Preliminary Survey of the Moth Population on Bennachie

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Introduction

It is perhaps surprising to discover there are over 500 species of larger moths, known as macro-moths, in Scotland and over 900 micro-moths. Many are frankly spectacular, and even the more modest species have remarkably subtle and attractive colouration and patterning. This has evolved to improve their survival chances in their own particular habitat. The Bennachie plateau and its surroundings offer a significant range of habitat types, and would be expected to have a reasonable variety of moth species. This report summarizes the results of trapping sessions, carried out mainly around the eastern end of Bennachie during 2018. During this process 142 species of moths were identified.

There is a network of enthusiasts across the country who report their moth sightings to a local County Moth Recorder. After verifying reports, the Recorder enters them into a national database - the National Moth Recording Scheme (NMRS). The NMRS is run by Butterfly Conservation (BC) who hold national statistics on moth populations. Trends in populations of different moth species are regarded as sensitive indicators of issues such as habitat loss and climate change. Data from the NMRS is used to inform such research. BC is shortly to publish the Atlas of Britain and Ireland's Larger Moths showing distributions of all British Isles macro-moths. Much of the recent data used for these maps has come from moth recorders monitoring their local moth populations.

Today, moths are generally recorded as photos rather than the killed specimens kept by collectors in Victorian times and the early 20th century. Traps use a light source, generally some type of UV light, to attract the moths which then enter through a funnel, or similar structure, into a holding chamber. To encourage them to settle, egg boxes are put in the chamber and the moths usually creep under these and hide in the cavities. Presumably this mimics their usual daytime resting places. The trap can be monitored during the course of an evening, or the light may be left on overnight and the moths checked in the morning. Once the moths have been identified they are released unharmed.





Left: Mains-powered trap; Right: A trial portable LED trap.

Where there is access to mains electricity, it is simplest to use this to power the light trap. However, this limits the locations which can be surveyed. Traps have been used in more isolated locations powered by 12V car batteries (very heavy) or by portable generators (even heavier!). The weight limitations make it difficult to use these traps very far from a road. Consequently, in order to survey moths on the Bennachie plateau, a lighter trap suitable for transporting on foot or bicycle, was trialled. This trap, using LEDs as a light source, permitted the use of a lightweight battery. A French-designed moth trap, utilising a cage of white netting, was found to be lighter than traditional traps.

THE PRELIMINARY BENNACHIE MOTH SURVEY

Most of the trapping sessions were carried out using mains powered traps in a garden at the base of the hill, near the Bennachie Centre. Three sessions were carried out using a traditional portable trap near to Rowantree, and by the Linn Burn. The LED trap was used on the plateau between Mither Tap and Oxen Craig

on three occasions to sample the species at a higher altitude.¹ In total, 26 sessions were carried out between April 11th and Oct 20th 2018.

RESULTS OF THE PRELIMINARY SURVEY

A wide variety of moths were caught, many of which were quite striking and beautiful. A sample of these is shown in the following photographs. The detailed results are then presented in a table which shows the total numbers of moths trapped and in which weeks they were seen. There then follows data on the frequency with which the various species were trapped, and a diagrammatic illustration of the concept of moths' flight seasons. The last section of this article describes inferences which can be drawn from the data in the table, and a selection of species with interesting stories.



Emperor Moth

A large and spectacular moth which is regarded as common on heath and moorland. The male flies by day during April and May, so why is it so rarely noticed by hill walkers? The caterpillar grows to over 6 cms, and, in its later stages is bright green with black and yellow spots, and is well camouflaged among young heather shoots. However,

the author's uncle, who was red-green colour blind, could spot the caterpillars at a distance. It seemed the camouflage did not work for him!

¹ The trap ratings were Mains - MV 125w and Actinic 22w (10 sessions with each). Traditional portable 40w, LED portable 21w



Elephant Hawk-moth

These moths are wonderfully camouflaged when on their main food plant, Rosebay Willowherb. This specimen was vibrating his wings to warm up his flight muscles and, shortly after the photo was taken, he was off.



Coxcomb Prominent

The Coxcomb Prominent has projections on the edge of its wings which are raised over its back when at rest giving it a distinct profile. Presumably this helps to break up the moth's outline and aids its camouflage when at rest on tree bark and among dead leaves.



Buff Tip

Common in woodland and gardens, this moth does a convincing imitation of a broken birch twig when at rest.



Brown Silver-line

Although it may fit the stereotype of dull brown moth, the Brown Silver-line is actually quite attractive. The caterpillars feed exclusively on bracken so the moth is present throughout the British Isles.



White Ermine

While White Ermine were caught on Bennachie, the example in the photo was actually trapped in France.



Burnished Brass

This moth is well named possessing shiny, metallic patches on its forewings.



Poplar Hawk-moth

This is the most common and widespread of the Hawk-moth family and occurs wherever its food plants, mainly poplars and willows, are established. It has a unique resting posture presumably to disguise its moth shape from predators.



Antler Moth
The creamy-white, branching,
antler-like mark gives this
moth its name. Some examples
are more convincingly antler
shaped than this one.

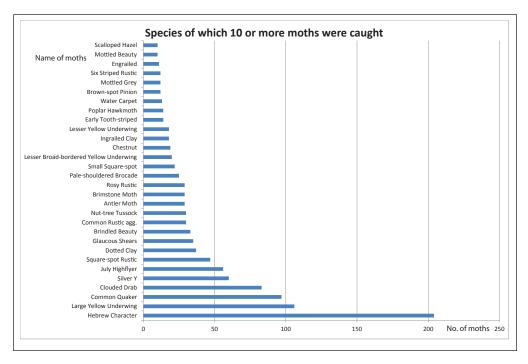
RESULTS TABLES

Each column in the following two tables represents a week from early April to mid October 2018. The moth species which were trapped are listed on the left, and an X indicates the weeks when they were caught.² Sometimes more than one session was carried out in a particular week, and some weeks there was no trapping at all. 1437 moths of 142 species were identified over the 6 month

² In order to limit the size of the printed table, those species where 2 or less moths were caught have not been included. The complete table containing all sightings is available online at www.bailiesofbennachie.co.uk

	Total	Total APR)	MAY	_			JUNE	Total APR MAY JUNE JULY AUG SEPT		JUL	, -			<	AUG		; i	SEPT	-			OCT	
	moths 9th	9th	16th	23th	30th		14th	21st	28th	4th	7th 14th 21st 28th 4th 11th 18th 25th 2nd 9th 16th 23rd 30th 6th 13th 20th 27th 3rd 10th 17th 24th 1st	th 25th	h 2nd	9th	16th	23rd 3	toth 6	3th 15	3th 2C	th 27	th 3rd	10th	17th 2	4th 1:		8th 15th
Yellow Horned	9	×	×																							
Chestnut	19	×	×	×	×																					×
Hebrew Character	204	×	×	×	×	×	×																			
Clouded Drab	83	×	×	×	×	×																				
Satellite	4	×	×		×																					
Common Quaker	97	×	×	×	×	×	×																			
Mottled Grey	12	×	×																							
Brindled Beauty	33		×	×	×																					
Twin-spotted Quaker	က		×																							
Early Tooth-striped	4		×		×																					
Engrailed	7		×	×	×				×																	
Red-green carpet	6		×	×	×																					×
Water Carpet	13		×	×	×		×	×	×																	
Brindled Pug	က		×	×	×																					
Scalloped Hazel	9						×	×	×	×																
Nut-tree Tussock	30				×		×	×	×																	
Scarce Prominent	9				×	×																				
Glaucous Shears	35						×	×	×																	
Brimstone Moth	53							×	×	×																
Brown Silver-line	9							×	×																	
Common Pug	2							×	×																	
Common Wave	က								×	×	×															
Coxcomb Prominent	7							×	×		×															
Flame Carpet	7							×	×									×	×							
Flame shoulder	ო							×	×																	
Grey Pine Carpet	4							×	×	×																
Knot Grass	က							×	×																	
Brocade	25							×	×	×	×															
Poplar Hawkmoth	4							×	×	×	×				×											
Scalloped Hook-tip	4							×	×																	
White Ermine	9							×	×		×															
Garden Carpet	7							×	×																	
Small Phoenix	7							×	×	×	×															
Brown Rustic	7								×		×															

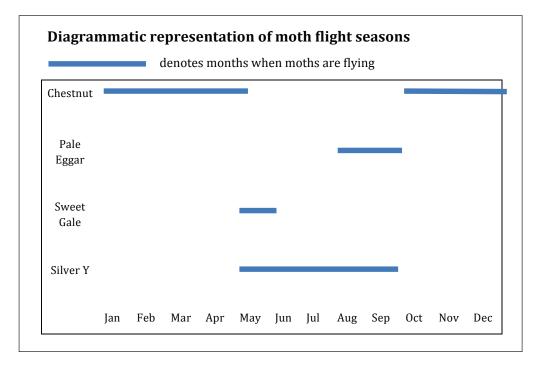
November Moth	Autumnal Moth	Red-line Quaker	Pale Eggar	Sallow	Heath Rustic	Brown-spot Pinion	Barred Chestnut	Square-spot Rustic	Rosy Rustic	Underwing	Garden Carpet	BBYU	LBBYU	Common Dustic aga	Double Square-spot	Small Rivulet	Dotted Clay	Ingrailed Clay	July Highflyer	Riband Wave	Six Striped Rustic	Antler Moth	Large Yellow Underwing	True Lover's Knot	Smoky Wainscot	Mottled Beauty	Scalloped Oak	Green Carpet	Small Square-spot	Silver-ground Carpet	Tawny-barred Angle	Spectacle	Silver Y	
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survey. In 40 species only 1 individual was seen. At the other end of the scale the maximum trapped, over a period of 6 weeks, was a total of 204 of the species Hebrew Character. The chart shown above documents those species of which 10 or more moths were caught.

FLIGHT SEASONS

Individual moth species have a distinct flight season: the timing of which is important for particular parts of their life-cycle, typically associated with mating, egg laying, or availability of food plant. The diagram below illustrates the concept of flight seasons. The results shown in the tables above demonstrate that individual species were only trapped within the periods defined by their flight season.



Examples of Moth Lifecycles

The following are notes about those species which are highlighted in the results tables (above) in bold font. They illustrate how moths occupy particular niches in terms of habitat, food-plants and timing of lifecycle.



Yellow Horned

This moth does not have horns, but does have orange antennae from which it takes its name. It was caught in the first two weeks of surveying in early April. The adult moths emerge from the pupa in late February and are on the wing till mid-April. During this time they mate, lay eggs and then die.

Its caterpillars then hatch from the egg around mid- May and feed voraciously until mid-July when they pupate among leaf litter on the ground. The pupa then passes the autumn and winter in relative safety until the adult moth emerges in

early spring. This moth takes a full year to complete one cycle from egg to adult and many moths follow a similar pattern. Only a few species of moth over-winter as an adult. The majority survive the cold weather as an egg, a caterpillar or a pupa. Two species were identified which pass the winter as an adult – the Chestnut and the Red-green Carpet.



Chestnut

Chestnuts were trapped in April and again during October. This is typical for this moth which emerges from its pupa in late September and is active during the autumn. Over winter the adults are dormant in cold weather, but become active in mild spells, and in the Spring they mate and

eggs are laid. The caterpillars feed on a wide range of broad leaved trees



Red-green Carpet

The Red-green Carpet has a slightly different strategy. When the adults emerge from the pupa in the autumn they mate, and the males having served their purpose then die. Only the females survive the winter to then lay their eggs in the spring, like the Chestnut, on various broadleaved trees of woodlands and hedges.



Pale Eggar

The Pale Eggar, which was trapped in August, is quite a widespread moth, particularly on moorland. It shows adaptations which allow it to cope at relatively high altitude. Typically the adults have a flight season from August to September. It survives the winter as an egg, hatching into a larva in

April. In milder areas the caterpillars will pupate after about two months. However in upland areas, where growth is slower, it spends its second winter as a nearly fully grown larva, which then completes its growth and pupates in its second spring and summer thus taking two years to complete its life cycle.



Small Square-spot

The Small Square-spot was trapped in June, July, August and October. In the northeast of Scotland the eggs of this moth are generally laid around July. The caterpillars hatch a few weeks later and feed mainly on a range of herbaceous plants such as dandelion, docks and foxglove. This

caterpillar typically eats at night and hides low down in the leaf litter by day. These plants keep a basal rosette of green leaves during the winter which allows the Small Square-spot to overwinter as a caterpillar, being dormant in cold spells, but becoming active and feeding in milder weather. In May the fully grown caterpillar pupates underground and emerges as an adult around June-July. In the south of England, where the climate is milder and winters shorter, the adult moths tend to emerge a month earlier, and it manages to fit in an extra complete cycle from egg to adult over the summer. It would seem that the good summer during 2018 allowed the Small Square-spots in this area to behave like those down south. The fact that

they were caught over a five month span suggests that, unusually, there were two generations.



Silver Y

The Silver Y is a common and widespread moth which often flies by day, and can be seen nectaring at flowers along with butterflies. This moth does not survive over winter in Britain. In the spring these moths arrive in waves from southern Europe and North Africa, and spread throughout the country.

They then lay their eggs on a wide range of both wild and cultivated herbaceous plants. There can then be two generations in subsequent months and these are supplemented by more migrants. In the autumn it is thought that the moths which grew up in the UK migrate south back to the countries from which their ancestors originated. 60 of these moths were trapped between June and August.





Left: Sweet Gale; Right: Glaucous Shears.

Sweet Gale and Glaucous Shears

The Sweet Gale Moth and the Glaucous Shears are both typically moorland moths and there have been very few records of the Sweet Gale in this area. Finding it was quite a significant result.



Slender Brindle

Some moths, which previously only occurred in the south of Britain, are extending their range and spreading north. The Slender Brindle used to be found only south of the border but since the 1980s it has spread north and is now resident in the southern half of Scotland and up the eastern side as far

as Moray. The caterpillars of this moth feed on woodland grasses, at first feeding inside the stems and, later, on the leaves and flowers. They overwinter in the larval stage in tussocks of grass which remain green through the cold weather, give them protection and allow feeding in mild spells. When fully grown, the larva burrows into the soil, where it pupates in an underground cocoon. This is still a relatively rare moth in this area.



Pale Pinion

Even rarer is the Pale Pinion. Historically this was a moth of southern England, but, in recent years, presumably due to climate change, it has spread rapidly north and is widespread in the southern half of Scotland. It is only rarely recorded in NE Scotland. One individual was caught in April which

would have emerged in the previous autumn and overwintered in some sheltered spot as an adult. In the spring they feed at willow catkins as a source of energy, then mate and lay eggs. The caterpillars feed on a wide range of broadleaved trees and shrubs.

Conclusion

Using a light trap regularly over a season opened a window into the world of moths. 142 of the 420 species which have been documented in NE Scotland were seen. Many of these were visually striking and showed remarkable camouflage and mimicry. Moths were found with different life patterns which have evolved to cope with seasonal change, particularly the challenge of surviving the winter. Bennachie supports moths from a range of habitats, and moths were caught whose larvae feed on grasses, herbaceous plants, shrubs and trees, and moorland plants. It was interesting to learn about the Silver Y moth which migrates here from the Mediterranean area. The unusually warm summer allowed the Small Square-spot to produce an extra generation, as typically happens in the south and, finally, the northward spread of the Pale Pinion is an example of the effect of climate change on moth distribution.

This initial look at the moth population has provided a base-line dataset upon which to build. Next season, it is intended to improve the design of the LED moth trap, in particular, by making it more easily transported by bike, and to carry out more frequent monitoring of moths at higher altitude on the Bennachie plateau. It will be interesting to observe the effects of varying altitudes and ecologies on the habits of the Bennachie moths.

If the reader would be interested in experiencing moth trapping, there are a number of public events during the summer organized by various agencies including the Aberdeenshire Council Ranger Service. The website of the East of Scotland branch of Butterfly Conservation lists all events and has helpful information on moth identification and listings of species likely to be seen in any given month. This can be found at https://butterfly-conservation.org/in-your-area/east-scotland-branch

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