Observation of Chequered Skippers in Scotland in 2010

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The Chequered Skipper *Carterocephalus palaemon* was not recognised in the western Highlands until 1942. Before that the species had been restricted, it was believed, to open, grassy spots in a few selected woods in the English Midlands and Southern Counties. The Scottish colonies were unknown in 1944 to Stokoe, who wrote that it is ‘a very uncommon and local species and has been reported only rarely and frequently at long intervals since it was first noticed as an inhabitant of Britain in 1798’ (Stokoe 1944). By the time when *The Butterflies of Great Britain and Ireland* appeared, in 1990 (Emmet & Heath 1990), the last specimen had been seen in Rutland in 1976 and the Chequered Skipper was extinct in England. It was suggested that English colonies were more sedentary than those in Scotland. However, although lack of woodland management has been suggested as a key factor, a convincing explanation of any differences and of why the English colonies died out, while those in Scotland remain confined to their relatively small area of Lochaber, has not so far been given.

Much of our detailed knowledge stems from fieldwork carried out by Neil Ravenscroft in 1988-90 at Ariundle National Nature Reserve while working on a three-year PhD study on Chequered Skipper ecology (Ravenscroft 1991, 1994a, b, c). Ariundle is about 30km south-west of Fort William.

In 2005, I visited Glasdrum Wood NNR and the Butterfly Conservation reserve at Allt Mhuic. Glasdrum is on the north shore of Loch Creran, about 25km further south than Ariundle. Allt Mhuic is about 15km north of Fort William on
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the north bank of Loch Arkaig (for details of both these sites, see Newland 1996). At Allt Mhuic, no Chequered Skippers were seen in 2005 as the weather was poor, but good observations were possible at two sites in Glasdrum Wood. In 2010, I repeated these site visits and added a study of Chequered Skippers over three days in Glen Loy. This is a sheltered valley stretching 12 km west from the River Lochy, about 8 km north of Fort William. Glen Loy is much bigger than the other sites, and Chequered Skippers had been seen here during visits by Lee Slaughter every year from 1988 to 1995 and then again in 2008. He described their location in a fascinating article (Slaughter 2009).

Description of the sites

The site at Allt Mhuic and both of those at Glen Loy are close to open courses of running water. The two sites at Glasdrum Wood are not close to running water, but they are adjacent to tall, usually damp woodland and are partially shaded.

All five sites were once wooded. Glasdrum A is the result of straightforward clearing for an electricity powerline. Glasdrum B is where charcoal workers cleared woodland and levelled the site many years ago to build their kilns. Allt Mhuic was cleared for timber removal. In the case of Glen Loy, deforestation is likely to have been the result of timber extraction coupled with the consequences of the floodplain being water-logged. When there is downward seepage from bogs at a higher level, woodland plants are replaced by Purple Moor-grass Molinia caerulea, Bog-myrtle Myrica gale and bog-mosses Sphagnum and surviving trees are mainly vestigial birches Betula (Pearsall 1950). This well describes the floodplain of the River Loy, although, in 2010, water levels were significantly lower than has usually been the case. Following very little precipitation during the winter of 2009/10, 2010 had an exceptionally dry spring. The result was that the floodplain of the River Loy had dried out so much that it could be walked on in trainers with no danger of getting wet feet.

Glasdrum Wood NNR and Allt Mhuic butterfly reserve are subject to regular maintenance. Grazing by deer at Glasdrum is supplemented by manual scrub clearance. For site A this is necessary to protect the electricity line. Because the wayleave has now become so important for butterfly fauna, there is close monitoring and Bracken Pteridium aquilinum control by Scottish Natural Heritage. Similarly, site B and the other woodland glades in the NNR are intentionally maintained to encourage, in particular, Chequered Skipper and Pearl-bordered Fritillary Boloria euphrosyne.
In recent years, Butterfly Conservation’s reserve at Allt Mhuic has been grazed by cattle with the intention of encouraging butterflies. This has not been successful, because butterfly populations have fallen. Reducing the duration of grazing is now planned. Discussions with FCS rangers carrying out a condition survey in June 2010 confirmed that the density of Chequered Skippers here is currently low. Site abundance indices have fallen from a high of 38 in 2005 to a low of only 5 in 2009.

Most of the open land at Glen Loy is part of the estate of Cameron of Locheil and is lightly grazed by sheep and by a herd of some 200 Red Deer Cervus elaphus, which range widely in the district. Therefore, the Glen Loy sites have no special maintenance. They are both along riverbanks, site A along a burn flowing north to south into the River Loy and site B alongside the River Loy flowing west to east into the River Lochy.

Observations of density and location

Chequered Skippers fly at low density. Ravenscroft recorded their peak density in his study area as 8.6 per ha. For the five sites I have visited, my subjective impression is that Allt Mhuic has the lowest flight density, probably of the same order as Ravenscroft found. Glen Loy site B (which is along the north bank of the River Loy) has the highest density, perhaps up to 300 per ha, with the other sites in between. Walking along the north bank of the River Loy on 2nd June 2010, I found male and female Chequered Skippers either nectaring or perching every dozen strides, with sometimes two or three in sight together. A transect route along the river bank would record an exceptionally high number because of their linear disposition along the edge of the river. I found that site B had moved from where it had been found by Lee Slaughter two years earlier. When compared with his description, this site appeared to have doubled in length, at least, and to have migrated to the river bank. The most favoured stretch of river was now at least 1km long, starting 0.5km further west and stretching eastwards along the full length he had identified.

Vegetation communities

In Scotland, Purple Moor-grass is believed to be the sole larval foodplant of Chequered Skippers. It grows naturally on boggy ground, becoming tall and flowering in the late summer, before dying back to provide a dense mat which shades out other plants. Sheep and deer prefer shorter, more nutritious grasses, but cattle eat the longer Purple Moor-grass (Cresswell 2008). Their grazing greatly reduces tussocks and allows Heather Calluna vulgaris and other, shorter plants to flourish. Cattle also trample and break up the dried matted grass in winter. A consequence is that Chequered Skipper larvae are likely to be casualties of excessive cattle grazing, which may have happened at Allt Mhuic.

In his research at Ariundle, Ravenscroft (1994a) described 12 different vegetation communities. For Chequered Skippers, he found that the most popular area for males and females nectaring was rush meadowland, with Bugle Ajuga reptans, Marsh Thistle Cirsium palustre, Cow Parsley Anthriscus sylvestris, bird’s-foot trefoil (? Lotus corniculatus or L. pedunculatus ?), Tormentil Potentilla erecta A male Chequered Skipper perched on a Blubell beside the riverbank at Glen Loy site B. David Newland
and Ragged-robin *Silene flos-cuculi*, but with little Purple Moor-grass (his community XI). Perching by males occurred where there were Bracken and low seedlings of Downy Birch *Betula pubescens* to provide off-ground perches. Generally, this area included also some bare ground with Bluebell *Hyacinthoides non-scripta*, Tormentil and Honeysuckle *Lonicera periclymenum* (community VI). Most larvae were found where there were prominent tussocks of Purple Moor-grass mixed with tall Bog-myrtle (up to 2m tall) and Downy Birch seedlings (community IV).

The preferred nectaring area at Ariundle, community XI, occupied 0.09ha and was some 20m from the perching area, community VI, which occupied 0.16ha. The popular area for larvae amounted to 0.88ha and, from examination of the recorded distribution of adults and larvae, this area was centred some 200m from the areas favoured by adults.

It is not clear whether similar results would be found from a correspondingly detailed study of other sites. But, for the five sites described here, I found that the vegetation communities are all more mixed than they must have been at Ariundle in 1988-90. My observations suggest that, for these five sites, adult nectaring and perching areas are generally combined and no distinction can be made between the two. Males and females coexist without obvious interference.

When I visited, it was too early to search for larvae, but tussocky Purple Moor-grass grows close to all the areas where I found adult butterflies. At Glasdrum, Purple Moor-grass is sheltered by the woodland edges. At Allt Mhuic and Glen Loy, the grass is more exposed but grows within large areas of Bog-myrtle which are adjacent to the observed flight areas in all cases and which offer protection and shade.

**Dependence on weather conditions**

The die-back of Purple Moor-grass after flowering in late summer was found by Ravenscroft (2004b) to be a cause of larval mortality, suggesting that autumn rainfall is important, as is shelter from drought conditions should they occur. He followed the development of 12 larvae until they either died or hibernated for the winter. They grew from about 2mm on emergence to some 25mm to 30mm before hibernating in late October or early November. However, some larvae in poor micro-

habitats grew at half the rate of the majority and died after about three months (see Fig.1).

The best larval habitats are where Purple Moor-grass is tall and luxuriant with long, wide leaves. This was reflected in the depth of green of the grass leaves. Ravenscroft found that plants on which larvae survived had higher nutrient content and, in particular, were richer in nitrogen than those on which larvae died. Good foodplants remained green until the late autumn, while poorer foodplants generally turned brown as early as September. The water content of the soil is a major factor in the development and nutrient content of Purple Moor-grass, and Ravenscroft concluded that ‘it is the requirements of the larvae for food-plants of enhanced nutrient status and prolonged phenology that limit the population range’ (Ravenscroft 1994b).

**Correlation analysis**

When Ravenscroft was doing his research in 1988-90, there were no reliable annual records of abundance. Therefore, it was not possible to correlate abundance with weather patterns. Now it is, because the transect at Glasdrum has been walked sufficiently regularly for site abundance indices to be published annually by the UK Butterfly Monitoring Scheme (BMS). I have explored whether the annual abundance of Chequered Skippers at Glasdrum shows any correlation with the weather in the previous year, when larval development might have been affected.

BMS site indices for Glasdrum have been published for 2002-2007 and for 2009. Although no data have been given by BMS for 2008 and the findings for 2010 had not been published at the time of writing, John Halliday, the warden at Glasdrum, has kindly supplied data for these years.
I calculated the correlation that exists between the abundance of Chequered Skippers at Glashdrum and the previous year’s rainfall by using Met Office data for Western Scotland ([www.metoffice.gov.uk/climate/uk/stationdata](http://www.metoffice.gov.uk/climate/uk/stationdata)). In Fig. 2a, abundance is plotted against the previous year’s aggregate rainfall for the four months July-October. In Fig. 2b, it is plotted against the previous year’s rainfall for the one month of July.

In Fig 2a, the correlation coefficient when using aggregate rainfall is \( r=0.42 \), with the probability that this could have occurred by chance high at 0.26. In other words, there is poor correlation. However, in Fig. 2b, the correlation coefficient when using the previous year’s July rainfall is 0.86 (maximum 1.0), with the probability that this could have arisen by chance only 0.003 (3 parts in 1,000). This means, according to these data, that there is clear correlation between butterfly abundance and rainfall in the previous month of July.

A more thorough analysis allows for the effect of the previous year’s abundance as well as July rainfall, but the conclusion from doing a complete analysis is the same, namely that July rainfall is important.

One feature of Ravenscroft’s Fig. 1 may be interpreted as biological evidence which supports this conclusion. He shows two curves in this figure. One (with solid circles) is for larvae which grow to the stage of successful hibernation. The other (with open circles) is for unsuccessful larvae, which do not grow to reach hibernation. Apparently, from the first weeks of life, their rate of growth proceeds more slowly than that of larvae which are likely to reach the hibernation stage. Ravenscroft attributes this slow growth to lack of nutrition from the foodplant. Lack of rainfall at the critical period in the first weeks of larval development must reduce the nutritional quality of Purple Moor-grass. It does seem possible that this may lead to retarded early larval growth, which may never be recovered, thus preventing larvae from reaching hibernation.

**Discussion**

At all five sites which I examined, there was no doubt that nectaring and perching, in which category I include basking (by both males and females), occurred in the same places. This is not surprising given that habitats suitable for nectaring and perching were mixed at all five sites. In effect, Ravenscroft’s vegetation communities VI and XI were mixed into a single heterogeneous vegetation community. Males and females generally took little notice of each other, and mating was observed only occasionally by Ravenscroft (1991), once by Slaughter (2009) and not at all by myself.

So far as I know, the separate distributions of adult butterflies and their eggs and larvae have not been studied for many species, perhaps for the reason that this is a difficult thing to do. Results for the Wood White *Leptidea sinapis*, one of the few species that have been studied, are described in Pollard & Yates (1993). At one site, flowers and

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**Fig. 2** Correlation diagrams for Chequered Skipper abundance at Glashdrum NNR plotted against the previous year’s aggregate rainfall July-October (a) and July rainfall only (b). The shaded bands indicate the bounds within which there is 95% confidence that the true correlation lies.

(a) Weak correlation, \( r=0.42, P=0.26 \)

(b) Significant correlation, \( r=0.86, P=0.003 \)
larval plants were separate, and butterflies then flew over a wider area than they did at another site, where flowers were present in areas suitable for egg-laying. At the latter site, adults tended to remain in their breeding area.

I was not able to identify where the adult female Chequered Skippers that I saw were egg-laying, but good stands of tender-looking Purple Moor-grass, partially shaded by woodland edges or by Bog-myrtle, were in all cases close to the nectaring and perching areas, and it would not have been necessary for females to travel far to find apparently good egg-laying sites. On the other hand, Ravenscroft (1991) reported females flying over open hillside and sometimes found them over 2km away from suitable habitat.

An interesting detail reported by Ravenscroft (1991) was that he found larvae several hundred metres away from where adults were seen. ‘By caging these larvae and marking the butterflies that emerged the following year, it was found that these fly back to the adult flight areas of the previous year.’ Since he also found that adults respond only to visual objects nearer to them than about 4m (Ravenscroft 1994c), the means by which adults rediscover their original colony’s location several hundred metres away remains to be explained.

It is rather surprising that the July rainfall at Glasdrum is so strongly correlated with the following year’s emergence. I would not have been surprised at a weak connection between the two, but the strong correlation is unexpected. This correlation is based on limited data and I feel that it should be treated with caution until more evidence is available. It depends critically on the results for 2005/06 and 2009/10. Since there was heavier than normal rainfall in July 2010, if this conclusion is reliable, we may expect a strong emergence in 2011. Time will soon tell!

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