



LEPIDOPTERAN LODGERS: RECORDING MOTHS FROM BIRD NESTS

by Douglas Boyes

Very hungry caterpillars

Acaterpillar munching on a leaf is probably what comes to mind when most people picture the early life stages of butterflies and moths. But if Eric Carle's classic, *The Very Hungry Caterpillar*, is to be believed, caterpillars have a much more varied palette. It is certainly true that many species shun the conventional diet of leafy greens, even if lepidopterans that enjoy a diet of chocolate cake and Swiss cheese are confined to children's storybooks.

Take *Cryptoses choloepi*, a pyralid moth found in the forests of South America. The caterpillars of this species feed exclusively on sloth droppings (Waage & Montgomery, 1976). Or *Hyposmocoma molluscivora*, which spins silk to ensnare passing snails (Rubinoff & Haines, 2005). Some species have to be quick. In Hawaii, a number of pug

moths *Eupithecia* spp. eat flies. These caterpillars patiently adopt a twig-like posture, ready to strike when one lands nearby (Montgomery, 1983).

There's no need to venture to the tropics to find weird and wonderful feeding strategies. Look no further than the remarkable china-mark moths Acentropinae, whose aquatic larvae feed on pondweed in waterbodies throughout the UK. A sizeable number of British species manage to obtain their sustenance from dead wood, while a couple have specialised on beeswax. As testament to how difficult it is to extract nutrients from honeycomb, the larvae of Greater Wax Moth *Galleria mellonella* can also break down plastics (Bombelli, Howe & Bertocchini, 2017).

Given this wide array of feeding strategies, it may come as no surprise that some moths have taken to living in bird nests.





The contents of several nest boxes.
Middletown, Montgomeryshire, October
2013 (Photo: D. Boyes).



Two easily identified bird nest tineids,
Tinea semifulvella (facing page) and
T. trinotella (above)
(Photos: D. Boyes).

An unlikely home?

Moths are not the only lodgers in bird nests; 17 other invertebrate orders have been found living in nests globally (Hicks, 1959) and a single study in England documented over 120 different arthropod species (Woodroffe, 1953). A nest full of hungry beaks would appear to be a rather perilous living arrangement for most insects. What can make living in the home of a predator worthwhile?

At first glance, bird nests might not seem that special. But to invertebrates, they represent a veritable trove of organic detritus: from nesting materials, such as dried leaves and moss, to feathers and nutrient-rich guano. Even the birds themselves may be food, both dead and alive (depending on whether you're a decomposer or a parasite).

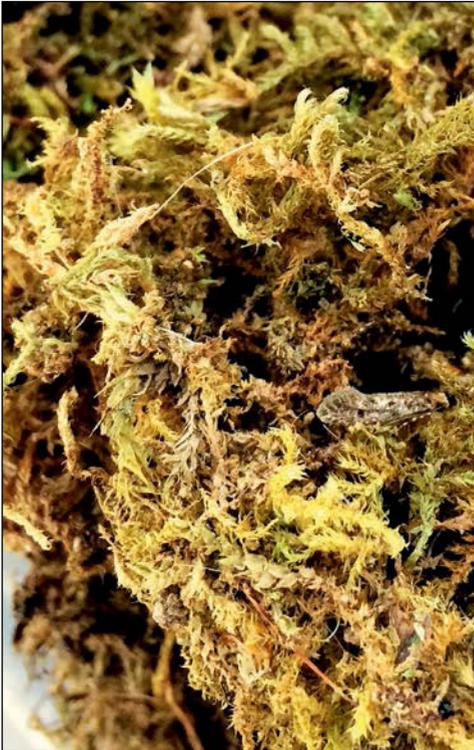
It's thanks to this varied assortment of resources—concentrated in one spot—that nests are able to support such diverse communities. On top of this, bird nests tend to be sheltered and are often relatively warm, especially while chicks are being incubated (Sinclair & Chown, 2006)—all the makings of an invertebrate's paradise.

The buffet inadvertently laid out by birds clearly benefits the invertebrates. But is this relationship ever mutually beneficial? Perhaps. Some lodgers may pay their way by recycling waste materials, helping to keep the nest clean. It's also possible that birds enjoy a reduced level of parasitism if their nest contains a diverse community of invertebrates, as these will tend to include predatory species that help keep the number of fleas and mites low (Hanmer *et al.*, 2017). Tree hollows, the natural analogues to artificial boxes, may be especially rich in these beneficial invertebrates, as these have faster rates of detritus decomposition and fewer ectoparasites (Hebda, Kandziora & Mitrus, 2017).

Learning more

It was back in 2013 when I first looked for moths in bird nests. I saw my parents cleaning out the garden nest boxes and seized the opportunity to find out about this unusual group. I simply put the material from six tit nests in a plastic tub. The following spring it was alive with adult moths from five different species (*Monopis laevigella*, *Endrosis sarcitrella*, *Hofmannophila pseudopretella*, *Niditinea striolella* and *Nemapogon koenigi*).

A couple of years later I took it up a notch and collected around 250 bird nests. This was to form my undergraduate research project. Having just completed Part I of my finals, the following summer consisted largely of drinking Pimm's, going punting, and counting the thousands of moths that emerged (though not necessarily all at the same time).



The findings of that project have been covered elsewhere (see Boyes, 2018; Boyes & Lewis, 2018). So instead of repeating those results here, I thought it would be more useful to explain the general methods; a 'how to' guide, if you like. I'll then mention some of the moths that might turn up. I hope this will prove helpful and perhaps encourage a few people to give it a go.

I wanted to do quantitative analysis for my dissertation, so I gathered enough nests to fill a shed. Obviously, there's no need to collect so many. My earlier rearing exercise shows that looking at a small handful of nests can still be rewarding.



Niditinea striolella are exceptionally well-camouflaged in nest material (Photos: D. Boyes).

REARING MOTHS FROM BIRD NESTS: SOME POINTERS

Sourcing nests

Songbird nests can be collected any time after the chicks are fully fledged (a new nest is built each season). In practice, it's usually fine to collect these nests from October up until the end of January. As most of you will know, it is an offence under the Wildlife and Countryside Act 1981 to interfere with the nest of any wild bird while it's in use.

Artificial nest boxes are the easiest way to obtain nests. Those erected at breast height are ideal, as this saves faffing about with a ladder. Nature reserves typically have a high density of boxes. Get permission from the landowner first—this is unlikely to be a challenge; most nest boxes are routinely emptied each winter so you're probably going to be saving someone a job.

Of course, the vast majority of British birds don't regularly breed in nest boxes. I was lucky to be in an area with lots of Pied Flycatcher *Ficedula hypoleuca* and Redstart *Phoenicurus phoenicurus*; however, for much of the UK, nest boxes will be overwhelmingly occupied by Great Tit *Parus major* and Blue Tit *Cyanistes caeruleus*. It often requires a bit more effort to get a wider variety of nest types. Lots of species take sanctuary in hedges or dense undergrowth. These nests can become conspicuous in the depths of winter.

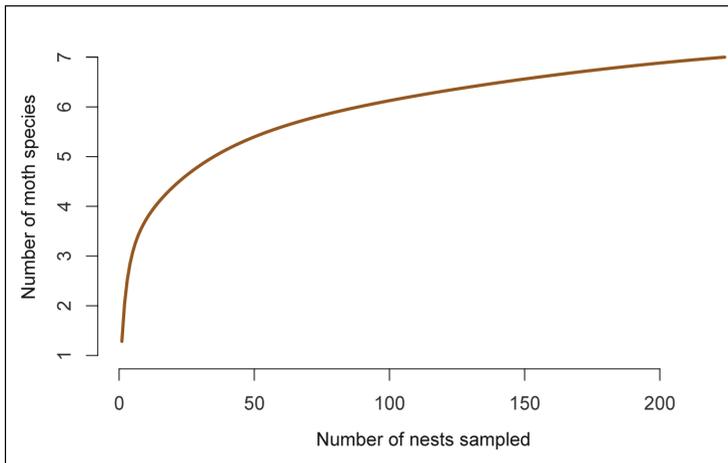


Figure 1. Species discovery curve for my undergraduate project data. This shows the total number of moth species expected when a given number of bird nests are collected. A small handful of nests is most likely to yield 1–3 moth species but it may require collecting increasingly more nests to find additional species.

How many nests?

I had initially sourced 500 nests but storage space quickly became an issue. To save space (and reduce effort), material from lots of nests can be aggregated in a single large container; although I think it's preferable to keep each nest separate. This way you can get an idea of how many moths are living in a single nest and see if specific types of nest have different moth species.

The good news is even if you only collect one nest, it will probably contain bird nest moths (around three-quarters of my nests contained at least one species). It's not unusual for a single nest to contain several species but it's essentially a lucky dip. My project data suggests it may be necessary to collect a fair few to have a good chance of recording the more unusual species.





Collecting material from nest boxes on Boxing Day. Dolforwyn Woods, Montgomeryshire, December 2015 (Photo: C. Boyes).

Collecting the nest material

Even over the winter, nests are teeming with life. The lepidopteran inhabitants are not typically conspicuous (save the odd caterpillar), but there is plenty to keep an all-round naturalist entertained. Beetles, flies, earwigs, spiders, centipedes, millipedes, evidence of bee and wasp nests—no doubt pseudoscorpions and all manner of other minuscule critters too.

Unfortunately, there is sometimes unwelcome company when gathering nests. Bird fleas are one of the most prolific inhabitants of nest boxes and quite literally leap out of hibernation on sensing vibrations from an approaching warm-blooded animal. Thankfully, they can't survive long without an avian host so are no more than a mild irritant. Disposable overalls and gloves can prevent the itchy bites. In the end, I found it easier to wear shorts and a t-shirt, flicking the

fleas off when I felt them crawling on my skin.

A potentially more serious hazard is fungal spores. If inhaled, some can cause nasty respiratory problems and I had to wear a respirator for my undergraduate project. In my own time, I would instead opt to minimise the risk by only handling nests in well-ventilated areas and taking care to avoid getting my face too close to nest material.

For nest boxes, the entire contents can just be scooped out. Any container will do. I found paper bags easiest to work with in the field (these can be sealed by folding several times and securing with clips). Some nests will be bone dry, others soaked through. For wet nests, placing the paper bags on an old towel is an effective way to soak up excess moisture (although these should not be dried out completely).



Handling nests for my undergraduate project.

Perhaps you can be too careful after all...
(Photo: J. Jaffe).

Nests in paper bags, shortly after being collected. Middletown, Montgomeryshire, January 2016 (Photo: D. Boyes).



Storing nests until emergence

To make it easier to observe the insects, I transferred nests into plastic boxes, similar to the type used for Chinese takeaways. A sealed container is liable to a build-up of condensation, so a large hole should be made in the lid. To prevent insects escaping, secure a sheet of fine mesh under the lid so it is taut.

Store the nests in a shed, or similar. This should be unheated, with little direct sunlight.

The nests can now be forgotten until the spring. Adults will begin to appear from mid-April to early May. Around this time it is worth checking on the nests at least once every two to three days. The emergence can be fairly drawn-out and some species appear several weeks later than others.



Nests in plastic containers ready for emergence. John Krebs Field Station, Wytham, May 2016
(Photo: D. Boyes).



The usual suspects

The most frequent moths in nest boxes are **Skin Moth** *Monopis laevigella*, **White-shouldered House-moth** *Endrosis sarcitrella* and the wonderfully-named **Brown House-moth** *Hofmannophila pseudospretella*. A single nest can contain several hundred individuals of these species. They all feed on detritus in situations not limited to bird nests (as suggested by the common names).

Other species that might be expected include *Tinea semifulvella* and *T. trinotella*, both of which will be familiar to avid moth-trappers as they readily come to light. Conversely, *Niditinea striolella* seems rather secretive (and can only be identified from genitalia) but can be common in nest boxes so is probably rather overlooked.

There are quite a number of scarce species that are said to be associated with bird nests. Examples include the strikingly-marked **Tapestry Moth** *Trichophaga tapetzella*, as well as the much more nondescript *Tinea columbariella* and *T. dubiella*.

The nests of raptors are thought to be home to a unique community of scavenging invertebrates that exploit scraps of dead animal. *Monopis fenestratella*, which has only been recorded in Britain on a few occasions, may be one such example (Jaworski, Gryz & Buszko, 2011). Unlike in songbirds, the nests of bird of prey are reused season to season so the opportunity to study their fauna is rare. Collecting the pellets of these birds may be an effective way to rear the specialists that consume animal detritus.

Nests in built-up areas may also host a slightly different group of species. These can contain clothes moths that are not originally native to Europe and don't occur naturally in bird nests here. The most infamous species, *Tineola bisselliella*, serves as an exemplar. This much-hated pest was probably accidentally imported from Africa during the nineteenth century (Plarre & Krüger-Carstensen, 2011) and now reaches such a high density when chewing through our jumpers that they sometimes spill out into nearby bird nests (Plarre, 2014).



Tapestry Moth

Trichophaga tapetzella.
Casares, Malaga Province,
Andalucia, Spain, 31 October
2018 (Photo: D.G. Grundy).



Tinea columbariella.

Sapcote, Leicestershire,
25 June 2018 (Photo: G.
Callow).



White-shouldered House-moth

Endrosis sarcitrella blending into the nest material
(Photo: D. Boyes).

Conclusions

The detritus-eating moths are a fascinating group. In Britain, around 20 such species are supposedly found in bird nests. However, most of these are poorly understood and the majority appear to be quite rare. As with most microlepidoptera, these species are easiest to study through their early life stages. Some will regularly show up in moth-traps but many do not.

These moths can be easily reared by putting old bird nests in a sealed container—the only difficult thing is remembering to check for adults in the spring! This is a great activity to do over the winter when there’s not much else going on. Any resulting records will no doubt be greatly appreciated by your County Moth Recorder (you might even find species that are new for your vice-county). If you give it a go, feel free to get in touch with any queries and do let me know how you get on. Good luck!



Skin Moth

Monopis laevigella is one of the most abundant bird nest moths (Photo: D. Boyes).

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