

## Moths- the masters of mimicry

A common way to avoid being eaten in the animal kingdom is to convince a potential predator that you are not in fact a tasty morsel, but rather either something uninteresting or even potentially harmful. One group of animals which have mastered this method of deception are the moths which have evolved a variety of ingenious methods to fool their foes.

The first way of deceiving a potential predator is to pretend you are an inconspicuous object which is normally found in the background, this is called mimesis or masquerade, and moths have evolved a variety of different disguises to pretend to be background detritus. For instance, beautiful wood nymph, *Eudryas grata*, looks like a freshly deposited bird dropping which will obviously be ignored by any predator on the hunt for a tasty moth. A geometrid moth from South East Asia, *Macrocilix maia*, has taken this disguise a step further and has evolved to mimic 2 flies feasting on a bird dropping, it even managed to mimic the smell. However, one of the most stunning examples of mimesis can be seen the notodontid moth, *Uropyia meticulodina*, which has flat wings which are patterned in such a way that they look 3D, so, to any passing predator, this moth looks like just another curled-up dead leaf.

More incredible still are the moths which have evolved to mimic several different background objects. The caterpillars of the American peppered moth, *Biston betularia cognataria*, feed on willow and birch and, depending on which they are living on, either look like willow twigs or birch twigs by changing colour to match their background <sup>[1]</sup>. Caterpillars of the moth, *Nemoria arizonaria*, either mimic the catkins of oaks or they resemble oak twigs depending on what they eat, they look like catkins if they eat catkins, or they look like twigs if they eat leaves. <sup>[2]</sup>

Mimesis, although interesting in its own right, is not mimicry in the strictest sense. Mimicry is where one species has evolved to resemble another in some way, this can happen for a number of different reasons and so there are several forms of mimicry, the most widely known of which is Batesian mimicry. Batesian mimicry is where an organism mimics an unpalatable or potentially harmful species in order to ward off predators. This can be seen in the clearwing moths, family Sesiidae, which resemble various species of wasps and hornets. Predators then avoid them so they don't get stung; however it is all a cunning ruse as these moths lack the apparatus to sting anything.

A rather more audacious form of mimicry is to pretend to be the species which is hunting you. This is known as predator mimicry and has been carried out with great effect in *Brenthia* moths from Costa Rica which look and move like jumping spiders. In fact their disguise is so convincing that jumping spiders, which would normally prey on moths of a similar size, instead treat them like rivals and upon seeing the moth carry out territorial displays <sup>[3]</sup>, thus proving that they have been fooled.

It is not just the visual appearance of other species which moths can mimic, the Death's head hawkmoth, *Acherontia atropos*, which raids honeybee hives to eat the honey stored inside does not look like a bee at all, however once it is inside the colony it is ignored. This may seem odd as

everyone knows that bees are very protective over their stores so why do they allow this intruder to live among them unmolested? The reason is very simple: The death's head hawkmoth smells like a bee, this fools the bees into thinking the moth is just a very large nestmate and it can go about its business undisturbed <sup>[4]</sup>.

So as you can see, moths have evolved a number of incredible and beautiful disguises to aid in their everyday survival and, despite often being overlooked for being drab in comparison to their colourful butterfly relatives, can provide us with an extraordinary insight into one of the great mysteries of evolution: Mimicry.

## References

1. Noor M.A.F., Parnell, R.S. and B.S. Grant (2008); A reversible colour polyphenism in American peppered moth (*Biston betularia cognataria*) caterpillars; PLoS ONE. 3:1-5
2. Greene, E. (1989); A diet-induced developmental polymorphism in a caterpillar. Science Feb 3;243(4891):643-6
3. Rota, J. and D. L. Wagner (2006); Predator Mimicry: Metalmark Moths Mimic Their Jumping Spider Predators; PLoS ONE 1(1): e45; doi: 10.1371/journal.pone.0000045
4. Moritz, R. F. A. Kirchner, W. H and R. M. Crewe (1991); Chemical Camouflage of the Death's Head Hawkmoth (*Acherontia Atropos* L.) in Honeybee Colonies; Naturwissenschaften 78, 179-182