of Nightjars in the Brecks shows that birds consistently travel off the forest, to semi-natural habitats, such as grass-heathland, that occur nearby (Fig. 1). The assumption is that the birds are traveling to the grass-heathlands to exploit more abundant or more accessible prey – principally moths – our working hypothesis. This study set out to compare relative moth abundance between the forest breeding habitat and the adjacent grass-heathland. A previous study of the same Nightjar population had concluded there was no significant difference between these two habitats in terms of moth biomass (Sharps et al. 2015), though the results, in fact, indicated that a difference may occur. This inconsistency and our Nightjar tracking work therefore underpinned our working hypothesis, and so we compared relative moth abundance, body-volume (as an index of 'biomass') and species richness between the forest and grass-heathland habitats (for greater detail see Hunter 2016).

METHODS

The study took place in Thetford Forest and an adjacent grass-heathland (52.4°N, 0.6°E) (Fig. 1). Moth sampling was conducted in two clear-fell areas of the forest known to hold breeding Nightjars, including birds that had been tracked to the specific grass-heathland in previous years. The heathland habitat adjoined the southern edge of the forests and primarily consist of a community category known as CG7, that is *Festuca ovina-Hieracium pilosella-Thymus praecox pulegioides* grassland (with *Cladonia* spp. sub community) (Rodwell, 1992), but as 'Brecklands Heath' (JNCC, 2016) it included *Astragalus danicus* and small, interspersed patches of *Calluna vulgaris*. During the project (summer 2016) the grass-heathland was ~20cm grass height and under only light grazing by sheep.

For the sampling regime, eight 15W actinic 'heath moth traps' were allocated between one forest site (Site 1 – four traps) and the heathland, then later between two forest types (sites 1 & 3 - two traps each) and the heathland (four traps) (Fig. 1). Traps were placed at least 30m apart, and moved according to a random number square 20x20m on a weekly basis. Each trap was equipped with a data logger which

Henderson, I., Hunter, D. & Conway, G. 2018. Comparing moth abundance between the breeding and foraging locations of the European Nightjar *Caprimulgus europaeus*, in Thetford Forest A BOU-funded project report. BOU, Peterborough, UK.

Ian Henderson and Greg Conway were awarded £1,636 by the BOU in 2016.

Figure 1. A map of the survey area for moth trapping over three locations. (Site 1 = Woodland Site 1, Site 2 = Heathland, Site 3 = Woodland Site 2). Also plotted are tracks of Nightjars traveling to the nearby grass-heathland – red lines.

recorded temperature and either light levels or humidity. Precipitation, wind speed and cloud cover were obtained from a meteorological station approximately 5km away. Weekly vegetation surveys were taken from the surrounding 3m diameter of area traps. Moth samples were retrieved from the traps between the hours of 03:30 and 08:30, to reduce losses. Moths unidentified in the field were collected, refrigerated, identified and later released. A sample of individual moth species was taken to a measure body volume as an indirect index of biomass. The data were analysed using General Linear Models among others tests.

Henderson, I., Hunter, D. & Conway, G. 2018. Comparing moth abundance between the breeding and foraging locations of the European Nightjar *Caprimulgus europaeus*, in Thetford Forest A BOU-funded project report. BOU, Peterborough, UK.

Ian Henderson and Greg Conway were awarded £1,636 by the BOU in 2016.

RESULTS

Over the course of 51 separate sampling days, between late May and early August, over the three study sites, 2,049 moths were recorded (1,266 macro moths (61.6%), 795 micro moths (38.4%). Heathland had significantly higher values of moth abundance ($F_{2, 35}$ = 9.14, *P* <0.001; Fig. 2) and moth volume. Macromoth abundance was consistently higher in the heathland site traps, followed by woodland site 1. There were differences between forest site 1 and 2 that suggested the vegetation composition of the forest compartment will also affects moth availability. Macro moth abundance varied with temperature, abundance of other invertebrates, and rain. Micromoth abundance did not vary significantly with location, but varied significantly with temperature and field layer vegetation height. Grass-heathland had around 65% higher macromoth biomass (body volume) and on average almost twice the average abundance (macromoths made up over 60% of the moth samples samples), sometime three times the abundance.

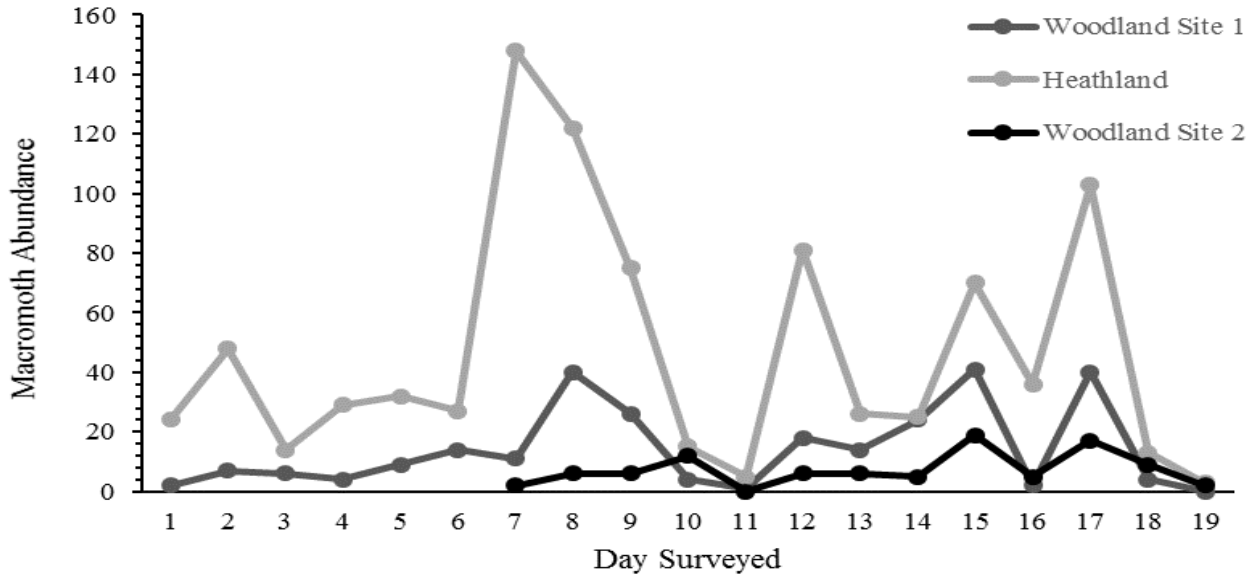

Figure 2. Moth abundance across three sampling locations caught in heathland moth traps over 19 separate sampling days (n trap days = 51; n moths = 2049).

The average number of species caught per trap was inconsistent, but overall was greater in the two woodland sites than in the grass-heathland site.

Henderson, I., Hunter, D. & Conway, G. 2018. Comparing moth abundance between the breeding and foraging locations of the European Nightjar *Caprimulgus europaeus*, in Thetford Forest A BOU-funded project report. BOU, Peterborough, UK.

Ian Henderson and Greg Conway were awarded £1,636 by the BOU in 2016.

CONCLUSIONS

This small test study, of limited scale and coverage of Breckland Nightjar habitats, nevertheless demonstrated that the non-forest grass-heathland had almost twice the average abundance of the moths (especially noctuid macromoths) and significantly higher overall moth biomass. The forest habitats supported a higher species richness of moths, probably because the grass-heathland was relatively uniform in character compared to the forest compartments which were more varied in floral structure and composition. But in terms of sheer biomass, it is likely that grass-heathland provides significantly more efficient foraging for the Nightjars than the two breeding compartments sampled on the forest and the results are consistent with our working hypothesis that the Nightjars visit non-forest habitats to exploit more abundant food resources.

Further work would benefit from representation across a greater range of Nightjar breeding and semi-natural foraging habitats. Understanding differences in the resource provision of different forest compartments will help understand interactions between management and environmental variables that affect resource change over time. Thus, further research should distinguish differences in moth abundance between forest compartments or rides with different management structures or field-layer compositions. It would be interesting to track trends in moth resources over time to understand the potential significance of food resource accessibility or availability on determining settlement decisions, foraging patterns, breeding densities and population trends in Nightjars.

ACKOWLEDGEMENTS

We would like to thank both the Forestry Commission and the Elveden Estate for allowing access to their land, and Graham Geen (BTO) for fieldwork support and moth advice. We would also like to thank the BOU for kindly providing a grant in support of the work.

REFERENCES

Conway, G., Wotton, S., Henderson, I., Langston, R., Drewitt, A. and Currie, F. 2007. Status and distribution of European Nightjars *Caprimulgus europaeus* in the UK in 2004. *Bird Study* 54: 98-111.

Hunter, S, 20016. Comparing moth abundance between European nightjar (*Caprimulgus europaeus*) breeding and foraging locations in relation to nesting density, habitat type and temperature. MSc Thesis. University of Reading.

Jncc.defra.gov.uk. 2016. *Breckland*. [online] Available at: http://jncc.defra.gov.uk/default.aspx?page=2016 [Accessed 14 Sep. 2016].

Rodwell, J. S. (ed.) 1992. *British Plant Communities. Volume 3. Grassland and montane communities*. Cambridge University Press.

Sharps, K., Henderson, I., Conway, G., Armour-Chelu, N. and Dolman, P. 2015. Home-range size and habitat use of European Nightjars *Caprimulgus europaeus* nesting in a complex plantation-forest landscape. *Ibis* 157(2): 260-272.