The Secret World of Moths: Our Essential Night-Shift Pollinators

Lime Hawk-moth

1. Deep Time and Diversity: Understanding the Moth

To understand the ecology of our countryside, we must first understand the sheer scale of the moth world. Moths and butterflies both belong to the insect order Lepidoptera (derived from the Greek for 'scale-wing'), meaning their wings are covered in thousands of microscopic, overlapping scales that create their intricate patterns, provide waterproofing, and insulate their bodies.

The True Masters of the Order

There is a common misconception that butterflies are the 'main' group and moths are merely a drab byproduct. Evolutionarily, the exact opposite is true. Out of the roughly 2,600 Lepidoptera species resident in the British Isles, fewer than 60 are butterflies. The remaining 2,500+ species are moths, split broadly into macro-moths (larger, stouter species like Hawk-moths and Noctuids) and micro-moths (tiny, delicate, often highly specialized leaf-miners and grass-moths). Moths took to the air over 200

million years ago—long before the first primitive flowering plants appeared, and roughly 100 million years before butterflies branched off from them as a daylight-seeking sub-group.

Built for the Dark: Key Adaptations

- **Feathery Antennae:** Unlike the simple, clubbed antennae of butterflies, many male moths possess complex, comb-like, or feathery antennae (pectinate). These act as ultra-sensitive chemical radars capable of picking up a single molecule of a female's mating pheromone from over a mile away.
- **The Thoracic Furnace:** Flying in the chill of a British night requires immense energy. While butterflies rely passively on the morning sun to warm up, many macro-moths pump their wings rapidly while resting to generate muscular friction, raising their core body temperature to over 30°C before taking off. Their thick, furry bodies are actually dense coats of modified scales designed to trap this hard-earned heat.
- **Acoustic Armor:** To survive the arrival of echolocating bats 50 million years ago, moths developed cutting-edge defense systems. Many species possess primitive 'ears' on their abdomens or thoraxes attuned precisely to ultrasound, allowing them to perform sudden, evasive spiraling dives when a bat locks onto them. Others, like the Tiger moths, emit their own ultrasonic clicks to jam the bat's sonar or warn that they taste highly toxic.

2. The Multi-Stage Lifecycle

A moth's ecological footprint changes dramatically as it transitions through four distinct life stages, each interacting with the local environment in a completely different way:

- **The Egg (Ova):** Laid precisely on specific 'host plants' that the future larvae can digest.
- **The Larva (Caterpillar):** The ultimate feeding machine. Caterpillars spend weeks consuming plant matter, shedding their skins (instars) several times as they grow exponentially. This is the stage where they convert vast fields of green leaves, grass, and decaying wood into highly nutritious protein for local ecosystems.
- **The Pupa (Chrysalis):** The transformation phase, usually spent buried safely in the soil, hidden in leaf litter, or spun into a silk cocoon fixed to a twig.
- **The Adult (Imago):** The final flying stage. While some adult moths lack mouthparts entirely and live for only a few days purely to mate (such as the giant Emperor and Lunar Hornet moths), the majority possess a long, straw-like tongue (proboscis) used to drink energy-rich nectar from plants, driving the engine of nocturnal pollination.

3. The Night Shift: A Critical Ecological Engine

While bees, hoverflies, and butterflies dominate our screens and conservation headlines, moths quietly underpin our entire countryside. They are the unsung heroes of the food web and the plant world.

The Food Web Foundation

- **The Blue Tit Metric:** A single brood of blue tit chicks requires up to 10,000 caterpillars (primarily moth larvae) in the few weeks between hatching and fledging. Without moths, our spring songbird populations would collapse.
- **Night Predation:** Adult moths are the primary food source for night-flying predators, particularly bats, nightjars, and owls.

The Power of Nocturnal Pollination

Recent groundbreaking research from UK universities (including UCL and Sheffield) has shattered the old myth that bees do all the heavy lifting. Moths play a massive, highly efficient role in keeping our ecosystems fertile.

- **The 15% Share:** While day-flying bees handle the vast majority of diurnal flower visits, nocturnal moths are responsible for roughly 15% of all pollination across flowering plants, trees, and wild crops. In urban and edge-of-town environments, this can spike to nearly one-third (33%) of all plant visits.
- **The 'Happy Accident' Efficiency:** University of Sussex studies show that moths are actually more efficient pollinators per visit than bees. While bees meticulously collect and clean pollen into baskets on their legs, moths have incredibly furry bodies. When a moth settles onto a flower to drink nectar, pollen sticks heavily to its chest (ventral thorax). When it flies to the next bloom, this pollen is easily and accidentally brushed off.
- **Diversity Back-Up:** Moths visit a completely different profile of plants than bees—frequently targeting pale, heavily scented night-bloomers, wild brambles, and woodland trees like sallows and oaks. They provide a critical genetic safety net for wild flora.

4. A Malmesbury Almanac: Our Local Moths Through the Seasons

Our unique local geography—where the Sherston Avon and Tetbury Avon collide to form a network of damp river valleys, cutting through ancient woodland borders and hawthorn hedgerows—supports a massive variety of macro-moths.

If you set up a light trap or walk with a torch in the local area, here is the full 12-month calendar of what you are most likely to find on the wing:

Spring Emergence (March – May)

Rank	Common Name	Scientific Name	Local Habitat / Notes
1	Common Quaker	*Orthosia cerasi*	Massively abundant; feeds on sallows and oaks.

2	Hebrew Character	*Orthosia gothica*	Unmistakeable black 'mark' on wing; ubiquitous.
3	Clouded Drab	*Orthosia incerta*	Highly variable in color, very common in early spring.
4	Early Grey	*Xylocampa areola*	Feeds on honeysuckle; often found resting on fence posts.
5	Twin-spotted Quaker	*Anorthoa munda*	Clean grey/brown wings with two distinct black dots.
6	Small Quaker	*Orthosia cruda*	Smallest of the Quakers, turns up in huge numbers in oak woods.
7	Brimstone Moth	*Opisthograptis luteolata*	Bright yellow; first generation peaks in May around hedgerows.
8	Early Thorn	*Selenia dentaria*	Rests with wings folded together tightly like a butterfly.
9	Muslin Moth	*Diaphora mendica*	Semi-translucent white/grey wings with black spotting.
10	Streamer	*Anticlea derivata*	Beautifully patterned; larvae feed on wild rose.
11	Flame Shoulder	*Ochropleura plecta*	Bold cream stripe along the top edge of a dark wing.
12	Garden Carpet	*Xanthorhoe fluctuata*	Familiar garden resident; dual-brooded starting in May.
13	Nut-tree Tussock	*Colocasia coryli*	Distinctive dark-banded forewings; hazel/birch feeder.
14	Powdered Quaker	*Orthosia gracilis*	Favors damp, low-lying meadows.
15	Shoulder Stripe	*Earophila badiata*	Intricately lined wood-feeder on the wing through April.
16	Shuttle-shaped Dart	*Agrotis puta*	Pale male, dark female; very common garden dart moth.
17	Waved Umber	*Menophra abruptaria*	Superb woody camouflage; larvae feed on privet and lilac.
18	Red-green Carpet	*Chloroclysta siterata*	Overwintered females emerge early to feed on sallow blossom.
19	Chocolate-tip	*Clostera curtula*	Distinct rich brown wingtips; poplars/willows breeder.
20	Lime Hawk-moth	*Mimas tiliae*	The first of the big spectacular hawk-moths to emerge in May.

Early Summer Peak (June – July)

Rank	Common Name	Scientific Name	Local Habitat / Notes
1	Heart and Dart	*Agrotis exclamationis*	Consistently the single most abundant moth in midsummer traps.
2	Large Yellow Underwing	*Noctua pronuba*	Heavy-bodied garden classic; flashes bright yellow in flight.
3	Riband Wave	*Idaea aversata*	Delicate, paper-like; the banded form is very common here.

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4	Flame Shoulder	*Ochropleura plecta*	Strong second generation numbers overlapping summer species.
5	Double Square-spot	*Xestia triangulum*	Pale brown with clear dark square markings on the wing.
6	Marbled Beauty	*Bryophila domestica*	Cryptic lichen-mimic; abundant on old stone walls and roofs.
7	Uncertain / Rustic	*Hoplodrina sp.*	Broad, plain brown moths that frequently fill summer trap bases.
8	Common Footman	*Eilema lurideola*	Rests rolled up like a tiny grey stick; feeds on tree lichens.
9	Bright-line Brown-eye	*Lacanobia oleracea*	Common garden 'pest' (larvae love tomato plants and nettles).
10	Snout	*Hypena proboscidalis*	Long palps create a 'snout'; highly abundant around nettle beds.
11	Elephant Hawk-moth	*Deilephila elpenor*	Stunning pink and olive; breeds heavily on willowherb and fuchsias.
12	Poplar Hawk-moth	*Laothoe populi*	Large, strangely shaped grey moth; highly attracted to light.
13	Buff-tip	*Phalera bucephala*	Flawless broken-birch-twig mimicry; very distinct.
14	Smoky Wainscot	*Mythimna impura*	Straw-colored; indicator of local damp grasses and reedbeds.
15	Dot Moth	*Melanchra persicariae*	Jet-black wings with a startling, brilliant white dot on each.
16	Dark Arches	*Apamea monoglypha*	Large, powerful, intricately patterned grass-feeder.
17	Willow Beauty	*Peribatodes rhomboidaria*	Mottled grey-brown geometer moth; highly variable.
18	Swallow-tailed Moth	*Ourapteryx sambucaria*	Huge, pale-yellow, elegant wings; looks like a butterfly at dusk.
19	Middle-barred Minor	*Oligia fasciuncula*	Small, brick-red or tawny grass moth; common in June pastures.
20	Green Carpet	*Colostygia pectinataria*	Freshly emerged specimens are a striking, bright emerald green.

Late Summer & Early Autumn (August – September)

Rank	Common Name	Scientific Name	Local Habitat / Notes
1	Setaceous Hebrew Character	*Xestia c-nigrum*	Huge autumn generation; dark wings with a pale rosy-cream notch.
2	Square-spot Rustic	*Xestia xanthographa*	Floods late August traps; variable brown with clean square spots.
3	Common Rustic / Lesser	*Mesapamea secalis/didyna*	Extremely common grass-feeders; impossible to split without a lens.
4	Vine's Rustic	*Hoplodrina ambigua*	Rapidly expanding north through Wiltshire; loves dry garden spaces.
5	Large Yellow Underwing	*Noctua pronuba*	Numbers peak again as a late-summer generation emerges.

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6	Lesser Broad-bordered	*Noctua janthe*	Striking orange hindwings hidden under beautiful violet-brown.
7	Lesser Yellow Underwing	*Noctua comes*	Slightly smaller and more variable cousin of the Large Yellow.
8	Copper Underwing / Svensson's	*Amphipyra pyramidea/berbera*	Large glossy-winged moths that hide in dark crevices by day.
9	Flounced Rustic	*Luperina testacea*	Pale sand-colored moth; larvae feed inside grass root-knots.
10	Light Emerald	*Campaea margaritaria*	Pale sea-green; a second brood frequently peaks in September.
11	Straw Dot	*Rivula sericealis*	Tiny, yellowish, highly common over wetland edge vegetation.
12	Centre-barred Sallow	*Atethmia centrago*	Beautiful pinkish-orange and yellow; larvae feed on ash seeds.
13	Sallow	*Cirrhia icteritia*	Bright yellow like an autumn leaf; breeds on willow catkins.
14	Pink-barred Sallow	*Xanthia togata*	Bright purple-pink bands across golden-yellow wings.
15	Canary-shouldered Thorn	*Ennomos alniaria*	Bright canary-yellow furry body; highly distinctive woodland geometer.
16	Burnished Brass	*Diachrysia chrysitis*	Spectacular metallic, brass-green panels that reflect torchlight.
17	Silver Y	*Autographa gamma*	Migrant species; numbers swell heavily by late summer in gardens.
18	Rosy Rustic	*Hydraecia micacea*	Soft pinkish-brown hues; larvae drill into dock and potato stems.
19	Angle Shades	*Phlogophora meticulosa*	Folded wing shape looks like a crisp autumn leaf; flies all year.
20	Frosted Orange	*Gortyna flavago*	Beautifully marked orange/gold; larvae breed inside thistle stems.

Mid-Autumn to Early Winter (October – November)

Rank	Common Name	Scientific Name	Local Habitat / Notes
1	November Moth	*Epirrita dilutata*	Abundant in woods; part of a complex of three species nearly identical without a lens.
2	Feathered Thorn	*Colotois pennaria*	Beautiful rich orange-brown; males have spectacular, comb-like antennae.
3	Chestnut	*Conistra vaccinii*	Perfectly resembles a dark, glossy chestnut; feeds on ivy blossom and berries.
4	Yellow-line Quaker	*Agrochola macilenta*	A distinct reddish-brown line edged with yellow slices across the forewing.
5	Red-line Quaker	*Agrochola lota*	Prefers low-lying damp areas where larvae can feed on sallows and willows.
6	Mottled Umber	*Erannis defoliaria*	Highly variable; males range from plain to banded. Females are wingless.

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7	Green-brindled Crescent	*Allophyes oxyacanthae*	Intricate metallic green scales that mimic lichen; common in hawthorn hedges.
8	Brick	*Agrochola circellaris*	Warm orange-yellow, standard autumn leaf mimic; feeds on wych elm and sallow.
9	Merveille du Jour	*Griposia aprilina*	A stunning pastel-green and black masterpiece; hidden against lichen oak bark.
10	Sprawler	*Asteroscopus sphinx*	Flies late in November; has a strange habit of raising its thorax dramatically.

Deep Winter (December – February)

Rank	Common Name	Scientific Name	Local Habitat / Notes
1	Winter Moth	*Operophtera brumata*	Abundant. Males fly in freezing temps; completely wingless females on tree trunks.
2	December Moth	*Poecilocampa populi*	A rich, furry, dark charcoal-grey moth with cream lines; strongly attracted to light.
3	Spring Usher	*Agriopis leucophaearia*	One of the earliest signs of the turning year, emerging in oak woods in February.
4	Early Moth	*Theria primaria*	True to its name, it flies in January and February; look for them on hawthorn hedges.
5	Pale Brindled Beauty	*Phigalia pilosaria*	Stout, very hairy bodies to withstand frost. Females are wingless.
6	Dotted Border	*Agriopis marginaria*	Emerges in mid-February; wings have a neat row of tiny dark dots along trailing edge.
7	Satellite	*Eupsilia transversa*	Overwinters as an adult; distinct white dot flanked by two tiny spots.
8	Dark Chestnut	*Conistra ligula*	Darker, slightly pointier-winged cousin of the Chestnut; active on mild Jan nights.
9	Grey Shoulder-knot	*Lithophane ornitopus*	Resembles a piece of snapped grey twig or ash bark; overwinters as adult.
10	Herald	*Scoliopteryx libatrix*	Features scalloped, bright orange-patched wings. Often hibernates in outbuildings.

Herald

5. Vanishing into the Light: The Threat of Light Pollution

While macro-moth abundance in the southern UK has declined by nearly 39% since the late 1960s, land-use change and habitat loss are part of the problem—but Artificial Light at Night (ALAN) is a massive, invisible driver of modern decline.

The Vacuum Cleaner Effect

Standard, unshielded white and blue-rich LED outdoor lights act as ecological vacuums. They pull moths away from their natural woodland corridors and river edges, trapping them in continuous, exhausting flight around the bulb until they die of sheer exhaustion or are easily picked off by daytime predators like robins and wasps the following morning.

Blinded and Silent

Artificial light disrupts a moth's internal navigation system, which relies on the moon and stars. Furthermore, exposure to high-intensity light causes a form of temporary blindness, causing them to drop to the ground and stop feeding or searching for mates. Studies show that moth mating activity drops significantly on nights with high artificial light glare, and females emit fewer pheromones (attraction scents).

What We Can Do Locally in Malmesbury

- **Switch to Warm LEDs:** Replace bright white outdoor bulbs with warm-toned alternatives (under 3,000 Kelvin, or ideally amber/red wavelengths), which are significantly less attractive to insect eyes.
- **Shield and Direct:** Install downward-facing hoods on security lights to ensure light only illuminates the ground—not the surrounding trees, hedges, or river corridors.
- **Sensor Control:** Put outdoor lighting on short-duration motion sensors rather than leaving them on all night, creating safe, dark corridors for the night shift to work in peace.

6. How the Public Can Help: Creating a Sanctuary for Moths

Protecting moths doesn't just require complex regional strategies; it starts directly in our gardens, allotments, and green spaces. By changing how we manage our outdoor areas and introducing key plant species, we can turn our gardens into critical oasis points along North Wiltshire's ecological networks.

The Golden Rule: Feed Both Generations

To successfully boost moth numbers, a garden must support their entire lifecycle. Providing nectar for adult moths is excellent, but providing host plants for hungry caterpillars is what actually drives population recovery.

Top Plants for Adult Moths (Night Nectar Providers)

- **Honeysuckle (Lonicera periclymenum):** The ultimate night-scented climber. Releases its sweet fragrance at dusk, making it a primary target for fast-flying Hawk-moths.
- **Evening Primrose (Oenothera biennis):** Features large, pale yellow flowers that open fully in the evening specifically to attract nocturnal pollinators.
- **Jasmine (Jasminum officinale):** Produces intense nocturnal scents that carry across garden borders, guiding moths from considerable distances.
- **Budleja, Lavender, and Michaelmas Daisies:** While famous for daytime butterflies, these nectar-rich plants are heavily visited by dual-brooded and migrant moths (like the Silver Y) during summer nights.

Top Plants for Caterpillars (Larval Food Plants)

- **Native Trees (Willow, Birch, Oak):** Willows and Sallows feed the spring Quakers; Birches and Oaks support hundreds of woodland macro-moths. If space permits, leaving these unpruned is a massive boost.
- **Stinging Nettles (Urtica dioica):** The absolute host plant for species like the Snout, Dot Moth, and Spectacle. Dedicating a sunny corner to a patch of nettles is highly effective.

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- **Foxglove and Willowherbs:** Critical larval food sources for spectacular species like the Elephant Hawk-moth.
- **Native Grasses (Left Long):** Many autumn noctuids and summer darts (like the Large Yellow Underwing) lay eggs directly on common meadow grasses. Leaving a border unmown until autumn provides essential shelter for developing caterpillars.

Simple Habitat Management Tips

- **Embrace the Tidy-Up Delay:** Leave autumn fallen leaves and plant detritus untouched underneath shrubs until spring. Many moth pupae spend the winter hidden inside dead leaves or just beneath the surface of the soil; sweeping or tilling destroys them.
- **Incorporate Deadwood:** Leave fallen branches or stack old logs in damp corners. This creates ideal crevices for overwintering adult moths (like the Herald) to hibernate safely from winter frosts.

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