

**The Butterflies and Moths  
of Keele University**

**David W.Emley**

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**KEELE UNIVERSITY**

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### Further Reading

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# The Butterflies and Moths of Keele University

## Introduction

Keele grounds are covered with a wide range of trees, shrubs and flowering plants which in turn support a rich insect and bird fauna. The system of footpaths that criss-crosses the area enables us to study this wealth of wildlife with ease. The aim of this booklet is to put on record the results of a six-year study of the butterflies and moths to be found at Keele and to encourage the reader to take an interest in and look out for some of over 300 species of moths and 19 species of butterfly that have so far been found.

Butterflies have long been admired by naturalists and members of the public alike. Today many gardeners plant bushes such as Buddleia just to attract these beautiful insects. What is not generally appreciated is that there are less than 70 species of butterfly recorded regularly in Britain. Of these only about a dozen frequent gardens. In marked contrast to this there are over 2400 species of moth and it is not unusual to record over 200 species in an average suburban garden. I have recorded over 250 species in my garden at Trent Vale. The usual impression of a moth is one of a brown, hairy creature that flies into the house through an open window and flutters around the light. While it may be true that many moths are brown and nondescript, many more are very beautiful and even outshine some of our butterflies.

Because the moths are little known by naturalists or the public in general, Part 1 deals with their external appearance and gives hints on their identification. Part 2 deals with where to find them in general and in particular at Keele, and also how to attract them. Following is a summary of the occurrence of lepidoptera month by month at Keele. Part 3 consists of a review of the major families of lepidoptera to be found at Keele together with illustrations of typical members of each family. Finally, Part 4 consists of a systematic list of all the species recorded at Keele giving the months during which each is on the wing, together with an index of their abundance. It is not possible to assign butterflies and moths to specific points on a nature-trail. However, the trail depicted on the map takes in most of the areas which they frequent. In general they are to be found in the open rides and glades from the sewage plant, round to the entrance from Two Mile Lane where there is a rich flora which includes vetches, thistles, knapweeds, umbellifers and brambles, all of which are attractive to the lepidoptera and other insects. A walk along Two Mile Lane itself may also be profitable.

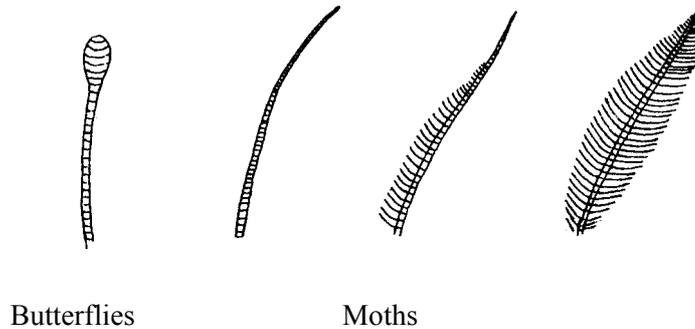
## PART 1

Butterflies and moths are insects in which the body, legs, and four wings are covered with minute scales. No other group of insects possesses this characteristic, so they are placed in the Order **Lepidoptera**, meaning "scale-winged". As well as having scales, they are unique in having a coiled **proboscis**, though not all lepidoptera have functional mouth-parts in the adult form. Their life-cycle is one of egg - caterpillar - pupa or chrysalis - imago or adult, thus placing them in the division **Endopterygota** of the Class **Insecta**. This means that the insect undergoes a metamorphosis before attaining the adult form.

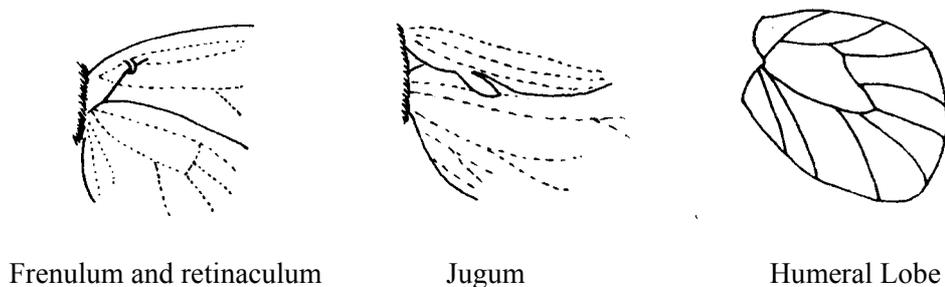
The British lepidoptera range in size from species with a wing-span of only 5mm to the Deaths'-head Hawkmoth with a wing-span of 135mm. The old collectors divided the moths into two arbitrary categories:-the Micro and the Macro-lepidoptera. As the names suggest, the division was one of size. The macro-lepidoptera families, as presently understood, contain approximately 950 species, most having wing-spans in excess of 25mm, though there are exceptions. They may be more conveniently described as those species dealt with in "Moths of the British Isles" by Richard South (an indispensable work). The micro-lepidoptera, numbering over 1600 species, have never been fully illustrated. For this reason, coupled with their small size, large number of species, and difficulty in identification they have never attained the popularity of the butterflies and larger moths. Consequently

this booklet will be restricted to the butterflies and macro-lepidoptera.

“How do I know that I am looking at a moth and not a butterfly?”. This is the question that I am asked most often. If we were considering lepidoptera, on a world scale the answer would be complex. However, in Britain the answer is fairly straightforward. Butterflies have antennae that terminate in a knob while moths have a variety of shapes of antennae none of which terminates in a knob - except in the “Burnets”. These brilliant day-fliers, however, have stouter bodies than any butterflies other than the drab, moth-like “Skippers”, with which they can hardly be confused.



There is another, more specific method of separation based on the mechanism whereby the fore and hind wings are coupled together so that they beat in unison. In butterflies the wings are held together only because the front pair overlap the hind pair to a considerable extent; the amount of overlap being increased by the **humeral lobe**, which is a special projection found only in butterflies and situated at the basal end of the front margin or **costa** of the hind wing. Moths employ two different systems: the first involves an extension or lobe of the fore wing called the **jugum**, which rests on the base of the hind wing; the second is more complex and consists of a stout bristle or **frenulum**. In the male the frenulum comprises a single bristle, but in the female it may consist of a series of bristles. The frenulum arises from the base of the hind wing and engages in a **retinaculum** which may consist of a single, hooked bristle, a series of hooked hairs, or a hooked, sclerotised bar on the under-side of the fore wing. The latter system is the one found on the majority of moths.



### Identification

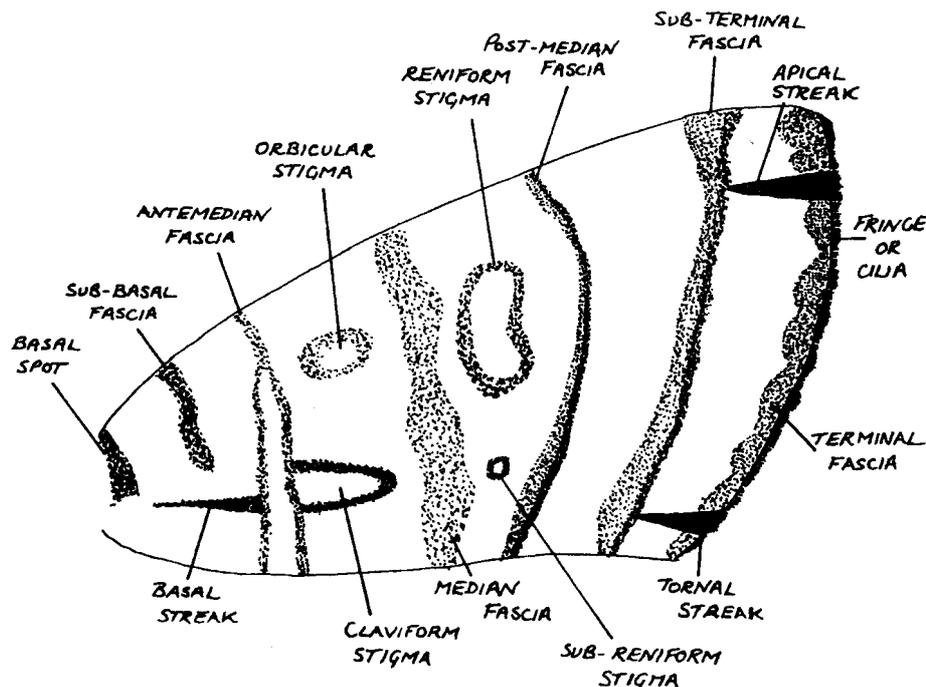
The identification of the butterflies is fairly straightforward. They fly in the daytime and can thus very often be examined closely while they are at rest on flower heads or sunning themselves on a stone or leaf. At such time they can be compared with the illustrations to be found in the many field-guides available.

The same cannot be said of the moths. The vast majority of the larger moths are nocturnal and consequently are not often seen except when at rest during the day on palings, tree trunks, or other vegetation. Identification is usually a matter of comparing the moth with the illustrations. Although this may sound simple enough one needs to realise that some species exist in a variety of colour-forms and in a range of sizes. The following section gives a brief review of the features used to identify moths. It is important to learn the names of the various markings and where they occur on the insect, as this will not only help when comparing a specimen with the descriptions and illustrations

but it will help when describing the moth to someone more knowledgeable.

Most moths can be identified by the shape of their wings and their surface markings. There ~re however, some species that outwardly resemble each other so closely that in order to establish the correct identification it is necessary to resort to dissection. Happily the number of species involved is small. Such difficult species include the Grey and Dark Daggers, Tawny, Marbled and Rufous Minors, and many members of the genus *Eupithecia*, commonly known as the “Pugs”.

The wings of our moths exhibit a wide range. of markings. However there are certain features that are constant, though no moth has a full complement of these. When present these features always occur in the same position on the wing but they may vary in size, intensity, and colouring.



The four **stigmata** are found only on the larger, stiff-winged moths of the family **Noctuidae**. In some species the stigmata may be represented by a dot or they may be absent. The **fascias** may be found on representatives of most of the families although they tend to be most prominent in the **Geometridae**; the thin-winged, narrow-bodied, weak-flying moths. As well as the fascias and stigmata, many other markings occur on the wing. However they are usually characteristic of a single species. For example, the buff wing-tips of the Buff Tip, or the pink blotches of the Peach Blossom may be cited as typical. Some markings are shared by related species, e.g. the y-shaped mark found on the Silver Y, Beautiful Golden Y and the Plain Golden Y or the dagger-shaped markings of the Grey and Dark Daggers.

The shape of the wing can help to place a moth in a particular family. For example most of the members of the **Drepanidae** or “Hook-Tips” have a hooked tip to the fore-wing while the members of the “Thorns” have scalloped edges to their wings.

The head, thorax and abdomen can also exhibit features of use in identification. For example the Spectacle and Dark Spectacle both have spectacle-shaped markings on the front of the thorax, while the Yellow Tail has a yellow tip to its abdomen.

Moths come in a wide range of colours but some genera and individual species have characteristic colouring. For example the “Emeralds” are, as their name suggests, largely green whereas the Brimstone and Speckled Yellow are mainly yellow.

Unfortunately for the beginner many moths can exist in a variety of coloured forms, some of these forms looking so different as to suggest they are entirely different species, giving rise to much

confusion. Melanism accounts for many of these varieties. Melanism arises from an excess of the black pigment, melanin, in the scales. In the extreme case of melanism the moth is totally black and devoid of any markings making identification or separation from melanic forms of other species difficult. Many of these melanic forms, it is believed, have always been present in the

population of the species, but at a low level. During the industrial revolution the environment became very dirty giving the dark, melanic forms a distinct survival advantage over the typical, less well camouflaged, light forms. The melanics thus became the dominant form in industrial areas such as the Potteries. At Keele we find a number of species exhibiting melanism, the most famous of these being the Peppered Moth, which has a 70% melanic population at present. The commoner of many such melanics are the Willow Beauty, Mottled Beauty, Marbled Minor, Rufous Minor, Grey Pug, and Green Brindled Crescent.

The male and female of a species are usually outwardly similar. However in some species, such as the Emperor Moth, the males have elaborate, feathery antennae while those of the female are simple. The feathery antennae enable the male to detect the scent that the female exudes, (sometimes from great distances) thus enabling him to locate her. In some genera the female is the larger of the two sexes.

There are several groups of moths in which the female is completely wingless or has only vestigial wings. Keele species include the Winter Moth, Northern Winter Moth, Dotted Border, Mottled Umber, Scarce Umber, and Pale Brindled Beauty. Some of these are pest species. The larvae emerge in the spring and cause much damage to trees.

### **Lepidoptera Names**

When reading through the checklist you may be struck by the unusual and rather quaint English names given to some of the butterflies and moths. Some names tell us about the food of the larvae, e.g. Foxglove Pug, Sallow Kitten, Poplar Hawk, Oak Hook-tip, and Grey Pine Carpet, while other names indicate distinctive markings of the adult, e.g. Eyed Hawk, the Spectacle, Twin-spot Carpet, Purple Bar, Figure of Eight, Silver Y, and Yellow Tail. Some names tell us about the time of year that the adults fly, e.g. Spring Usher, March Moth, May Highflyer, September Thorn, November Moth, and December Moth. Others purport to indicate their distribution or abundance (often misleadingly), e.g. Northern Spinach, Northern Winter Moth, Common Carpet, Common White Wave, Common Pug, and Scarce Silver-lines. Finally the name may reflect the difficulty of identification, as is the case with the Uncertain.

## **PART 2**

The area from the sewage plant and round to the entrance from Two Mile Lane is probably the best area to find butterflies and day-flying moths. Indeed I have not found the Common Blue or the Dingy Skipper anywhere else at Keele. The plants that are most attractive to lepidoptera in general are the thistles, hardheads, and vetches which are abundant in this area. In the summer there are three species of day-flying moth that can be found here: the Narrow-bordered Five-spot Burnet, the Small Yellow Underwing, and the Shaded Broad-bar. In autumn the Silver Y, supplemented by migrants from abroad, can occur in large numbers, but, unlike the previous species, it also flies at night.

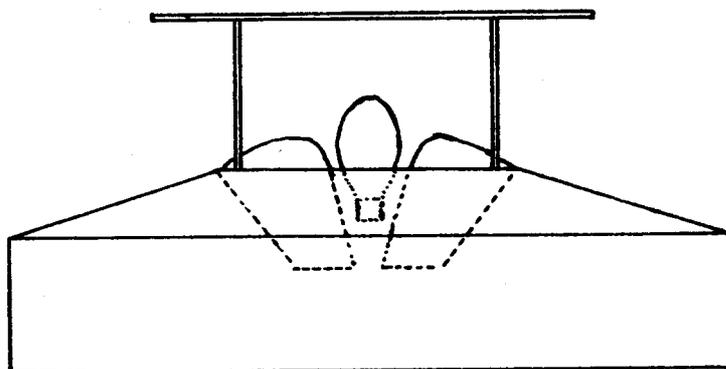
The majority of our moths are difficult to find. Being nocturnal, they spend the day resting in a variety of places which are often inaccessible. As many are cryptically marked so as to blend in with their background, the task of finding them becomes all the more difficult.

Those species that spend the day resting on tree trunks may be so coloured as to resemble either the bark or a bird dropping, while those that rest on twigs or leaves may resemble again a bird dropping, or a broken twig or withered leaf. Some moths may be disturbed from their resting place by tapping the vegetation as one walks past, but since most of them rest amidst the thickest scrub they are rarely met with during the day. In fact some moths, such as the Puss Moth and the Elephant Hawkmoth, are seen more often as caterpillar than as adult.

In order to see most of our moths it is necessary either to attract them artificially in some way or, to look for them at night where they are feeding naturally.

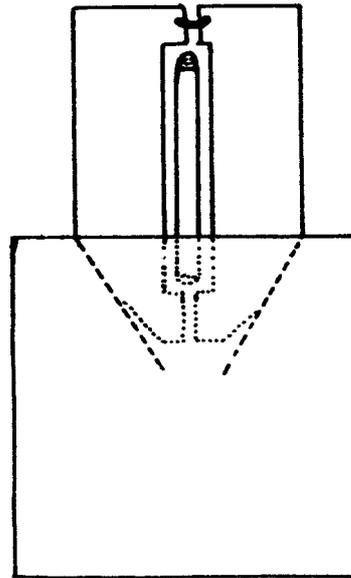
Moths, like butterflies, are attracted to flowering plants and when feeding they can often be approached quite closely (a torch does not seem to disturb them). In the spring, the sallow catkins are especially attractive to species such as the Red Chestnut, Hebrew Character, Common Quaker, Clouded Drab, Early Grey, and Dotted Border. The area below the sewage plant and round to the entrance from Two Mile Lane, with its large number of sallows, is once again a good area to search after dark. In the summer it is worth examining any area of bracken at dusk - Mill Green for example - for at this time members of the Swifts may be seen flying over it, the Gold Swift being particularly noticeable. In July and August the Buddleia is by far the best attractor of both butterflies during the day and moths at night. Its common name is, in fact, the "Butterfly Bush". The insects become almost stupefied when feeding on its very rich nectar, allowing one to approach quite close to them. There are a number of Buddleias planted amongst the campus buildings. In the late autumn it is worth examining any patch of ivy blossom after dark. It provides a rich source of nectar at a time when most other plants have died.

Without doubt the best way to see moths is to exploit the attraction that light holds for them. It is generally known that moths are attracted to houselights, shop windows, and car headlights. A good number of moths can be recorded by keeping a close watch on lighted windows at home. Experiments have shown that they are attracted mostly by ultra-violet radiation. Special traps have therefore been designed that incorporate an ultra-violet light source. The lamps are of two main types: a mercury vapour discharge lamp; and an actinic fluorescent tube. However an ordinary 200 watt light bulb will attract a good number of moths. The trap is left on overnight and the catch examined in the morning, after which the moths are released. I have been using such a trap at Keele during the past six years and most of the moths have been recorded by this method. The numbers of moths found in the trap can be very large. For example I caught over 1000 Large Yellow Underwings in a single night in 1980. Not only moths are attracted to light, but also lacewings, caddisflies, ichneumons, wasps and beetles may also turn up in the trap. Even bats -though indifferent to light -are attracted by the insects.



Robinson Trap using a 120 Watt mercury vapour lamp

Heath trap using a 6 watt actinic fluorescent tube



## A Year at Keele

The weather in January is rarely such as to encourage moths to fly freely and should any venture forth there are few flowering plants for them to feed on. Consequently I have no records of any lepidoptera in January at Keele. However it should be possible to find hibernating species such as the Angle Shades and Small Tortoiseshell in such places as garages, sheds, and out-houses.

The weather in **February** is little better than that in **January**, the only species recorded being the Pale Brindled Beauty which flies on warm nights towards the end of the month.

In **March** the flowering of the willow catkins heralds the emergence of spring species such as the Hebrew Character, Common Quaker, Clouded Drab, Small Quaker, Early Grey, and Dotted Border. Several hibernating species such as the Satellite, Angle Shades, Chestnut, and Herald may be tempted to fly on warm nights. On a sunny day, towards the end of the month, a visit to the birch trees close to the sewage plant may reveal an Orange Underwing flying around the tree tops, or a Yellow Horned resting on a branch, while a Small Tortoiseshell may be tempted out of hibernation on a warm day.

In **April** we find most of the March species plus a few more such as the first broods of the Early Thorn and the Engrailed. The larvae these produce will develop into adults that will emerge in the autumn. The latter species may be found resting on tree-trunks during the day as may the Early Tooth-stripe, Early Grey, and Dotted Border. That characteristic butterfly of spring, the Orange Tip, is out in April and May, while Peacocks, Small Tortoiseshells, and occasional Brimstones may also be seen.

**May** sees the end of the spring species and the start of the summer ones. Consequently there is an upsurge in the number of species on the wing; 71 compared with 21 in April. Several species, such as the Small Square-spot, Chinese Character, Grey Pine Carpet, Silver Y, Garden Carpet, Shuttle-shaped Dart, and Common Marbled Carpet, have their first broods in May; their second broods appear in the autumn. Some species such as the Clouded Border, Common Carpet, Flame Shoulder, Lesser Swallow Prominent, and Iron Prominent, first appear in May and have a protracted emergence period lasting up to five months. Rare or uncommon species that have occurred over the past six years include Great Prominent, Seraphim, Purple Thorn, Tawny Pinion (first Staffordshire record), Lunar Marbled Brown, and the Muslin. A number of moths may be found resting on tree-trunks, e.g. the Early Grey, Grey Dagger, Early Tooth-stripe, and Grey Birch, or resting on leaves e.g. the Clouded Magpie, Clouded Border, Silver Ground Carpet, Flame Carpet and Common Carpet. Of the butterflies, the Dingy Skipper appears in May and, being a drab colour, is one of our most over-

looked species. All the Whites put in their first appearance while the Orange Tips, Small Tortoiseshells, and Peacocks are well in evidence.

By **June** the season is well under way with 116 species having been recorded so far. This month sees the appearance of members of the Swift family, all except the Orange Swift (which emerges in the autumn) may be seen flying at dusk. The Gold Swift is especially noticeable in areas of bracken. Towards the end of June the day-flying Narrow-bordered Five-spot Burnet and the Small Yellow Underwing appear, as do the nocturnal yellow underwing moths. The Large Yellow Underwing, our most abundant moth, is a pest species. The larvae, known as “cutworms”, attack the roots of crop plants. Another hawkmoth, the Elephant Hawkmoth, occurs in June but it is probably better known as caterpillar than as adult. This is true of the Puss Moth which also occurs in June. New butterflies to be seen include the Small Copper, Common Blue, Large Skipper, Wall, and Meadow Brown. Rarities that have been recorded include the Sallow Kitten and the Beautiful Carpet.

The season reaches a peak in **July** with 154 species being recorded so far. Some of our most beautiful moths may be found during this month, for example, the Burnished Brass, Gold Spot, Magpie, Peach Blossom, Buff Arches, Foxglove Pug, Swallowtail, Sallow, and Barred Yellow. The last of the Keele hawkmoths, the Small Elephant Hawkmoth, occurs occasionally in July. Moths to be found at rest during the day include; Blue-bordered Carpet, Clouded Border, Common Carpet, Green Carpet, Grey Arches, July Highflyer, Light Emerald, Silver Ground Carpet, and Shaded Broad-bar (a day-flier). The rarities to have occurred so far include Scarce Silver-lines, White Satin, and Small Yellow Wave. July sees the first appearance of the migrant Painted Lady and the rare, resident, White-letter Hairstreak. The latter butterfly spends most of the time at tree-top level and so is not often seen.

Towards the end of **August** a slight drop in the number of species occurs. Only 129 species have been recorded. The knapweeds and thistles are at their best and so attract large numbers of butterflies such as the Red Admiral, Painted Lady, Peacock, Small Tortoiseshell, Meadow Brown and recently Small Skipper, and Comma. The handsome Garden Tiger is on the wing but seems more often to be seen by the casual observer than the keen lepidopterist. Towards the close of the month some of the autumnal species begin to appear, e.g. the September Thorn, the second brood of the Early Thorn, Autumnal Rustic, Brown-spot Pinion, Dusky Thorn, Mouse, Six-striped Rustic, the second brood of the Small Square-spot, Svensson's Copper Underwing, and the Sallow. Rarities which have occurred include the Barred Hook-tip (first Staffordshire record) and the Gold Spangle. Towards the end of the month the Grey Chi can often be found resting on tree-trunks.

The cold **September** nights take their toll of the moth species, with the number caught dropping to 49. Further autumnal species to emerge include Frosted Orange, Green Brindled Crescent, Flounced Rustic, Deep Brown Dart, Pink-barred Sallow, Red-line Quaker, and the beautiful Merveille-du-Jour. The second broods of the Common Marbled Carpet and the Grey Pine Carpet also occur. As the thistles and knapweeds die back so the number of butterflies dwindles. During the exceptional summer of 1976 several examples of that rare migrant: the Camberwell Beauty were seen feeding on rotting fruit in a garden on campus.

**October** sees a further reduction in species to 33 and also a reduction in the numbers of moths visiting the trap. Additional autumnal species include Beaded Chestnut, the Brick, Brindled Green, Centre-barred Sallow, Chestnut, Dusky-lemon Sallow, Feathered Thorn, Figure of Eight, Mottled Umber, Satellite, and Yellow-line Quaker. Of these the Chestnut and the Satellite will over-winter as adults and emerge again in the spring. The Grey shoulder-knot is the only rarity to turn up in October.

By **November** the weather has deteriorated and the number of species found has dropped to only 11. The December Moth and the very common Winter Moth, whose larvae provide an important food-source for the birds in the spring, appear as does the equally common Mottled Umber and Scarce Umber. The only record of the Streak was in November.

Poor weather in **December** often prevents use of the trap and the number of species recorded drops to 3, all of which are “hangers-on” from November.

## PART 3

The line drawn beneath each illustration represents 1cm

### BUTTERFLIES

#### Hesperiidae

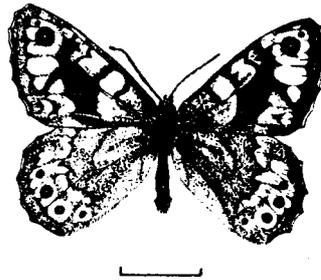


Large Skipper

Known collectively as the “Skippers” this family consists of small brown butterflies with stiff wings, relatively stout bodies, large heads, and a strong flight. When at rest the fore wings are held at an angle to the hind wings. They are the most moth-like of the butterflies.

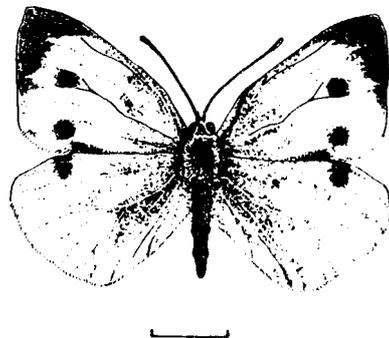
#### Satyridae

Wall



Members of this family are usually somber in colour being some shade of brown. The wings are ornamented with a variable number of eye-spots which may be arranged in a definite row along the margin of the wing or as spots on one or both pairs of wings. They may be found flying over grassy areas or along hedgerows.

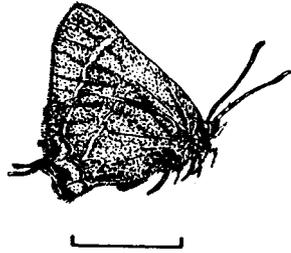
#### Pieridae



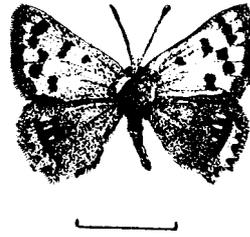
Large White

The members of this family are some shade of white or yellow and familiarity with that garden pest, the Large or Cabbage White, will enable members of this family to be readily recognised.

## Lycaenidae



White-letter Hairstreak

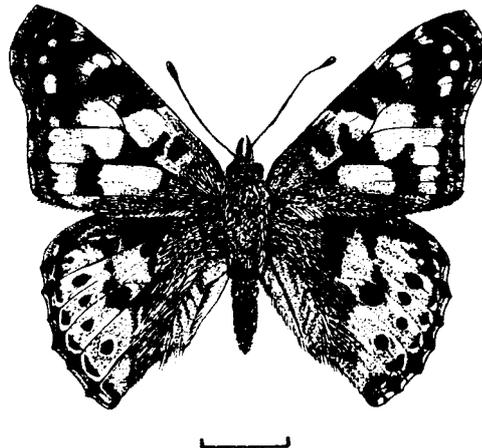


Small Copper

This family consists of three groups; the Coppers, the Blues and the Hairstreaks (so called because of the small hair-like projections, one on each of the hind margins of the hind wings). There is a representative of each group at Keele; the Common Blue, the Small Copper and the White-letter Hairstreak. The latter species is not often seen as it spends most of its life in the canopy of trees such as the Elm and Wych Elm.

## Nymphalidae

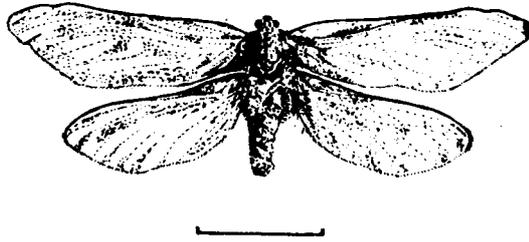
Painted Lady



This family includes many of our largest and most colourful butterflies. It includes such common species as the Small Tortoiseshell and Red Admiral as well as migrant species such as the Painted Lady. Both sexes have 4 walking legs, the fore legs being rudimentary and held against the body. All are partial to sweet things especially rotting fruit.

## THE MOTHS

### Hepialidae

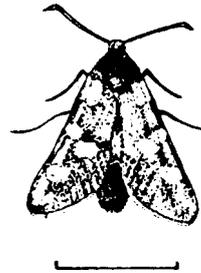


Ghost Moth

This is one of the most primitive families of the lepidoptera, the adults having no functional mouth-parts and small antennae. Members of this family are characterised by having the fore and hind wings of similar shape. All five species can be found at Keele but because they fly only at dusk, they seldom occur in the trap.

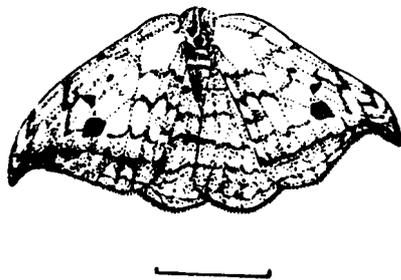
### Zygaenidae

Narrow-bordered Five-spot Burnet



Known collectively as the “Burnets” and “Foresters”; the “Burnets” have mainly metallic-blue fore wings with red spots and red hind wings with a blue border while the “Foresters” have green forewings and smoky hindwings. Their antennae are long and thickened at the tip and they frequent grassy areas. At Keele we have just one species; the Narrow-bordered Five-spot Burnet. All are day-fliers.

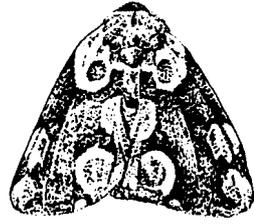
### Drepanidae



Pebble Hook-tip

Known collectively as the “Hook-Tips” members of this family are easily recognised by their hooked fore-wings

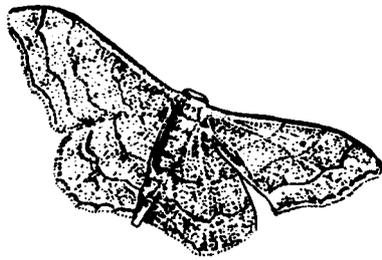
## Thyatiridae



Peach Blossom

This is a difficult family to define as it contains both stiff-winged, stout-bodied moths such as the Peach Blossom (which may resemble members of the Noctuidae) and thin-bodied, flimsy-winged species such as the Common Lutestring (which may resemble the Geometridae).

## Geometridae



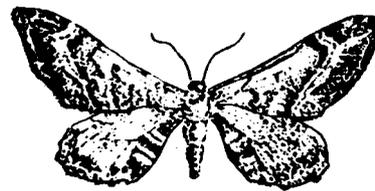
Riband Wave



Canary-shouldered Thorn



Garden Carpet



Narrow-winged Pug

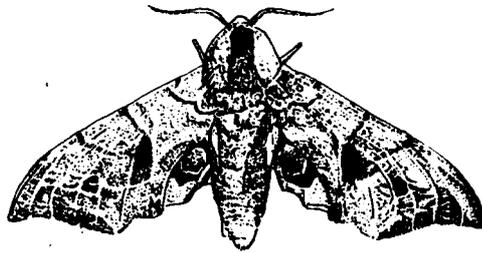


Peppered Moth

This is one of the two largest families of the macro-lepidoptera. The members of this family are commonly known as Carpets and Waves. Most have a thin body and flimsy wings and are generally

weak fliers. With such a large number of species in the family it is not surprising that there is a wide range of shapes and sizes.

### **Sphingidae**



Eyed Hawkmoth

The Sphingidae or Hawkmoths include some of our largest species of lepidoptera. They have long, stout fore-wings, small hind-wings and small, stout antennae. Many also have a long proboscis. The larvae are characterised by having a spine at the hind end.

### **Notodontidae**

Lesser Swallow Prominent



This is another difficult family to define but most of the species are large to medium-sized and hairy. The best known species is the Puss Moth, more often encountered as its fearsome-looking larva. They are known as “Prominents” because of the small projection on the rear margin of the fore-wing found in some species.

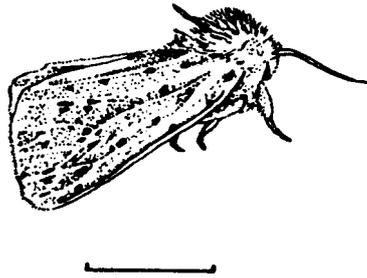
### **Lymantriidae**



Yellow Tail

Members of this family are known as Tussock Moths because of the tufts of hairs found on the larvae, irritant to human skin. The moths are hairy and the males have feathery antennae. The distinctive Gold Tail is the commonest member of the family to be found at Keele.

## Arctiidae

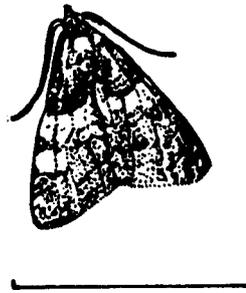


White Ermine

The Arctiidae include some of our most colourful moths; the Garden Tiger being the best known. The larvae are often known as woolly bears on account of their long, black hairs. The family can be divided into several smaller groups of which the Ermines are very distinctive, resembling the material of that name.

## Nolidae

Short-cloaked Moth



This family consists of only 5 species, one of which, the Short-cloaked Moth is found at Keele. Although being classed with the macro-lepidoptera, the Nolidae are very small and so, often overlooked.

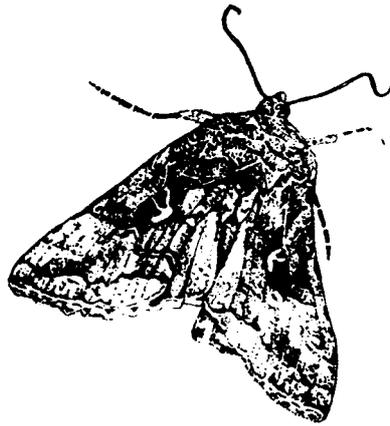
## Noctuidae



Heart and Dart



Grey Dagger



Silver Y



Broad-barred White

This is the largest family of the macro-lepidoptera and comprises the stout-bodied, stiff-winged moths commonly known as owlets or “noctuids”. The members of the family exhibit a great range of shape, size and colour.

## PART 4

### Systematic List

One of the main factors affecting the number of species to be found in a given locality is the diversity of food-plants. Some species will feed on a wide range of plants while others may be restricted to a single species. Though the woodlands at Keele are not of natural origin, they are very diverse in species content. Consequently we have a rich lepidoptera fauna.

In addition to the resident species, rarities occasionally turn up. Some species are, given the right weather conditions, capable of flying great distances. Some of the rarer species may have come from localities nearby, e.g. the Great Prominent and the Small Yellow Wave while others may have come from further afield e.g. the Barred Hook-tip. Some species are of course, true migrants, coming from Europe and north Africa, e.g. Painted Lady, Red Admiral, Camberwell Beauty, Silver Y, and Dark Sword Grass.

Some species are present at such a low level that they are often not seen for several years. Then, for some reason, the conditions are such that the population “explodes” and abnormal numbers are recorded for one or two seasons. The Slender Brindle is such a species. It was first noted at Keele in 1980 when 2 were caught. In 1981, however, over 40 were recorded. This is also true for the Treble Lines, Lunar Marbled Brown, Merveille-du-Jour, and Purple Clay.

### Emergence

In this list I have indicated, by use of a the months that each species may be found. Where there is a gap of several months between emergence periods it is indicative of a double brood, e.g. Grey Pine Carpet, Common Carpet, Early Thorn, and Common Marbled Carpet. The emergence date is very dependent on the weather. A cold spell can delay emergence by several weeks.

Status I have tried to indicate the abundance of each species at Keele. It is not possible to do this on trap data alone as some species are attracted more to light than others. This is true of the weak-fliers which are not often caught in the trap. I have therefore based the index on trap data, field observation, and a knowledge of the lepidoptera of the surrounding area.

The status of a species may change from year to year depending on the weather. During the hot

summer of 1976 the Heart and Dart was very common with over 200 being caught on a single night. In 1981 - a wet year - no more than 20 were caught on one night. The Large Yellow Underwing is another example. In 1976 over 1000 were caught on a single night but in 1981, 450 was the maximum catch. The effect of the weather is more readily apparent when considering the butterflies. 1976 was one of the best years in living memory. Large numbers of migrants entered the country and the area below the sewage works was full of Painted Ladys, Red Admirals and Silver Y moths. Local rarities such as the White-letter Hairstreak were also seen in numbers at Keele. In 1981 however, I did not see a single Painted Lady or Red Admiral at Keele. Interestingly, 1981 was a good year for one species: the Small Skipper. It appeared for the first time in August and subsequently four or five were seen. It was also seen nearby at Waltons Wood and Scot Hay. This species has been spreading northwards, through Staffordshire over the past 11 years.

I have used “rarity” in the context of Keele. However, some of the species are rare or uncommon in Staffordshire as a whole. These include: Scarce Silver-lines, Tawny Pinion, Barred Hook-tip, Lesser-spotted Pinion, Grey Shoulder-knot, Small Elephant Hawk, Small Yellow Wave, and Great Prominent.

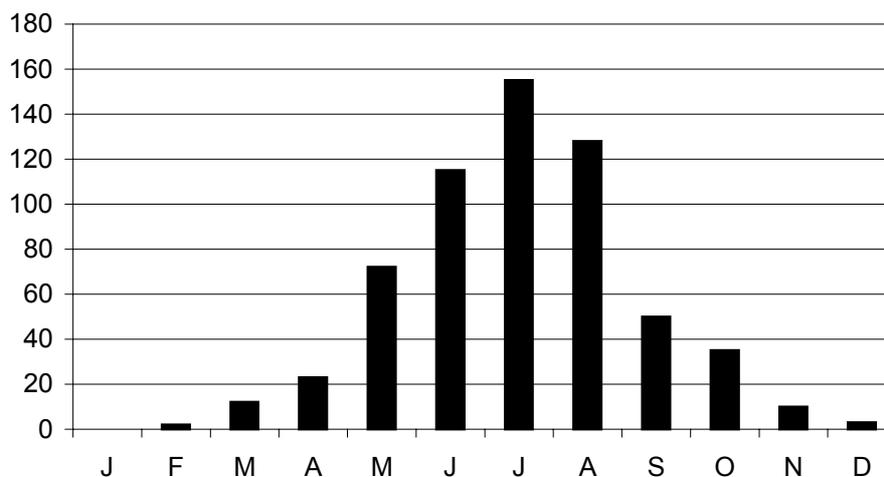
## Abundance Index

It is not possible to assign numerical values to the indices. It is sufficient to know that a moth with \*\*\*\*\* is more common than a species with \*\*\*\*\*, and so on.

- \* Rare; only 1 or 2 records over the past 6 years.
- \*\* Uncommon; does not occur every year and numbers generally low.
- \*\*\* Common
- \*\*\*\* Very common
- \*\*\*\*\* Abundant

- M Migrant
- DF Day-flying
- + Moths seen at rest during the day.

The nomenclature used in the systematic list follows that of Fletcher & Bradley, 1979; “A Recorders Log Book and Label List of British Butterflies and Moths”



Number of species recorded at Keele per month

## BUTTERFLIES

		JFMAMJJASOND	STATUS	
<b>Hesperiidae</b>				
Small Skipper	Thymelicus sylvestris	-----*-----	**	
Large Skipper	Ochlodes venata	-----***-----	***	
Dingy Skipper	Erynnis tages	-----**-----	***	
<b>Pieridae</b>				
Brimstone	Gonepteryx rhamni	---***-*-----	**	
Large White	Pieris brassicae	-----***-----	****	
Small White	Pieris rapae	-----**-*-----	***	
Green-veined White	Pieris napi	-----**-*-----	***	
Orange Tip	Anthocharis cardamines	---***-----	***	
<b>Lycaenidae</b>				
White-letter Hairstreak	Strymonidia w-album	-----**-----	**	
Small Copper	Lycaena phlaeas	-----***-----	***	
Common Blue	Polyommatus icarus	-----***-----	***	
<b>Nymphalidae</b>				
Red Admiral	Vanessa atalanta	-----****-----	***	(M)
Painted Lady	Cynthia cardui	-----**-----	***	(M)
Small Tortoiseshell	Aglais urticae	---*****-----		
Camberwell Beauty	Nymphalis antiopa	-----**-*-----	*	(M)
Peacock	Inachis io	---**-*-----	***	
Comma	Polygonia c-album	-----*-----	**	
<b>Satyridae</b>				
Wall	Lasiommata mergera	-----***-----	***	
Meadow Brown	Maniola jurtina	-----***-----	**	

**MOTHS**

		<b>JFMAMJJASOND</b>	<b>Status</b>
<b>Hepialidae</b>			
Ghost Moth	Hepialus humuli	-----**-----	***
Orange Swift	Hepialus sylvina	-----**-----	**
Gold Swift	Hepialus hecta	-----***-----	***
Common Swift	Hepialus lupulinus	-----**-----	***
Map-winged Swift	Hepialus fusconebulosa	-----***-----	***
<b>Zygaenidae</b>			
Narrow-bordered Five-spot Burnet	Zygaena lonicerae	-----***-----	*** (DF)
<b>Lasiocampidae</b>			
December Moth	Poecilocampa populi	-----*--	**
<b>Drepanidae</b>			
Oak Hook-tip	Drepana binaria	-----*-----	**
Barred Hook-tip	Drepana cultraria	-----*-----	*
Pebble Hook-tip	Drepana falcataria	-----**-----	** +
Chinese Character	Cilix glaucata	-----*--***-----	***
<b>Thyatiridae</b>			
Peach Blossom	Thyatira batis	-----*-----	***
Buff Arches	Habrosyne pyritoides	-----**-----	***
Figure of Eighty	Tethea ocularis	-----*-----	**
Common Lutestring	Ochropacha duplaris	-----**-----	***
Yellow Horned	Achlya flavicornis	--**-----	*** +
<b>Geometridae</b>			
Orange Underwing	Archiearis parthenias	--*-----	** (DF)
March Moth	Alsophila aescularia	--**-----	***
Grass Emerald	Pseudoterpna pruinata	-----*-----	**
Large Emerald	Geometra papilionaria	-----**-----	**
Little Emerald	Jodis lactearia	-----**-----	**
Small Fan-footed Wave	Idaea biselata	-----**-----	*** +
Single-dotted Wave	Idaea dimidiata	-----**-----	*** +
Riband Wave	Idaea aversata	-----***-----	*** +
Flame Carpet	Xanthorhoe designata	-----****-----	*** +
Dark-barred Twin-spot Carpet	Xanthorhoe ferrugata	-----**_*-----	**
Silver-ground Carpet	Xanthorhoe montanata	-----***-----	**** +
Garden Carpet	Xanthorhoe fluctuata	-----*_**-----	***
Shaded Broad-bar	Scotopteryx chenopodiata	-----**-----	*** (DF)
Common Carpet	Epirrhoe alternata	-----**_*-----	*** +
Shoulder-stripe	Anticlea badiata	-----**-----	***
Beautiful Carpet	Mesoleuca albicillata	-----*-----	* +
Purple Bar	Cosmorhoe ocellata	-----*-----	*** +
Northern Spinach	Eulithis populata	-----**-----	***
The Spinach	Eulithis mellinata	-----*-----	*
Barred Straw	Eulithis pyraliata	-----*-----	***
Small Phoenix	Ecliptopera silaceata	-----*****-----	*** +
Dark Marbled Carpet	Chloroclysta citrata	-----**-----	***
Common Marbled Carpet	Chloroclysta truncata	-----**_*-----	*** +
Barred Yellow	Cidaria fulvata	-----**-----	**
Blue-bordered Carpet	Plemyria rubiginata	-----**-----	*** +
Grey Pine Carpet	Thera obeliscata	-----**_*-----	***
Broken-barred Carpet	Electrophaes corylata	-----*-----	**

		<b>JFMAMJJASOND</b>	<b>Status</b>	
Green Carpet	Colostygia pectinataria	-----**-----	***	+
July Highflyer	Hydriomena furcata	-----***-----	****	
May Highflyer	Hydriomena impluviata	-----*-----	*	
November Moth	Epirrita dilutata	-----**--	***	
Winter Moth	Operophtera brumata	-----*-	****	
Northern Winter Moth	Operophtera fagata	-----*-	**	
The Rivulet	Perizoma ffnitatum	-----*****-----	***	
Small Rivulet	Perizoma alchemillata	-----**-----	***	
Sandy Carpet	Perizoma flavofasciata	-----**-----	***	+
Twin-spot Carpet	Perizoma didymata	-----**-----	***	+
Slender Pug	Eupithecia tenuiata	-----*-	*	
Foxglove Pug	Eupithecia pulchellata	-----***-----	***	
Mottled Pug	Eupithecia exiguata	-----*-	**	
Lime-speck Pug	Eupithecia centaureata	-----*-	**	
Currant Pug	Eupithecia assimilata	-----**-----	***	
Common Pug	Eupithecia vulgata	-----***-----	***	
Grey Pug	Eupithecia subfuscata	-----**-----	***	
White-spotted Pug	Eupithecia tripunctaria	-----**-----	**	
Tawny-speckled Pug	Eupithecia icterata	-----**-----	***	
Narrow-winged Pug	Eupithecia nanata	-----*-	**	
Golden-rod Pug	Eupithecia vigaureata	-----*-	**	
Brindled Pug	Eupithecia abbreviata	---*-----	**	
Oak-tree Pug	Eupithecia dodoneata	-----**-----	**	
Juniper Pug	Eupithecia pusillata	-----**-----	***	
Larch Pug	Eupithecia lariciata	-----*-	***	
Dwarf Pug	Eupithecia tantillaria	-----*-	**	
V-Pug	Chloroclystis v-ata	-----***-----	***	
Green Pug	Chloroclystis rectangulata	-----**-----	***	
Double-striped Pug	Gymnoscelis rufifasciata	-----**-----	**	
The Streak	Chesias legatella	-----*-	*	
Small Yellow Wave	Hydrelia flammeolaria	-----*-	*	
Seraphim	Lobophora halterata	-----*-	*	
Early Tooth-stripe	Trichopteryx carpinata	---**-----	***	+
The Magpie	Abraxas qrossulariata	-----*-	**	
Clouded Magpie	Abraxas sylvata	-----**-----	***	+
Clouded Border	Lomaspilis marginata	-----*****-----	***	+
Tawny-barred Angle	Semiothisa liturata	-----*****-----	**	
Brown Silver-line	Petrophora chlorosata	-----**-----	***	+
Scorched Wing	Plagodis dolabraria	-----*-	**	
Brimstone Moth	Opisthograptis luteolata	-----**_*-----	***	
Canary-shouldered Thorn	Ennomos alniaria	-----**-----	***	
Dusky Thorn	Ennomos fuscantaria	-----***-----	***	
September Thorn	Ennomos erosaria	-----**-----	***	
Early Thorn	Selenia dentaria	---**_*-----	***	
Purple Thorn	Selenia tetralunaria	-----*-	*	
Scalloped Hazel	Odontopera bidentata	-----**-----	***	
Scalloped Oak	Crocallis elinguarua	-----**-----	***	
Swallow-tailed Moth	Ourapteryx sambucaria	-----***-----	***	
Feathered Thorn	Colotois pennaria	-----**--	***	
Pale Brindled Beauty	Apocheima pilosaria	-**-----	***	
Peppered Moth	Biston betularia	-----***-----	***	
Spring Usher	Agriopis leucophaearia	-*-----	***	
Scarce Umber	Agriopis aurantiaria	-----***-----	***	
Dotted Border	Agriopis marginaria	---**-----	****	+
Mottled Umber	Erranis defoliaria	-----**--	****	+
Willow Beauty	Peribatodes rhomboidaria	-----**-----	***	
Mottled Beauty	Alcis repandata	-----**-----	***	

		<b>JFMAMJASOND</b>	<b>Status</b>
The Engrailed	Ectropis bistortata	----*---*-----	*** +
Grey Birch	Aethalura punctulata	-----**-----	*** +
Common Heath	Ematurga atomaria	-----*-----	*
Bordered White	Bupalus piniaria	-----***-----	*** +
Common White Wave	Cabera pusaria	-----*****-----	*** +
Common Wave	Cabera exanthemata	-----**-----	*** +
Clouded Silver	Lomographa temerata	-----**-----	*** +
Early Moth	Theria primaria	-*-----	***
Light Emerald	Campaea margaritata	-----***-----	*** +
Barred Red	Hylaea fasciaria	-----*-----	*
<b>Sphingidae</b>			
Lime Hawk	Mimas tiliae	-----*-----	**
Eyed Hawk	Smerinthus ocellata	-----*-----	**
Poplar Hawk	Laothoe populi	-----***-----	***
Elephant Hawk	Deilephila elpenor	-----**-----	***
Small Elephant Hawk	Deilephila porcellus	-----*-----	*
<b>Notodontidae</b>			
Buff Tip	Phalera bucephala	-----***-----	***
Puss Moth	Cerura vinula	-----*-----	***
Alder Kitten	Furcula bicuspis	-----**-----	**
Sallow Kitten	Furcula furcula	-----*-----	*
Iron Prominent	Notodonta dromedarius	-----***-----	***
Pebble Prominent	Eligmodonta ziczac	-----***-----	***
Great Prominent	Peridea anceps	-----*-----	*
Lesser Swallow Prominent	Pheosia gnoma	-----***-----	***
Swallow Prominent	Pheosia tremula	-----***-----	***
Coxcomb Prominent	Ptilodon capucina	-----***-----	***
Pale Prominent	Pterostoma palpina	-----*-----	**
Lunar Marbled Brown	Drymonia ruficornis	-----*-----	**
Figure of Eight	Diloba caeruleocephala	-----*-----	**
<b>Lymantriidae</b>			
Pale Tussock	Dasychira pudibunda	-----*-----	*
Yellow Tail	Euproctis similis	-----*-----	*** +
White Satin Moth	Leucoma salicis	-----*-----	*
<b>Arctiidae</b>			
Garden Tiger	Arctia caja	-----**-----	***
White Ermine	Spilosoma lubricipeda	-----**-----	***
Buff Ermine	Spilosoma luteum	-----***-----	***
Muslin Moth	Diaphora mendica	-----*-----	*
Ruby Tiger	Phragmatobia fuliginosa	-----*_*-----	***
Cinnabar	Tyria jacobaeae	-----*-----	** (DF)
<b>Nolidae</b>			
Short-cloaked Moth	Nola cucullatella	-----**-----	***
<b>Noctuidae</b>			
Garden Dart	Euxoa nigricans	-----**-----	***
Turnip Moth	Agrotis segetum	-----***_*---	***
Heart and Dart	Agrotis exclamationis	-----*****---	*****
Dark Sword-grass	Agrotis ipsilon	-----*_***_*	** (M)
Shuttle-shaped Dart	Agrotis puta	-----*****---	***
The Flame	Axyليا putris	-----***-----	***
Flame Shoulder	Ochropleura plecta	-----*****---	***

		<b>JFMAMJASOND</b>	<b>Status</b>
Large Yellow Underwing	Noctua pronuba	-----*****	*****
Lesser Yellow Underwing	Noctua comes	-----*****	*****
Broad-bordered Yellow Underwing	Noctua fimbriata	-----***	***
Lesser Broad-bordered Yellow Underwing	Noctua janthina	-----***	****
Least Yellow Underwing	Noctua interjecta	-----**	***
Double Dart	Graphiphora augur	-----***	***
Autumnal Rustic	Paradiarsia glareosa	-----**	***
True Lover's Knot	Lycophotia porphyrea	-----***	***
Pearly Underwing	Peridroma saucia	-----*	** (M)
Ingrailed Clay	Diarsia mendica	-----***	****
Purple Clay	Diarsia brunnea	-----*	***
Small Square-spot	Diarsia rubi	-----*****	***
Setaceous Hebrew Character	Xestia c-nigrum	-----*****	***
Triple-spotted clay	Xestia ditrapezium	-----**	**
Double Square-spot	Xestia triangulum	-----**	***
Dotted Clay	Xestia baja	-----**	***
Six-striped Rustic	Xestia sexstrigata	-----*	***
Square-spot Rustic	Xestia xanthographa	-----***	***
The Gothic	Naenia typica	-----***	***
Green Arches	Anaplectoides prasina	-----**	***
Red Chestnut	Cerastis rubricosa	---***-----	***
Grey Arches	Polia nebulosa	-----**	*** +
Cabbage Moth	Mamestra brassicae	---***-*	***
Dot Moth	Melanchra persicariae	-----**	***
Pale-shouldered Brocade	Lacanobia thalassina	---***-----	***
Bright-line Brown-eye	Lacanobia oleracea	---***-----	***
Broom Moth	Ceramica pisi	-----***	***
Broad-barred White	Hecatera bicolorata	-----**	**
The Lychnis	Hadena bicurris	-----*	**
Antler Moth	Cerapteryx graminis	-----**	***
Feathered Gothic	Tholera decimalis	-----*	***
Pine Beauty	Panolis flammea	---*-----	***
Small Quaker	Orthosia cruda	---***-----	****
Lead-coloured Drab	Orthosia populeti	---*-----	**
Powdered Quaker	Orthosia gracilis	---**-----	***
Common Quaker	Orthosia stabilis	---****-----	****
Clouded Drab	Orthosia incerta	---***-----	****
Twin-spot Quaker	Orthosia munda	---*-----	**
Hebrew Character	Orthosia gothica	---***-----	****
Brown-line Bright-eye	Mythimna conigera	-----*	*
The Clay	Mythimna ferrago	-----**	***
Smoky Wainscot	Mythimna impura	-----**	***
Common Wainscot	Mythimna pallens	-----***	***
Shoulder-striped Wainscot	Mythimna comma	-----**	***
The Shark	Cucullia umbratica	---***-----	**
Minor Shoulder-knot	Brachylomia viminalis	-----**	***
Deep-brown Dart	Aporophyla lutulenta	-----*	*
Tawny Pinion	Lithophane semibrunnea	---*-----	*
Grey Shoulder-knot	Lithophane ornitopus	-----*	*
Early Grey	Xylocampa areola	---***-----	*** +
Green-brindled Crescent	Allophyes oxyacanthae	-----**	***
Merveille-du-Jour	Dichonia aprilina	-----**	**

		<b>JFMAMJASOND</b>	<b>Status</b>	
Brindled Green	Drybotodes eremita	-----**--	***	
Grey Chi	Antitype chi	-----**--	***	+
The Satellite	Eupsilia transversa	--*-----**	***	
The Chestnut	Conistra vaccinii	--**-----**	***	
Dark Chestnut	Conistra ligula	-----**--	**	
The Brick	Agrochola circellaris	-----***-	***	
Red-line Quaker	Agrochola lota	-----**--	***	
Yellow-line Quaker	Agrochola macilenta	-----**--	***	
Brown-spot Pinion	Agrochola litura	-----***-	***	
Beaded Chestnut	Agrochola lychnidis	-----*-	***	
The Suspected	Parastichtis suspecta	-----*-	**	
Centre-barred Sallow	Atethmia centrago	-----*-	*	
Pink-barred Sallow	Xanthia togata	-----**--	***	
The Sallow	Xanthia icteritia	-----****-	***	
Dusky-lemon Sallow	Xanthia cilvago	-----*-	**	
Poplar Grey	Acronicta megacephala	-----**--	***	
The Miller	Acronicta leporina	-----****-	***	+
Alder Moth	Acronicta alni	-----*-	**	
Dark Dagger	Acronicta tridens	-----****-	***	+
Grey Dagger	Acronicta psi	-----****-	***	+
Knot Grass	Acronicta rumicis	-----****-	***	
Marbled Beauty	Cryphia domestica	-----***-	***	
Svensson' s Copper Underwing	Amphipyra berbera	-----***-	***	
Mouse Moth	Amphipyra tragopogonis	-----****-	***	
Small Angle-shades	Euplexia lucipara	-----***-	***	
Angle-shades	Phlogophora meticulosa	---*-----*	***	+
The Olive	Ipimorpha subtusa	-----*-	**	
Lesser-spotted Pinion	Cosmia affinis	-----*-	*	
Dun-bar	Cosmia trapezina	-----***-	***	
Dark Arches	Apamea monoglypha	-----****-	*****	
Light Arches	Apamea lithoxylaea	-----**--	***	
Clouded-bordered	Apamea crenata	-----***-	***	
Brindle				
Dusky Brocade	Apamea remissa	-----****-	***	
Small Clouded Brindle	Apamea unanimis	-----***-	**	
Rustic Shoulder-knot	Apamea sordens	-----***-	***	
Slender Brindle	Apamea scolopacina	-----**--	***	
Marbled Minor	Oligia strigilis	-----**--	***	
Rufous Minor	Oligia versicolor	-----**--	***	
Tawny-marbled Minor	Oligia latruncula	-----***-	***	
Middle-barred Minor	Oligia fasciuncula	-----***-	***	
Rosy Minor	Mesoligia literosa	-----****-	***	
Cloaked Minor	Mesoligia furuncula	-----*-	**	
Common Rustic	Mesapamea secalis	-----***-	*****	+
Small Dotted Buff	Photodes minima	-----**--	***	
Small Wainscot	Photodes pygmina	-----**--	**	
Flounced Rustic	Luperina testacea	-----****-	***	
Rosy Rustic	Hydraecia micacea	-----**--	***	
Frosted Orange	Gortyna flavago	-----*-	***	
Treble-lines	Charanyca trigrammica	-----**--	**	
The Uncertain	Hoplodrina alsines	-----**--	***	
Mottled Rustic	Caradrina morpheus	-----***-	***	
Pale Mottled Willow	Caradrina clavipalpis	-----****-	***	
Small Yellow Underwing	Panemeria tenebrata	-----**--	**	(DF)
Scarce Silver-lines	Bena prasinana	-----*-	*	
Green Silver-lines	Pseudoips fagana	-----**--	**	
Burnished Brass	Diachrysia chrysitis	-----**--	***	

		<b>JFMAMJJASOND</b>	<b>Status</b>
Gold Spot	<i>Plusia festucae</i>	-----***----	***
Silver Y	<i>Autographa gamma</i>	-----*****--	***** +
Beautiful Golden Y	<i>Autographa pulchrina</i>	-----***----	*** +
Plain Golden Y	<i>Autographa jota</i>	-----***----	***
Gold Spangle	<i>Autographa bractea</i>	-----*-----	*
Dark Spectacle	<i>Abrostola trigenina</i>	-----***----	**
The Spectacle	<i>Abrostola triplasia</i>	-----***----	***
The Herald	<i>Scoliopteryx libatrix</i>	-****-***--*	***
The Snout	<i>Hypena proboscidalis</i>	-----**-----	*** +
The Fan-foot	<i>Herminia tarsipennalis</i>	-----***----	***
Small Fan-foot	<i>Herminia nemoralis</i>	-----**-----	***

I will be pleased to receive any further records or specimens of butterflies and moths found at Keele. Please send them to me at the Geology Department.

