Wyre Forest Study Group

Nocturnal Migration

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My gradual awareness of NocMig (Nocturnal Migration) grew out of my interest in bats over the past several years. I have been trying to survey and identify different bat species by staring at their echolocation spectrograms until my eyes went square. To do this, I used every ultrasonic recorder I could get my hands on; passive acoustic recorders that you abandon in a field like forgotten Tupperware, and handheld detectors you wave around like a ghost hunter who has taken a wrong turn into ecology. Over the years, my collection of acoustic gadgets has grown in perfect proportion to my obsession. It is basically Pokémon, but for acoustic equipment.

During spring, summer, and autumn, I collect tens of thousands of recordings that might contain bat calls. At this point, I am pretty sure I have spent more time listening to ultrasonic noise than is medically advisable. All these files must be analysed with specialist software that sorts the "maybe bats" from the "definitely not bats." Spoiler: most of them are "definitely not bats." They're the acoustic equivalent of spam email.

But then I started checking some of these "noise" files manually because, apparently, I do not value my free time, and something weird popped up. Many of them had ultrasonic calls that were far too low for bats. After a bit head scratching and research (and several sessions of sitting in a dark corner), I realised they were probably bird contact calls. Not the cheerful daytime songs we all know, but the secret, slightly passive-aggressive noises birds make to each other in the dark. Many were between 5 and 20 kHz — technically audible to young humans with healthy hearing, but only if the bird is shouting directly into your ear, which they rarely do while flying overhead at 2 a.m.

Because these recordings were happening at night — prime bat o'clock — it eventually dawned on me that I might be picking up birds flying in the dark, possibly migrating. And, since UK bats tend to spend winter tucked up in hibernation like tiny goth hedgehogs, I realised my recorders had a whole new purpose: eavesdropping on nocturnal bird migration. Congratulations, I had accidentally reinvented my hobby.

NocMig – A Brief History

This whole approach — NocMig, or Nocturnal Migration Monitoring using sound — is still a relatively new field. People have known birds migrate at night since the 19th century, but early methods involved staring at the moon until your neck hurt or counting how many birds flew into lighthouses (not ideal for the birds, or the lighthouse keepers). More recently, radar and wind turbine casualties have added to the picture. I got to see radar ornithology in action during my RAF days, which felt very high-tech compared to "look at the moon and hope."

Then affordable digital audio recorders came along and changed everything. Suddenly, anyone with a recorder and a questionable sleep schedule could collect nocturnal flight calls. By the 2010s, people across Europe and North America were sharing standardised overnight recording methods, and the number of datasets exploded. Finally, we started comparing inland and coastal migration patterns on a big scale. These days, NocMig sits comfortably alongside radar, ringing, and visual migration counts — like the slightly eccentric cousin who shows up with a microphone and says, "I heard something interesting last night…"

Current Applications of NocMig Data

NocMig datasets now contribute to several areas of ecological research and conservation practice:

Seasonal Patterns and Migration Dynamics

Continuous overnight acoustic recording provides a robust dataset for examining the seasonal and behavioural patterns of nocturnally migrating birds. By capturing calls throughout the night and across the full migration seasons, it becomes possible to quantify several key aspects of migratory behaviour:

Migration timing – including the first detectable arrivals, peak passage periods, and final departures. These seasonal markers help define the onset, progression, and conclusion of migration for individual species and can reveal year-to-year shifts in phenology.

Nocturnal movement intensity - typically measured as call rate per hour or per night. This metric offers an estimation for the volume of birds moving overhead, enabling comparisons between nights, seasons, and species. It also helps identify major passage events, stopover dynamics, and periods of heightened migratory activity.

Weather-dependent variation is just about how birds react to whatever the sky is doing. Wind, cloud cover, visibility, temperature, rain — they all play a part. Birds are not just drifting around at random; they're constantly reading the weather and making decisions.

You will often see big movements when there is a helpful tailwind, for example, or hear more calls on cloudy nights when birds rely less on the stars.

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Once you start paying attention to these patterns, you can predict some movements with surprising accuracy.

Putting all these metrics together, you start to get a really rich picture of how birds behave across the seasons. They help us see how the timing of migration is changing as the climate shifts, how different species react to things like wind or temperature, and even how bigger ecological factors — like food availability or changes in habitat — might be nudging birds to adjust their strategies over time.

In other words, these numbers are not just data points; they are clues that help us understand the bigger story of how birds are adapting to a changing world.

Species Detection and Distribution

NocMig is particularly effective:

Waders are a great example of birds that reveal far more at night than we ever notice during the day. In the Midlands, it is very possible that species like Whimbrel, Curlew, Snipe (with those sharp "chipping" calls), various Sandpipers, and even the occasional Golden Plover in autumn and winter can all show up far more often on nocturnal recordings than in daytime field sightings.

Then there are the thrushes and other passerines with distinctive nocturnal flight calls. Many small migrants give short, repeated calls as they travel at night, and these are often so consistent and recognisable that they're perfect for NocMig work.

Thrushes are wonderfully reliable. Redwing (Figure 1), Song Thrush, Blackbird, Fieldfare, and Mistle Thrush each have their own signature call — different pitches, different rhythms, different shapes on the spectrogram — which means you can identify them confidently even when they are flying high above you in total darkness.

And, as a little aside, it was probably the challenge of tracking Redwing migration at night that helped push early NocMig techniques forward. They are still one of the stars of the show today.

Collectively, waterbirds and rails add an important dimension to NocMig datasets. They highlight the hidden movements of species that are often overlooked in standard migration monitoring, and they help build a more complete picture of how wetland-associated birds use the landscape at night. These birds are famously secretive during the day, but at night they can be surprisingly vocal. Moorhen, Coot, and Water Rail all produce distinctive, far-carrying calls during nocturnal flights. Picking up these sounds can give us clues about local breeding, autumn dispersal, and the occasional migratory movement that would be almost impossible to detect by sight alone.

Equipment and Recording Set-ups

When it comes to NocMig, the gear can be as simple or as sophisticated as you want. People use everything from the ubiquitous and affordable consumer recorders to full-blown research-grade systems, and they all have their place.

Recording Devices

There are many options including:

Smartphones

If you are just starting out with NocMig, you honestly don't need anything fancy. Your smartphone is already a surprisingly capable little recorder. The built-in mics on modern phones have improved greatly and simply leaving your phone running in the garden for an hour or two after dark can pick up more night-flying birds than you might expect. Pair it with one of the many recording apps out there and you have suddenly got a perfectly decent entry-level setup.



Figure 1. Diagnostic sonogram of nocturnal migrating Redwing.
Steve Horton



Figure 2. Nocturnal migrating call of Water Rail. Steve Horton

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Handheld digital recorders

If you want to step things up a notch, handheld digital recorders are the next natural stop. Tascam and Zoom models are the usual favourites — they are reliable, offer good sampling rates, and are easy to place in the garden or take out into the field. And, if you do not fancy paying full price, places like eBay often have second-hand units going for a fraction of the cost.

Passive or static recording units

Then you have passive or static recording units — the weatherproof, leave-them-out-for-days kind of kit. These are brilliant if you want to record on a schedule or monitor a site over a longer period. Entry-level devices like AudioMoth or π•pipistrelle are surprisingly affordable, though you will want a weatherproof case unless you enjoy rescuing soggy electronics. More advanced units exist too, but they can get pricey quickly.

A word of caution: When Static recorders are deployed for days or weeks at a time, it is important to interpret the resulting number of records with caution. Depending where sited, a static unit might, for example, have a solitary Mallard sitting directly in front of the microphone for several hours. Mallards are highly vocal birds, so the dataset could easily show 172 calls – but the real question is whether that represents 172 Mallards, or one very chatty individual making a right din as usual!

Software and Data Processing

Once you have got your recordings, the real fun begins. NocMig analysis is all about looking at sound visually, using spectrograms created through FFT (Fast Fourier Transform) processing. Adjusting things like window size lets you balance time and frequency detail so you can really tease out those faint calls.

Here are some of the tools people commonly use:

Audacity -

https://www.audacityteam.org/

A free favourite that runs on just about anything. You can customise the spectrogram view, scroll through your recordings, and mark-up anything that looks suspiciously bird-shaped.

Raven Pro -

https://www.ravensoundsoftware.com/ -

A more advanced, research-grade package with powerful measurement tools and the ability to batch-process recordings. Great if you are handling large datasets or want precise acoustic measurements.

Automated Classifiers - This is where machine learning steps in. Tools like BirdNET, Merlin Sound ID, and Chirpity are becoming really useful for screening recordings.

Chirpity (*www.chirpity.mattkirkland.co.uk*) is gaining traction for its clean interface and strong performance on nocturnal flight calls.

But — and this is important — they do not replace human judgement. Background noise, call variation, and overlapping sounds mean that manual verification is still essential, especially for tricky species. I would normally have the probability level set to 90%.

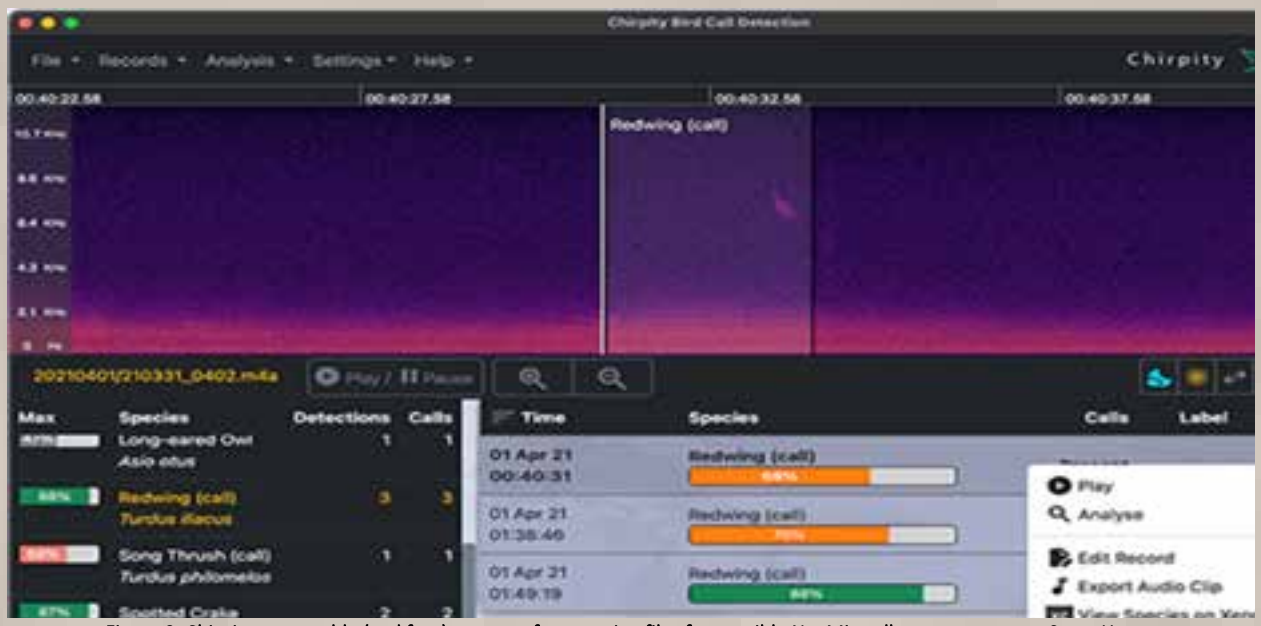


Figure 3. Chirpity – a capable (and free) program for scanning files for possible NocMig calls. Steve Horton

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Other important online NocMig resources

Two online platforms are absolute game-changers:

Xeno-Canto (*www.Xeno-Canto.org*) is the global library of bird sounds. If you're trying to figure out whether that faint "tsip" at 2:14 a.m. was a Redwing or a passing Meadow Pipit, Xeno-Canto is where you go to compare your clip with thousands of verified recordings from around the world.

Trektellen (*www.Trektellen.org*) is where you can share your NocMig results and see what others are picking up. It is brilliant for spotting migration patterns, comparing notes with other recorders, and getting a feel for what is moving through your region on any given night. It turns your garden recordings into part of a much bigger picture.

Additional Useful NocMig Resources

Merlin Bird ID app – *www.merlin.allaboutbirds.org*

Collins Bird Guide app

Books: - Identifying Migratory Birds by Sound - (Stanislas Wroza)

In summary, NocMig is one of the easiest, most rewarding ways to connect with bird migration — and you can do it from your own garden. There is something magical about stepping outside after dark, setting up a simple recorder, and discovering the hidden night-time journeys of birds you would never normally notice. Even a single evening can reveal Redwings, Song Thrushes, or the occasional surprise migrant slipping overhead while the rest of the world sleeps. It is low-effort, endlessly fascinating, and a brilliant way to feel part of the wider movement of wildlife passing through your patch.



Figure 4. NocMig recording sites in the UK. www.TrekTellen.org.