



## OUR 'DISAPPEARING' BUTTERFLIES

George Thomson

There is a general impression amongst the adult population in Scotland that there are fewer butterflies about today than in their youth. Many knowledgeable naturalists also believe that this is the case. Clearly, if recent industrial or housing development has destroyed the habitat of a species in the immediate vicinity of one's home, it could be expected that not so many butterflies would be noticed there. It will be shown in this paper, however, that the changes in the distribution of most of our species took place before the birth of many of the people who have suggested that our butterflies are 'disappearing' that is, more than seventy years ago, and when they did change their ranges, man was not instrumental to any significant extent.

The causes have been complex and almost certainly multifactoral, but if a single reason must be pinpointed we must look for natural causes and not to the effects induced by man. Thus the present concern for our fauna, while perfectly justified in the case of many of the higher mammals and birds, is hardly justified in the case of butterflies in Scotland. Reference is here being made to Scotland alone. South of the border the situation is quite different and is, quite rightly, being monitored by bodies such as Monks Wood Experimental Station in the form of the 'European Invertebrate Survey', so that the scale of disappearance can be assessed.

It is thanks to the dedication of the great Scottish naturalists of the last century that we have what is possibly an unequalled record of the distribution of our butterflies in the nineteenth century. Without doubt the most eminent was Dr. Francis Buchanan White (1842-1894) from Perth whose knowledge of Scottish lepidoptera was greater than any of his contemporaries. Through his contributions to the 'Scottish Naturalist' and those of collectors in other parts of Scotland to that journal, the Proceedings and Transactions of local natural history societies and to the entomological journals, supplemented by the records found in other literature and the collections housed in Scottish museums, it is possible to build up a fairly accurate picture of the distribution patterns of butterflies through Scotland from the beginning of the nineteenth century to the present day.

There have been, at one time or another, some fifty-seven species of butterfly recorded in Scotland. This number includes species which have proba-

bly been introduced accidentally, those which are probably errors (misidentifications and so on) and those which were certainly found but which are now extinct. The first two categories do not concern us here as none of the introductions has resulted in permanent populations. Those which have become extinct in Scotland have some considerable bearing on the problem of distribution change. If these species are added to those which are still to be found it can be said that the Scottish fauna has comprised forty-five species.

#### MIGRANT SPECIES

Of this number, eight species are migrants, and do not overwinter in Scotland: consequently, their apparent abundance is entirely dependent upon the numbers which reach the border and beyond. The actual numbers which arrive are difficult to estimate. They are also difficult to compare with the records from the last century because throughout Britain as a whole there are possibly more people reporting butterfly records to journals now than in earlier days, although in Scotland this might not be the case.

The Clouded Yellow (*Colias crocea* Geoffrey in Fourcroy) reaches southwest Scotland more often than not, but there are only about half a dozen reports of the species from central Scotland, from near Glasgow in the west to Fife and Perth in the east. As with its close relative, the Pale Clouded Yellow (*C. hyale* L.) for which there are three records, there is no evidence that it reached Scotland more frequently or penetrated further into Scotland last century than it does now. The same can be said for the much more common Red Admiral (*Vanessa atalanta* L.) and the Painted Lady (*V. cardui* L.) both of which reach central Scotland most years. The Camberwell Beauty (*Nymphalis antiopa* L.), however, was more frequently reported in the 1800's than in recent years. Indeed, judging from the number of specimens in Scottish collections, it can be assumed that this handsome butterfly arrived regularly and could be found in most of central, southern and eastern Scotland last century. The Monarch (*Danaus plexippus* L.) was not found in Scotland until 1941 and there is only a single record to the Queen of Spain Fritillary (*Issoria lathonia* L.) from Minto, Roxburghshire. Also the Long-tailed Blue (*Lampides boeticus* L.) has been seen only once, at Ardrossan, Ayrshire.

## SPECIES WHOSE DISTRIBUTIONS HAVE CHANGED LITTLE

The distribution of about half of the remaining species has changed little since records began. Of the three 'whites' the Large White (*Pieris brassicae* L.) is possibly the least common in central Scotland, usually appearing in May or June although sometimes only one or two specimens are seen in late summer, if conditions have been unfavourable. The Small White (*P. rapae* L.) occasionally reaches pest proportions, but in the central area the Green-veined White (*P. napi* L.) in the form of a distinct sub-species (*thomsoni* Warren) outnumbers the others. The Green Hairstreak (*Callophrys rubi* L.) Small Copper (*Lycaena phlaeas* L.) and Common Blue (*Polyommatus icarus* Rott.) are found throughout the central belt more or less commonly, the former where blaeberry (*Vaccinium* sp.) abounds and the others frequently repopulating derelict land. The Small Tortoiseshell (*Aglia urticae* L.) is to be found everywhere, including the centres of our larger towns. One must look for wet meadow in order to find the Small Pearl-bordered Fritillary (*Clossiana selene* Denis and Schiff.) and moors to find the Dark-green Fritillary (*Mesoacidalia aglaja* L.). Both are to be found in central Scotland. There is a gap in the range of the Scotch Argus (*Erebia aethiops* Esp.) in central Scotland. There is an old record from the Trossachs and a doubtful one from Flanders Moss but the nearest localities now appear to be in north Perthshire. TN Mountain Ringlet (*E. epiphron* Knoch) does not descend below 300 m but above this level it can be found on Ben Lomond and might still be found on some or our other local hills at a suitable elevation. The Meadow Brown (*Maniola jurtina* L.) and Small Heath (*Coenonympha pamphilus* L.) are widespread and sometimes rather common on grasslands in central Scotland but the other 'Heath', the Large (*C. tullia* Muller), is restricted to peat bogs such as Letham Moss, Flanders Moss and Strathblane Moor.

The Chequered Skipper (*Carterocephalus palaemon* Pallas) was not found in Scotland until 1939 and the Holly Blue (*Celastrina argiolus* L.) was first recorded in 1950. The Peacock (*Inachis io* L.) has had an odd history being quite common over a number of years then almost disappearing for a time before returning to its previous abundance. It was extremely common in central Scotland in 1955. The Brimstone (*Gonepteryx rhamni* L.) has been known to migrate and the five records from Scotland might be the result of this or accidental introduction. It is curious that three of the reports, apparently all *bona fide* sightings, are from Fife, and a fourth is from Perth.

## EXTINCT SPECIES

Eight species have, almost certainly, become extinct in recent times. The Large Tortoiseshell (*Nymphalis polychloros* L.) has never been a common species in Scotland. There are single records from Cairn Ryan, Ayrshire and Preston, Berwickshire in the late nineteenth century. Castle Sweyne (1901) and south Knapdale (1887). Buchanan White (1871) reported it as 'very rare' in the Tweed, Forth and Dee districts. The records from the Dee district are interesting as there are other records from this area including a few at Inverurie in 1872 as well as a remarkable report (Palmer, 1974) of the species being seen every year up till about 1960 from a locality south of Aberdeen. The Small Skipper (*Thymelicus sylvestris* Poda) was reported as being 'not rare' in the neighbourhood of Edinburgh before 1809 (Stewart, 1811), but there are no further records from there. This butterfly could well have been more widespread in the past but only just survived into the nineteenth century in Scotland. The Grizzled Skipper (*Pyrgus malvae* L.) was reported by Lennon (1862) at Glen Mills near Dumfries and by Buchanan White (1871b) at Inveran, Sutherland. The most recent records are those of Evans (1909) who reports it from 'heathy places near Glasgow' and Cairn Ryan in 1896.

The Silver-studded Blue (*Plebejus argus* L.) is another of the species for which there are few records. It was said to be found in the neighbourhood of Edinburgh in 1809 (Stewart *loc.cit*) and near Killiecrankie by D. P. Morrison *ante* 1871. There is a more recent report from near Gourock in 1895, the last, apart from an apochryphal account by Perry (1948). The Duke of Burgundy Fritillary (*Hamearis lucina* L.) must have disappeared earlier as there are only two records, one from Dalswinton (Lennon, 1862) and one from Denholm, Berwickshire in 1868. Denholm also boasts the last record of the Comma (*Polygonia c-album* L.) where it was said to be scarce in 1868, although it was possibly found in Fife about the same time. It was reported from Edinburgh in 1809 by Stewart (*loc.cit*).

There are odd records of the Silver-washed Fritillary (*Argynnis paphia* L.) which prevail until the end of the nineteenth century. These range from Edinburgh to Arrochar and from Bennachie to Muchalls. There are also records from Roxburghshire and Berwickshire. The Gatekeeper (*Pyronia tithonus* L.) was found in Kirkcudbrightshire, Ayrshire and even Wester Ross up to the

1860's and perhaps later 93 but certainly not beyond the end of the last century. It might seem odd, however, that there are no specimens of this species from Scotland in any of the old collections, and Ford (1945) expressed this sentiment. But neither are there specimens of most of these extinct species as far as we know. Few collectors at that time put data labels on their specimens so what might be missing is the data, not the specimens.

#### SPECIES WHOSE DISTRIBUTIONS HAVE CHANGED

The ranges of the remaining twelve species have contracted to a greater or lesser extent from the beginning of the last century and it is this group which demands close study. It is fortunate that the past record of the distribution of these butterflies is well documented and we can be fairly certain that the account of their ranges is, in general, accurate. Some of the less conspicuous species like the Dingy Skipper might well have been overlooked in the past, but there is every likelihood that the very same species are overlooked today.

##### The Large Skipper (*Ochlodes venata* Bremer and Gray) Map 1

This butterfly was never found north of the central belt and here the only records are from the neighbourhood of Edinburgh reported by Stewart in 1809 and, presumably the locality mentioned by Lowe and Logan (1852), the Botanical Gardens of that city, refers to the same colony. Stainton (1857) repeats what is probably the same report. It was not found much to the north of Dumfries in the west, but from there there are a number of records, mostly from coastal localities. William Shaw (1896) reported the species from Galashiels. The Edinburgh Colony must have disappeared before the middle of the nineteenth century as it ceased to appear in lists about that time. The Galashiels report was not confirmed by later collectors and, while this colony might still exist, it is more likely that this skipper is now restricted to the southern part of the Kirkcudbright — Galloway coast where it is still rather common.

##### Dingy Skipper (*Erynnis tages* L.) Map 2

As long ago as 1868 *tages* was reported as being a rare butterfly in Scotland. It would seem that the butterfly has always had two separate distribution areas in Scotland, one in the north-east, but extending into Ross-shire and the other in the south-west this probably being a continuation of its

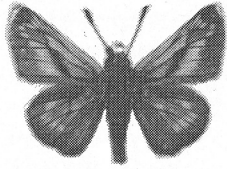
colonies in England and Wales. There is little evidence to show that this north-eastern range has changed from the early days of collecting, but in the south-west the species was found as far north as Glasgow in the middle of the nineteenth century, although there was only a single known locality north of Ayr. Today its range reaches Girvan on the south-west coast.

#### Orange Tip (*Anthocharis cardamines* L.) Map 3

About 1850 this species must have had an almost continuous distribution from the borders to Glasgow in the west and to the Moray Firth in the east. It was not rare in the Edinburgh district in 1809 and remained in the Lothians until the 1860's. In the Clyde area before 1900 it had been found in Lanarkshire, Renfrew, Paisley, Gourock and also Ayrshire where it was said to be generally distributed and rather common. Buchanan White (1871 b) said that it was sometimes common in the Almond, Muirhall and Methven areas of Perthshire and also Glen Farg. It was found in Stirlingshire about the same time and in Berwickshire prior to 1880. By 1900 it had gone from the Glasgow area. In 1921 it was said to have been lost for several years in Glen Farg having been very scarce in the 1881 – 6 period. As early as 1852 it was reported as being local and rather scarce at Duddingston, Musselburgh and Balgreen and must have disappeared shortly after that time. By 1900 it had become less common in the eastern borders and extinct at Gordon Moss, Berwickshire having contracted its range towards the south-west of the country and the lower valleys of the Spey, Dee and Don. About thirty years ago it began a very slow increase in its range appearing at Aviemore in 1954 and becoming much more common especially in the north-east. There is some indication that this spread is gathering momentum and there is even a single record from north-west Sutherland.

#### Small Blue (*Cupido minimus* Fuessly) Map 4

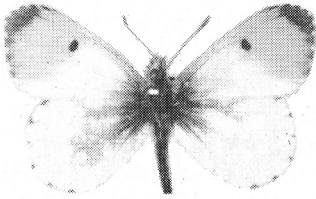
This is one of our most local species, its distribution being restricted by the presence or absence of its foodplant Kidney Vetch (*Anthyllis vulneraria*). However, while early records emphasise the small number of localities for the butterfly, there seems to have been no real shortage of places where this tiny species could be found, extending from Kerrara on the west (1860) to the Moray Firth on the east. It was found in Galloway, Arran and Ayrshire until the second half of the last century. In the border counties it was found in Roxburghshire in the 1880's, but in the Galasheils district it was rare by



Large Skipper



Dingy Skipper



Orange Tip



Small Blue

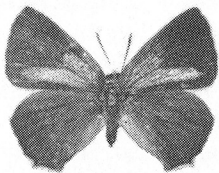


PLATE 1 Scottish Butterflies whose distributions have changed since records began.





1896. Lowe and Logan (1852) said that it was rare in Midlothian being reported first by Stewart (1811). Buchanan White collected it near Perth in 1870 and Ellison found it in the same localities in 1884. It penetrated as far west as Glen Lochay at this time. There were several localities in Fife and one of these, at Burntisland, survived until at least 1894. In the north east it was found in coastal districts as well as a couple of localities inland (Deeside and Strathspey). By early this century it could not be found in the west of Scotland. There is a recent report from Galloway, but the record is suspect. None of the inland localities in the border region was thought to produce this species beyond 1900, although it has survived on the south-east coast. However, in the last year or so three separate reports have been received, one from Roxburghshire and the others from Kirkcudbrightshire. It has gone from the Fife and Perth districts, while it has maintained its ground in the north-west, if a little less common than formerly. It has been found in Wick in the last few years where it might have been overlooked before.

#### Purple Hairstreak (*Quercusia quercus* L.) Map 5

The inconspicuous appearance of this butterfly together with its "tree-top" frequenting habits probably accounts for the paucity of records both from last century and in recent years. It was found near Perth until 1881 and perhaps later, but the only other report from the eastern part of Scotland was that of Buchanan White from the district of 'Forth' (1871 a). It has hardly ever been reported as common, but before the end of last century it disappeared from the localities in the east and during this century appears to have become less common in the few localities in which it has survived.

#### Scotch Brown Argus (*Aricia artaxerxes* Fabricius) Map 6

Arthur's Seat in Edinburgh was the place from which the original specimen of this species was taken. It is said to have survived there until 1869 (Evans, 1909). There is, however, a specimen in the Royal Scottish Museum marked 'Arthur's Seat 1898'. The Scotch Brown Argus was amongst the species which English collectors coming to Scotland in the last century would expect to find easily. It had a fairly extensive distribution through the south of Scotland to Ayrshire in the west until the 1890's and through east and central Scotland, including Fife, the Perth district and Glen Lochay, about the same time. In 1845 it was reported from Dumyat and was said to be not uncommon in 1852 in the Ochil Hills around Menstrie and Logie. Further north its

range reached the Caledonian Canal, Aberdeenshire and Banffshire. There is even a report of the butterfly in Shetland, but the accuracy of this report is doubtful. Between 1860 and 1900 *artaxerxes* disappeared from its localities in the Lothians and central Scotland. It has survived in at least two localities in Fife but has disappeared from the Perth district. Further north it became less common except in north-east Perthshire. However, it has been found in two places north of the Caledonian Canal in recent years. The status of the more northern localities in south-east and south-west Scotland appears to have become more precarious.

Pearl-bordered Fritillary (*Clossiana euphrosyne* L.) Map 7

Some reports from the middle of last century suggest that this butterfly was, at times, more common than its very similar relative *selene*, but it is doubtful if this was ever really the case. There is little doubt that this species had a fairly continuous, if sometimes sparse, distribution throughout the country at least as far north as Ross-shire. It was always less common in central and southern Scotland than in the Spey district and the west, being reported even from Rhum in 1938 by Professor Heslop-Harrison. In central Scotland there are records from Edinburgh (1809) and various sites in Perthshire. Some of the latter localities still survive like that at Crieff and Aberfoyle, but others no longer produce the butterfly, or it may still be rediscovered. These are Glen Lochay (*ante* 1900), Glen Farg (1880's), Scone and Birnam (about 1870). There is an old report from Bridge of Allan where it was found by Buchanan White in the 1860's, but repeated searches have not confirmed its existence there in recent times. Further south the butterfly must have disappeared from Ayrshire by the end of the last century. There is no doubt that the species is very much more local and rare now than before.

Marsh Fritillary (*Euphydryas aurinea* Rott.)

Map 8 According to Stainton (1857) the Marsh Fritillary was rare in Scotland. Reports in contemporary journals do not substantiate this account, but the butterfly was restricted to three main areas, the west coast and Inner Hebrides from Islay to just north of the Caledonian Canal, from the Forth to Aberdeen in the east and the borders, particularly the eastern borders. While the western localities have maintained their ground, there remains only one locality on the other side of the country, that being in Aberdeenshire. It appears to have been common, although very local, in one or two places near

Perth in 1881 and shortly before that in the Trossachs and even Bridge of Allan. It hung on at Logiealmond until at least 1921, but there are no more recent records from there. In Dumfriesshire it was last seen in 1949.

Speckled Wood (*Pararge aegeria* L.) Map 9

An excellent account of the change in the distribution of this butterfly is given by Downes (1948) showing that the species was found from the borders to Aberdeen in the east and to Skye in the west, with a significant gap in its distribution in the Central Highlands to the Moray Firth. This distribution pattern appears to have been maintained until about the middle of the nineteenth century when the species disappeared from the Edinburgh district, followed in the 1860's by a decline in the Perth district and further north in the east, barely surviving the 1880's. It seemed to have remained as a rarity near Perth until as recently as 1921. On the west coast and in the Inner Hebrides the species held its ground being more or less common from year to year. In the 1960's the Speckled Wood appeared to be extending its range northwards and in 1969 was found for the first time in the Black Isle, later being found as far east on the Moray Firth as Lossiemouth. Unfortunately, all of the southern populations had disappeared by the early 1900's and, as yet, there is no sign of a return to its old haunts.

Wall (*Lasiommata megera* L.) Map 10

One of the most interesting changes in distribution over the last one hundred and fifty years can be seen in the Wall Butterfly. It must have been found almost everywhere as far north as Aberdeen in the east and Glasgow in the west. It is a species which is, as its popular name suggests, not fussy about its habitat being found as a roadside butterfly as well as in rough fields, waste ground and gardens. Probably not more than a hundred years ago the butterfly would be a common sight to most people in all but the most urban districts of central Scotland. It was reported as common in Fife and the west of Scotland in 1851 and a year later it was said to be not infrequent in the Lothians. The year 1860 saw a change in the situation. It became uncommon in the Perth district through the 1860's, and must have become extinct in that region by the early 1870's. A few years later it had become scarce further south, in both the east and the west, until it remained common only in the south of Galloway. However, the butterfly has been reported singly from districts beyond its present stronghold in Scotland. It was found

in 1955 in Berwickshire, for example, and there is a very recent report of the species in Islay.

Grayling (*Hipparchia semele* L.) Map 11

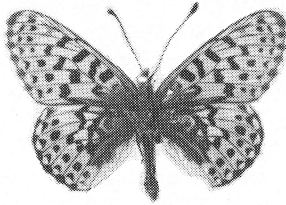
It has been said that one has little chance of seeing the Grayling unless you can also see the sea. While this is now the case in Scotland, with a few exceptions, the species has not always been coastal in its distribution. It appears to have been common near Perth in the second half of the nineteenth century and on Minto Crags, Roxburghshire, about the same time. There, and also in several places in the Hawick and Galasheils district, it was common until at least the end of the last century and probably for twenty years more. There is an old record from the western part of the Campsie Fells. Since 1900, the coastal localities too have diminished in number, but not significantly, while in some parts of the country there is some evidence of a move inland, the butterfly having been found on Ben Cruachan and also at Glengarnock in Ayrshire some fifteen miles inland.

Ringlet (*Aphantopus hyperanthus* L.) Map 12

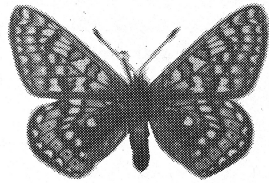
Compared to some of the previous species, the Ringlet's distribution has changed far less markedly. It has, however, disappeared from some of its more northern localities such as Skye (*ante* 1860), Glenshian and also from some of its old haunts near Edinburgh and Glasgow.

## DISCUSSION

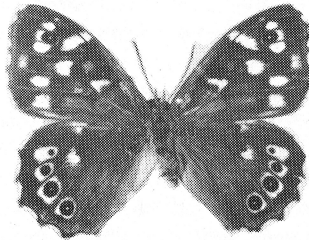
From this outline of past distributions it will be seen that two of our species ranges contracted before 1850 (Large and Dingy Skippers) six became less widespread sometime between 1850 and 1900 (Orange Tip, Small Blue, Scotch Brown Argus, Pearl-bordered Fritillary, Wall and Ringlet), while the remaining four have disappeared from former localities since the beginning of the present century. The first and most important observation which can be made from this is that there has not been a general decline in our butterflies within the lifetime of most of us. Indeed, the reverse may be the case. There is strong evidence that a number of our butterflies have become more common or more widespread in recent years. The Orange Tip appeared in Strathspey in the 1950's after a lapse of almost 100 years and is now a rela-



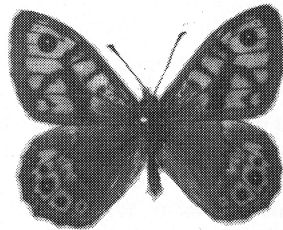
Pearl-bordered Fritillary



Marsh Fritillary



Speckled Wood



Wall

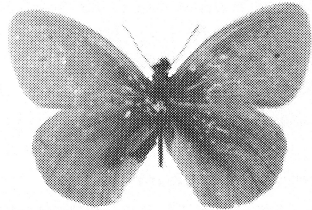
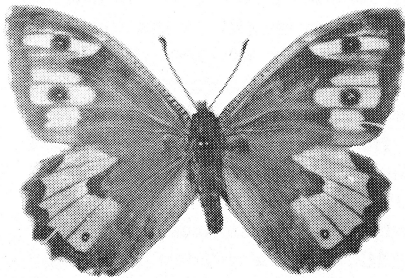


PLATE 2 Scottish Butterflies whose distributions have changed since records began.



tively common species from Newtonmore northwards. The Holly Blue has appeared in Dumfries (1950) having apparently spread from localities south of the border. The Small Pearl-bordered Fritillary is now more common than formerly in suitable locations throughout the country. The case of the Speckled Wood has already been cited and the Scotch Argus is also showing a similar spread eastwards.

The retraction of the species ranges within each of the date classes show a significant common trend. Of the butterflies in the 'pre 1850' and '1850 — 1900' groups there are three species which show an overall reduction in the number of localities in which the species are found (Small Blue, Pearl-bordered Fritillary and Ringlet), three which have become mainly restricted to the south-west and the north-east i.e. north Perthshire to the Moray Firth (Dingy Skipper, Orange Tip and Scotch Brown Argus) and two which have become restricted to the south-west (Large Skipper and Wall). On the other hand, three of the four species which have changed their distribution since 1900 (Purple Hairstreak, Marsh Fritillary and Speckled Wood) have retracted to the west of Scotland, a trend not observed in the other groups. Clearly, the effect of man on the situation over the past one hundred and fifty years must be negligible as he could not have brought about these clear patterns of distribution modification. Many human activities have been blamed for the reduction in butterflies including afforestation, insecticides and herbicides, over-collecting, ploughing and the destruction of permanent pasture, burning of heaths and grasslands and even golf. An examination in detail of each of these factors is beyond the scope of this paper, but mention may be made of the ones which are most usually blamed. The planting of extensive coniferous woodlands obviously affects the ecology of the land on which they grow; little by way of vegetation can survive below the canopy of a mature coniferous forest. But these woodlands are rarely planted on land of prime economic or entomological importance. The most likely species to be affected are the Small Pearl-bordered Fritillary and the Large Heath, but neither of these has shown a reduction in their numbers in Scotland, except in a few localities. On the contrary, an interesting and unexpected association appears to have developed between young plantations and some butterflies, notably the Pearl-bordered Fritillary and the Chequered Skipper, no doubt because of the protection afforded to the host plants in the early growth stages of the trees. The escalation in the use of synthetic organic insecticides did not occur until after 1845, much too late to cause the changes in distribution which have been described. The reproduc-



tive potential of insects, including our butterflies, is great and we can dismiss the suggestion that collecting has had any effect on our species with some confidence, but the destruction of permanent pasture appeals to be, at a first glance, a fair reason. However, once again changes in agricultural practice took place at a time which did not coincide with the changes we have seen in our butterflies. Similarly, the burning of heaths and grasslands had been practised for many years before the period which is being discussed. Even Gilbert White in his 'Natural History of Selbourne' (1788) expressed his concern:

“...yet, in this forest, about March or April, according to the dryness of the season, such vast heath-fires are lighted up, that they often get to a masterless head, and, catching the hedges, have sometimes been communicated to the underwoods, woods, and coppices, where great damage has ensued.”

There have been, of course, local extinctions which are due to causes which are not entirely natural. The best documented of these is that of the Scotch Brown Argus on Arthur's Seat, Edinburgh. The account of Logan (in Stainton, 1857) was prophetic:

“I have not diminished their numbers, having always a wholesome dread of exterminating species; but I believe a dealer has, and a host of small boys who come out of Edinburgh, with orange-coloured nets, and bottle them up wholesale, five or six together, alive, in the same receptacle, generally a matchbox, along with Blues and anything else they can find ...”

In addition to all this, Government has agreed to construct a carriage-road between Edinburgh and Duddingston, much to my disgust, as it is to come along the line o' the present footpath, and will destroy all the best localities for *artaxerxes*, *obelisca* etc.

Twelve years later, the last specimen was taken in that locality! What is not so well known is that the species was also found on the nearby Salisbury Crag and must have become extinct about the same time. Therefore, we have a situation where it would appear that over-collecting combined with the building of a road has led to the extermination of a butterfly locality but doubt must now be thrown on this explanation when we know of the adja-

cent locality on Salisbury Crag which, without the highway or small boys with their orange coloured nets, lost *artaxerxes* at the same time.

There is an explanation for the changes which took place which also explains the nature of these changes. It is well known that the climate of Scotland became more oceanic in the middle of the last century. Indeed, throughout papers on Scottish lepidoptera published between 1860 and 1870 we can read of the disastrous summers of the decade having an effect on the species. Newman (1870) makes it quite clear with reference to the Wall in Scotland:

"... the series of cold summers following that year (1860) seem to have destroyed the species."

We read the same comments in the case of *aegeria*, *minimus* and even some of the more common and widespread species, after which there was no mention of these butterflies regaining their former ground or returning to their former abundance, until very recently. Butterflies like *aurinea* and *quercus*, which tolerate, or perhaps even require, more moist conditions, became restricted to the western part of the country. Others, like *megea* and *venata* disappeared from all but the most favourable parts of the south-west, while the third group, in addition, kept their foothold in parts of the north-east.

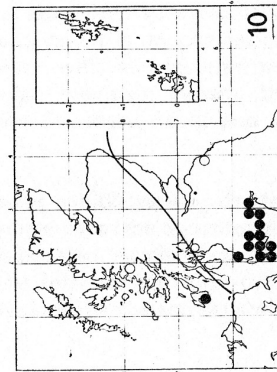
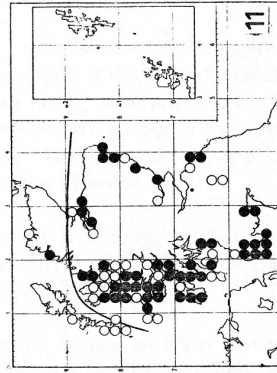
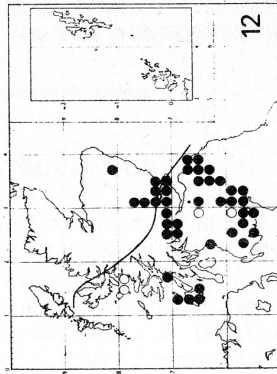
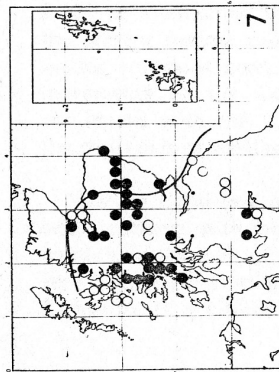
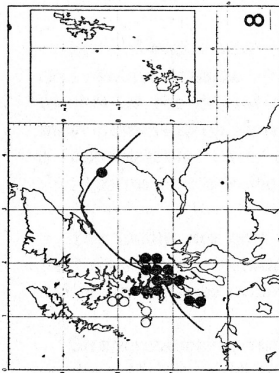
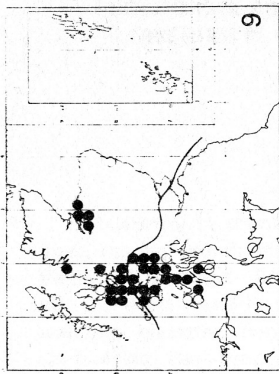
One element in the nature of distribution changes has not yet been mentioned. Short term fluctuations in population numbers is the rule rather than the exception. The Meadow Brown, Small Copper and Marsh Fritillary butterflies show marked changes in their numbers as well as increases and decreases in the areas which they inhabit. Thus, in certain years, the Meadow Brown may be found some considerable distance from its main stronghold and could, for example, be found in gardens one year and not be noticed again for a decade. These periodic tendencies for a species to move out from its population centre come under the heading of dispersal. Laidlaw (1970) postulates that population fluctuations are due to sunspot activity, but this theory is hotly disputed by many zoologists. Dennis (1976) and Heath (1974) have shown that very subtle changes in climate can produce significant changes in a species range. Last summer (1975) was one of the best for many years. The numbers of butterflies and moths were greater than had been observed for some time and the migrant species penetrated well into Scotland. The Red Admiral and Painted Lady were moderately common in cen-

tral Scotland and the Clouded Yellow was found as far north as Angus. The high number of sunny days enabled each species to complete its life cycle in perfect conditions. The winter following has been one of the driest on record, dry winters being more favourable entomologically than wet ones. It is possible that some species *may* return to central Scotland and they should be looked for in the appropriate habitat. The Orange Tip frequents marshes and damp meadows where its foodplant. Lady's Smock (*Cardamines pratensis*) is common. The Speckled Wood is fond of shady lanes and woodland clearings while the Wall could appear anywhere. Therefore, if all the conditions were right, we could experience a spread in the range of many butterfly species and we could, once again, find in central Scotland *aegeria* in our woods, *megea* in our hedgerows and *cardamines* in our fields. There is nothing which could stop their spread to the localities which are apparently as suited to their needs now as they were a hundred years ago.

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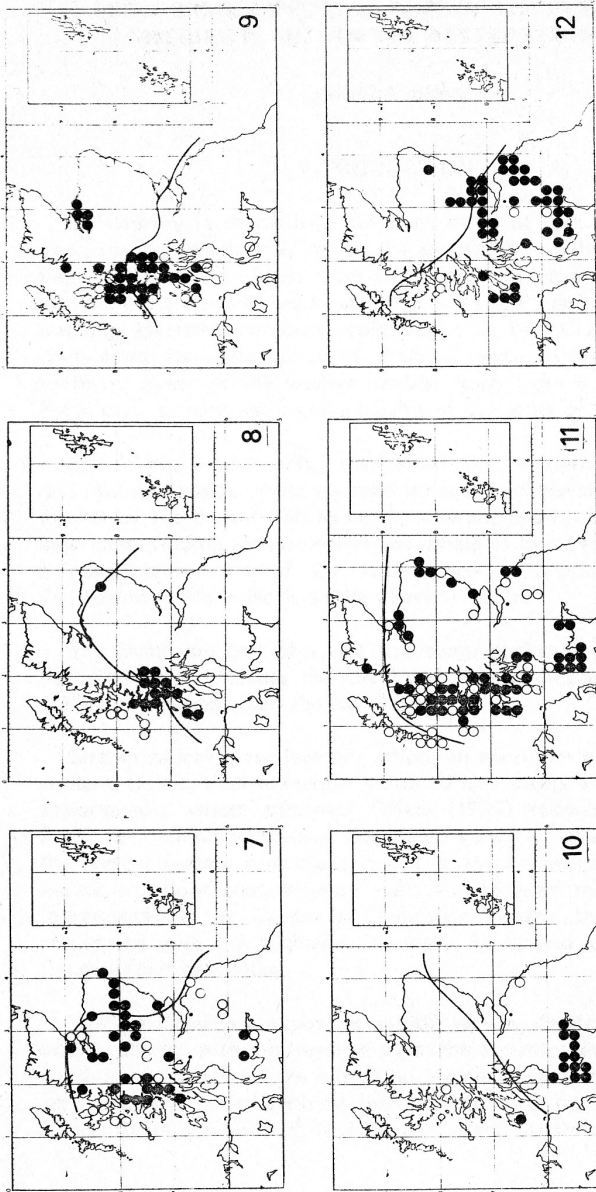


● 1960 - 1975

○ 1901 - 1959

— maximum range to 1900

• specific records to 1850



• specific records to 1850    — maximum range to 1900    ○ 1901 - 1959    ● 1960 - 1975

