Micro-moths in bird nests

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Birds as ecosystem engineers

Bird nests are ubiquitous but remarkably little is known about the diverse invertebrate communities they support. Globally, eighteen insect orders contain species associated with bird nests (Hicks, 1959) and a single study of urban nests in England documented over 120 insect species (Woodroffe, 1953). These invertebrates are mostly detritivorous, feeding on feathers, animal remains, faeces and dried plant matter.

Moths (Lepidoptera) are particularly frequent and species-rich occupants of bird nests but their natural history is poorly understood and some misapprehensions remain. For example, it was thought the common clothes moth *Tineola bisselliella* infested houses via bird nests; however, it has recently been discovered this non-native species can be regarded as wholly synanthropic in Europe (Plarre, 2014).

In constructing nests, birds act as ecosystem engineers: organisms that create habitat and modify the resources available to other organisms (Jones, Lawton & Shachak, 1994). Variations in the location, structure, materials and resources of nests are expected to lead to specialisation. However, no studies have explored these associations in a quantitative and systematic manner.

Figure 1: The storage of 250 bird nests. John Krebs Field Station, Oxfordshire. May 2016.

Methods: nests collected and rearing process

During January 2016, 224 nests (from 16 bird species) were collected from seven sites in mid-Wales. The majority were nest box-dwelling but a handful of open-nesting species were included. The nests were stored individually in an unheated shed (Figure 1) until the following spring. From early May-late July, the nests were inspected and any adults were counted and removed.

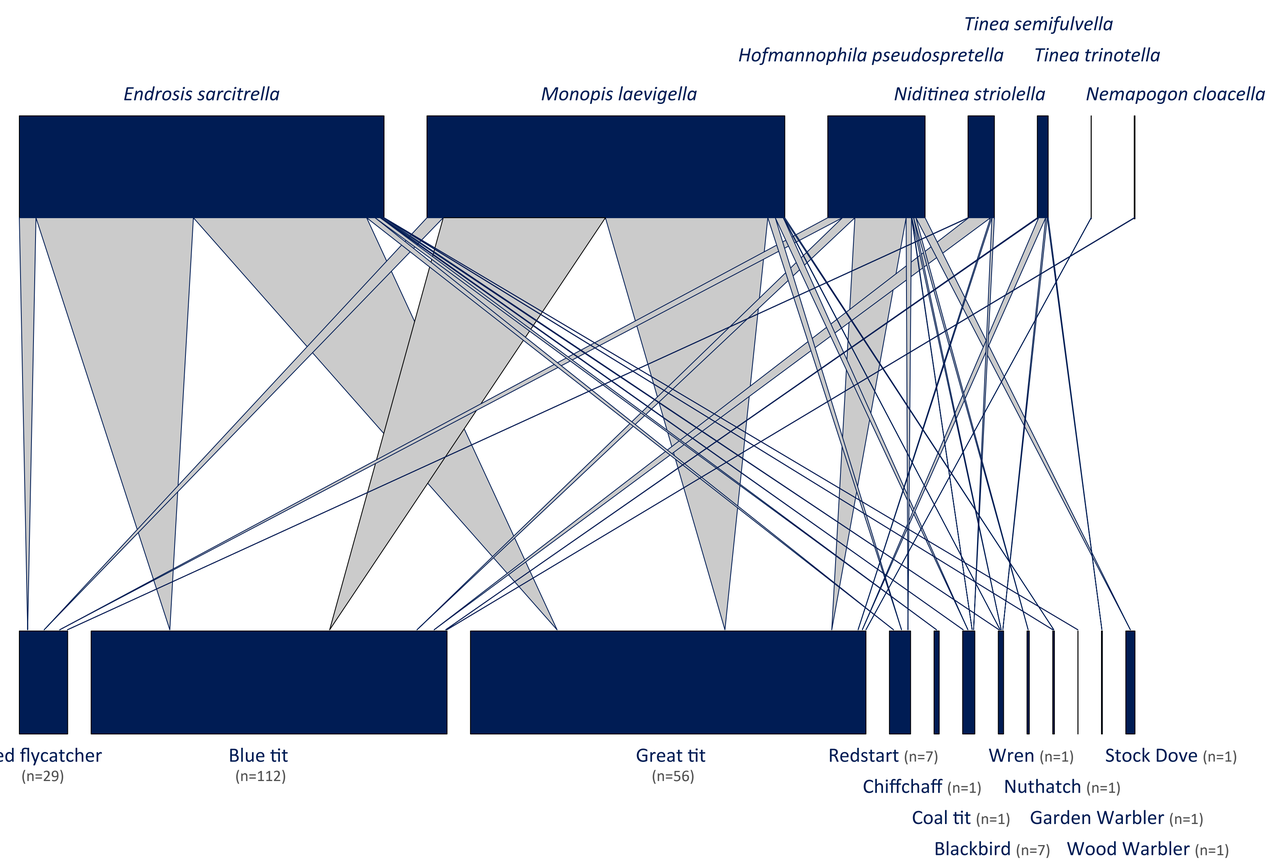
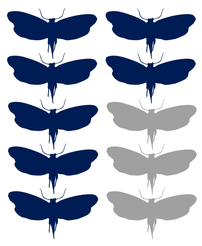


Figure 2: An interaction network showing the frequency of interactions between moth species and the nests of different bird species.

Selected results on the ecology of the system

Some nests contained no moths, while hundreds of individuals emerged from others. None of the measured nest attributes convincingly explained this variation (the best generalised linear models had very low McFadden R^2 values).

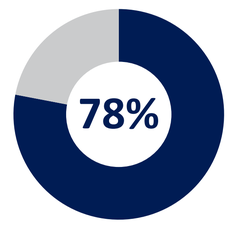


10 species

Of which 3 occurred by chance (life history not linked to bird nests).

4,657

individual moths



of nests supported moths

Only three moth species were common to this study and the previous investigation (Woodroffe, 1953). This may be because different bird species were considered: Woodroffe's data were for pigeon and sparrow nests in an urban setting, rather than the woodland nests considered here.

Nests were dominated by generalists

Despite the presence of several bird nest specialists, generalist detritivore moths made up 95% of total abundance and all species had low d' specialisation index values. Bird nests are patchy and unpredictable resources, something which selects for generalist life history strategies (Southwood, 1977).

Moths preferred closed nests

Abundance and mean presence was significantly higher in nests from boxes, compared to nests constructed in the open (Figure 3). This may be because closed nests are sheltered and retain more organic matter (more food for larvae). Only one species – *Tinea semifulvella* - preferred open nests, which could be a strategy to avoid inter-specific competition.

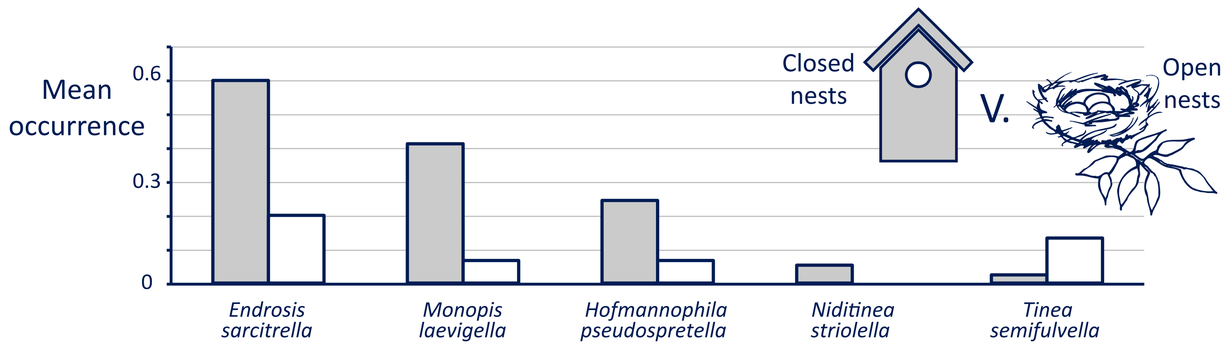


Figure 3: The mean value for presence across different species in both closed and open nests.

Novel natural history observations

- Perceived scarcity of *Niditinea striolella* is likely to be an artefact of its reluctance to disperse.
- First recorded occurrence of *Nemapogon cloacella* from a nest.
- No clothes moths were found, suggesting their occurrence in bird nests (away from urban centres) may have been overstated.

Acknowledgements

We thank Ada Grabowska-Zhang and Natasja van Gestel for advice on data analysis and Paul Roughley for help locating and collecting nests. Montgomeryshire Wildlife Trust gave permission to collect nests from their reserves. Clare and Simon Boyes provided patient support, even in the face of the unexpected flea infestation of their house.

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