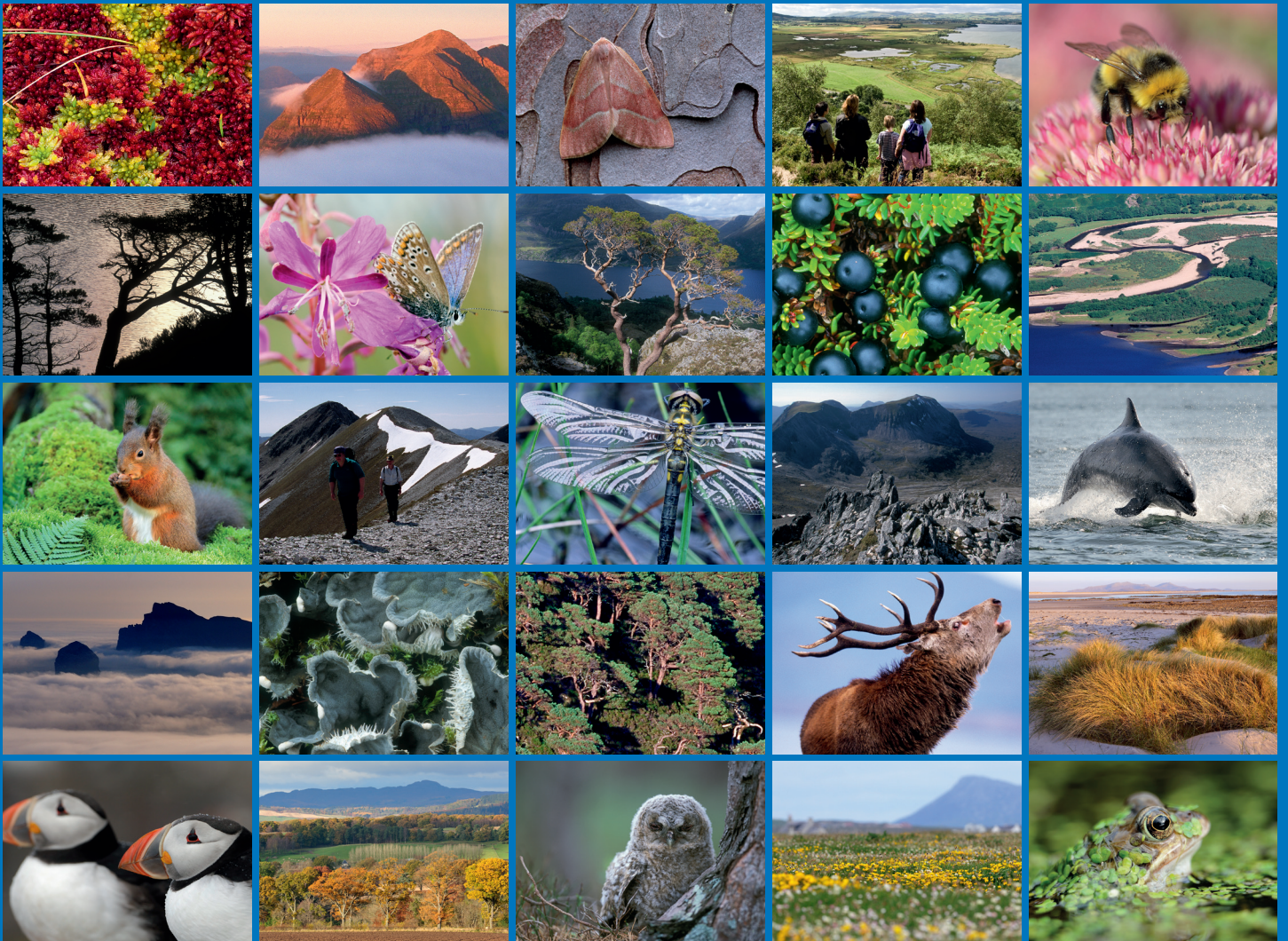


Site Condition Monitoring of dragonflies on Loch a' Mhuilinn SSSI 2016





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RESEARCH REPORT

Research Report No. 1086

Site Condition Monitoring of dragonflies on Loch a' Mhuilinn SSSI 2016

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RESEARCH REPORT

Summary

Site Condition Monitoring of dragonflies on Loch a' Mhuilinn SSSI 2016

Research Report No. 1086
Project No: 113952
Contractor: Jonathan Willet
Year of publication: 2020

Keywords

Loch a' Mhuilinn; Odonata; azure hawk; *Aeshna caerulea*; SSSI; Site Condition Monitoring; dragonfly; damselfly.

Background

Loch a' Mhuilinn Site of Special Scientific Interest (SSSI) lies on the north-west coast of Sutherland, 5 km south of Scourie. The site is of national importance for its woodland, lichens and the assemblage of dragonfly species.

The aim of the survey was to monitor and provide field data required by SNH to report on the condition of the dragonfly assemblage feature at Loch a' Mhuilinn SSSI.

Main findings

- The dragonfly assemblage on Loch a' Mhuilinn SSSI was in 'favourable maintained' condition with no identified threats to it.
- Azure hawk *Aeshna caerulea* was recorded on the site for the first time.
- The Odonata (dragonfly and damselfly) species list for the site is now ten which is an increase of one species from the 2010 and 2002 SCM surveys.
- Nine species of Odonata were confirmed as breeding on this site in 2016, an increase of two species from 2010.

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SCM Reports

This report was commissioned by SNH as part of the Site Condition Monitoring (SCM) programme to assess the condition of special features (habitats, species populations or earth science interests) on protected areas in Scotland (Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas and Ramsar sites). Site Condition Monitoring is SNH's rolling programme to monitor the condition of special features on protected areas, their management and wider environmental factors which contribute to their condition.

The views expressed in the report are those of the contractor concerned and have been used by SNH staff to inform the condition assessment for the individual special features. Where the report recommends a particular condition for an individual feature, this is taken into account in the assessment process, but may not be the final condition assessment of the feature. Wider factors, which would not necessarily be known to the contractor at the time of the monitoring, are taken into consideration by SNH staff in making final condition assessments.

Table of Contents	Page
1. INTRODUCTION TO THE SITE AND SURVEY	1
1.1 Species of key importance	1
2. METHODS	2
2.1 Habitat survey and monitoring	2
2.2 Order of site survey	2
2.3 Larval survey	2
2.4 Adult survey	2
2.5 British dragonfly society proof of breeding criteria	3
3. RESULTS	4
3.1 Habitat survey dates and weather conditions	4
3.2 Site description	4
3.3 Results of habitat survey	5
3.4 Results of 2016 species survey	5
3.5 Results of 2010 species survey	5
3.6 Results of the 2002 species survey	6
3.7 Existing Odonata records on the NBN database in the study area and adjacent 10 kilometre squares	6
4. DISCUSSION	7
4.1 Species recorded	7
4.2 Survey sites	7
5. CONCLUSION	8
5.1 An evaluation of the site condition in relation to Odonata	8
5.2 Species assemblage	8
5.3 Site management recommendations	8
6. REFERENCES	9
ANNEX 1: ODONATA RECORDS FROM THE SURVEY	10
ANNEX 2: MAP OF THE ODONATA SCM SURVEY SITES	11
ANNEX 3: PHOTOGRAPHS OF SURVEY SITES	12

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1. INTRODUCTION TO THE SITE AND SURVEY

Loch a' Mhuilinn Site of Special Scientific Interest (SSSI) lies on the north-west coast of Sutherland, 5 km south of Scourie. The site is of national importance for its mixed deciduous woodland, the exceptional woodland lichen flora and the assemblage of dragonfly species.

The aim of this survey was to monitor and provide field data required by SNH to report on the condition of the dragonfly assemblage feature at Loch a' Mhuilinn SSSI.

Nine species of Odonata that have been recorded within Loch a' Mhuilinn SSSI in the SCM surveys in 2002 and 2010 (Hewitt & Moran, 2002; Willet, 2011). The dragonflies recorded are black darter *Sympetrum danae*, common darter *Sympetrum striolatum*, four-spotted chaser *Libellula quadrimaculata*, golden-ringed dragonfly *Cordulegaster boltonii* and common hawkler *Aeshna juncea*. The damselflies recorded are the emerald damselfly *Lestes sponsa*, large red damselfly *Pyrrosoma nymphula*, blue-tailed damselfly *Ischnura elegans* and common blue damselfly *Enallagma cyathigerum*.

1.1 Species of key importance

Azure hawkler *Aeshna caerulea* is quite widespread in Sutherland, with roughly half of the Scottish (UK) distribution found in the north-west Highlands. This species is under-recorded as are most Odonata. Locally it is quite well recorded although most sightings seem to be near roads or tracks. There are two previous records within 5 km of Loch a' Mhuilinn so it is highly likely that it breeds close to the SSSI. Prior to the current survey, this species had not been recorded on the SSSI.

2. METHODS

Surveying for upland species of adult insects is unpredictable due to rapidly changing weather conditions and very local weather systems. The techniques used in this survey have been developed in the field over the last ten years.

The survey took place during the best weather conditions in July and August 2016. The two survey periods ensured that adults of both early (large red damselfly) and late (black darter) species would be on the wing.

2.1 Habitat survey and monitoring

Evaluation of habitat quality took place during the species survey.

2.2 Order of site survey

The map of the suitable Odonata habitat on the site was analysed and an order of survey was devised. The key sites on the SSSI were visited in an anti-clockwise direction in the following order 4, 1, 2, 3, 5 and 6 (see Annex 2).

2.3 Larval survey

Though weather is not a key consideration for larval sampling it is best to do it when it is not too cold, too windy or after or during heavy rain. Larval sampling took place when the temperature was 15°C or above, the wind speed was at or below force 4 and there had not been significant rainfall for three days. Most species' larvae had started emerging by June, so the ones caught when sampling were in the final larval stages and hence most straightforward to identify due to their size.

Larval sampling was undertaken by "guddling", this involves using a colander as a net and sweeping it through emergent vegetation, along the pool edge or along the pool's bottom. This is the tried and trusted Scottish larval sampling technique and is the most useful when dealing with pools with lots of sphagnum that tend to choke pond nets.

When approaching a pool, there is a hierarchy of survey actions to follow:

- Observe for any adult activity.
- Observe the edges of the pool and any marginal vegetation for signs of emerging adults or exuviae (the cast larval skin left behind after the emergence of the adult).
- Identify any exuviae and/ or emergent adults.
- Mark the site of any emergent adults to avoid them being damaged during the survey.
- Start larval sampling, until larvae are found or a maximum of twenty dips.
- Record all Odonata species as adult or larva, seen/ captured and any other readily identifiable species.

This was repeated for all the sites visited.

2.4 Adult survey

Although there was not a formal adult transect survey, a day was set aside for recording adults. Hence this took place during the best weather conditions available to the surveyor. Ideally these would include a temperature of over 17°C, very little wind and under 50 % cloud cover. These conditions did not occur during the study when the surveyor was available, so a sub-optimal survey day was utilised. High wind speed and significant cloud cover are the two key factors inhibiting adults flying if the temperature is over 15°C. These were not a factor on the survey date.

A suitable vantage point was identified at each of the survey locations allowing a view over potential basking/ perching sites and breeding pools. Ten minute watches with five minute breaks took place at various sites between 1100 and 1600. Late July/ August is the peak flight period for most Odonata species.

2.5 British dragonfly society proof of breeding criteria

The criteria from Taylor (2003) were used to indicate the breeding status of the species recorded at a particular site.

Breeding is inferred if one of the following states is recorded:

1. Confirmed breeding: exuviae or larvae present or teneral (newly emerged) adjacent to suitable water body. To this I would add the presence of cast larval moult skins where they can be identified to a particular species. It should be noted that only the presence of an exuvia constitutes absolute proof that at least one specimen has completed a cycle from egg to adult at the site.
2. Probable breeding: pair copulating or female ovipositing or regular presence of both sexes at suitable water body (normally annual presence or a repeated period consistent with the species' life-cycle length).
3. Possible breeding: female seen at a water body suitable for the species where at least one male has been observed to be engaged in some form of reproductive behaviour, such as territoriality or pursuing females.

3. RESULTS

3.1 Habitat survey dates and weather conditions

04/07/2016. 15°C with 50 % cloud cover, light rain in the morning. This was one of the best days of the month with late June and July being very changeable. The water level was very low in the loch and the bogs around the woodland were very dry.

24/08/2016. 18°C with 10 % cloud cover. Excellent conditions.

The 2016 spring in the west had been very dry and sunny but with a persistent northerly wind. June was overall a fine month with some warm days until the third week when the weather broke. July and August was very changeable with many windy and rainy days with cool temperatures. There was an improvement in mid-August onwards, with the weather becoming sunnier, more settled and warmer.

3.2 Site description

The site codes used follow those used in the 2002 SCM Report (Hewitt & Moran, 2002); two new survey sites were identified in 2010 (Willet, 2011).

LAM.1.

Rocky shore/ burn. NC16673935. Altitude 14 metres.

This is a rocky shoreline with very little in the way of emergent vegetation. A burn enters the loch at this point through a small, deep gully. The site is bounded on the north side by birch and hazel woodland with heathland to the south.

LAM.2.

East bay. NC16593944. Altitude 14 metres.

This is a shallow sheltered bay with common reed *Phragmites australis* predominating and some white water lily *Nymphaea alba*. Stone walls at the bay entrance and outflow provide good fixed points to catalogue any habitat change. This area has much more emergent vegetation and marginal vegetation than the last site and is much more sheltered, due to the bay being surrounded by woodland and higher ground all around the bay.

LAM.3.

West bay. NC16443942. Altitude 14 metres.

This is a shallow bay fringed by woodland on three sides with open water to the east. There is a discontinuous *Sphagnum* edge to the bay, which is different from the other two sample sites on the loch. There is also a small inflow burn that meanders through a mire that is dominated by common reed *Phragmites australis* and heather *Calluna vulgaris*.

LAM.4.

Saw sedge bog. NC16613905. Altitude 19 metres.

This is a depression beside the old road that is dominated by fen sedge *Cladium mariscus* (also known as saw sedge) in the middle of it covering an area of about 50 square metres. The open water around the plants is shallow. This area is more properly described as a fen.

LAM.5.

Bog pool. NC16093928. Altitude 40 metres.

This was the only bog pool found on site that held water all through the summer. It covers about 10 m² and is about 40 cm deep with a large amount of marginal *Sphagnum*. Cotton grass *Eriophorum sp.* is the main emergent vegetation there. There is 80% open water.

LAM.6.

Port nan Clach pool. NC15733905. Altitude 5 metres.

This pool was a V-shape about 6 metres long and 60cm wide. It was steep sided and found in a saddle mire on Rubh'an Dobhrain. The mire was wet in places with dense areas of common reed *Phragmites australis*. The pool was the only other permanent waterbody found on site. It was steep sided with little marginal vegetation; the only emergent vegetation in the water was the common reed.

3.3 Results of habitat survey

There were no factors negatively affecting the site.

3.4 Results of 2016 species survey

Table 1. Species recorded at each survey site. b – Indicates proof of this species breeding. This included sightings of larva, exuvia (cast larval skins left behind after emergence of the adult) and pre-flight, recently emerged adults. A dot indicates only the adult stage was seen. The total number of species recorded was ten, total number with proof of breeding was nine.

Species	LAM. 1	LAM. 2	LAM. 3	LAM.4	LAM.5	LAM.6
Azure hawker					b	
Black darter	•	•	b	b	b	
Blue-tailed damselfly	•	b	b	b	b	
Common blue damselfly	•	•				
Common darter	•	b	•	•		
Common hawker					b	
Emerald damselfly		b	b			
Four-spotted chaser	•	b	b		b	b
Golden-ringed dragonfly	•	•		b		
Large red damselfly	•	•	b	b	b	
Total species/ breeding	7	8/ 5b	6/ 5b	5/ 4b	5b	1b

3.5 Results of 2010 species survey

Table 2. 2010 SCM Results. b – Indicates proof of this species breeding. This included sightings of larva, exuvia (cast larval skins left behind after emergence of the adult) and pre-flight, recently emerged adults. A dot indicates the only the adult stage was seen. The total number of species recorded was eight, total number with proof of breeding was seven.

Species	LAM. 1	LAM. 2	LAM. 3	LAM.4	LAM.5	LAM.6
Black darter				b		
Blue-tailed damselfly	b	b	b	b	b	
Common blue damselfly						
Common darter		•	b			
Common hawker				•		
Emerald damselfly		•	b	b	b	
Four-spotted chaser		b		b	b	b
Golden-ringed dragonfly	b	•				
Large red damselfly	b	b	b	b	b	b
Total species/ breeding	3b	6/ 3b	4b	6/ 5b	4b	2b

3.6 Results of the 2002 species survey

Table 3. 2002 SCM Results. *b* – indicates proof of this species breeding. This included sightings of larva, exuvia (cast larval skins left behind after emergence of the adult) and pre-flight, recently emerged adults. A dot indicates only the adult stage was seen. Total number of species recorded was nine, total number with proof of breeding was three.

Species	LAM. 1	LAM. 2	LAM. 3	LAM.4
Black darter			•	•
Blue-tailed damselfly	•	b	•	•
Common blue damselfly	•	•	•	
Common darter	•	•	•	•
Common hawk	•	•	•	•
Emerald damselfly	•	b	•	
Four-spotted chaser		•		
Golden-ringed dragonfly	•	•		
Large red damselfly		•	b	
Total species/ breeding	6	7/ 3b	7/ 1b	4

3.7 Existing Odonata records on the NBN database in the study area and adjacent 10 kilometre squares

Table 4. Odonata recorded in adjacent 10 km squares. Note: all data comes from the NBN, the most recent of which were from 2015. NC13 is the 10 km square occupied by Loch a' Mhuilinn SSSI.

Species	NC14	NC24	NC03	NC13	NC23	NC02	NC12	NC22
Azure hawk				•	•		•	•
Black darter	•	•	•	•	•	•	•	•
Blue-tailed damselfly	•	•	•	•	•	•	•	
Common blue damselfly	•	•	•	•	•	•	•	•
Common darter	•	•	•	•	•	•	•	•
Common hawk	•	•	•	•	•	•	•	•
Emerald damselfly	•	•	•	•	•	•	•	
Four-spotted chaser	•	•	•	•	•	•	•	•
Golden-ringed dragonfly	•	•	•	•	•	•	•	•
Large red damselfly	•	•	•	•	•	•	•	•
Total	9	9	9	10	10	9	10	8

Of these species above only the azure hawk had not previously been recorded at Loch a' Mhuilinn SSSI but had been sighted nearby. The number of species recorded in each 10 km square is much more down to recording effort than any habitat suitability issue; it is highly likely that all 10 km squares in this area will have at least ten species. On average a 10 km square in Scotland has nine recorded species of Odonata.

4. DISCUSSION

4.1 Species recorded

This survey found one more species than the SCM in 2002 (Hewitt & Moran, 2002), this species being the azure hawk. This took the total number of Odonata species recorded on site to ten. Twelve species of Odonata have been recorded north of Ullapool. The two remaining species not recorded on the SSSI are greatly under-recorded with only one 10 km square for the northern emerald *Somatochlora arctica* and the two for the keeled skimmer *Orthetrum coerulescens* (according to records on the NBN database up to 2015).

In the 2010 SCM the common blue damselfly was not recorded though Willet (2011) stated that it was probably a case of it not being seen that year rather than not being present. This view was confirmed by common blue damselfly adults being recorded again in 2016 although no larvae were found. This species is still likely to be breeding on site, and is likely to have been missed because all Odonata larvae were hard to find when sampling during this survey.

The current survey found proof of breeding for azure hawk, a species that was not recorded in the 2002 or 2010 surveys. The azure hawk can be very tricky to find as often only a single larva is found per bog pool. This larva was found in the only suitable habitat for this species found on the SSSI. This species prefers to oviposit in shallow bog pools that do not dry out completely, with *Eriophorum sp.* growing in them and a sparse covering of *Sphagnum cuspidatum*.

The suite of Odonata species found on the site in 2002, 2010 and 2016 includes almost all the breeding species found north of Ullapool.

4.2 Survey sites

LAM.1. This site had little suitable breeding habitat other than for the golden-ringed dragonfly. However, the sheltered nature of the site means that it is used for resting and foraging by many species.

LAM.2. This site was the most easily accessed and best location for viewing large numbers of Odonata on the site. This was due to its sheltered location, large area of roosting/ feeding habitat nearby and easily accessible bank on the east shore. The stones on the northern bank and the stone wall were excellent basking sites for the common darter in particular. This site had the highest species count, with eight species.

LAM.3. This site was difficult to sample due to the steep banks and softness underfoot. It again was a sheltered location with a large area of roosting/ feeding habitat nearby.

LAM.4. This was another site that was difficult to sample fully due to the softness of the loch margin, so only the outer edges were sampled.

LAM.5. This pool was easy to access and sample but it did not have the full species assemblage expected. I would have expected black darter in this pool.

LAM.6. This pool was very close to the sea and flotsam had been washed up onto the mire by the pool during winter storms. Due to this the water in the pool may be slightly brackish and this may explain why only one species was found there.

5. CONCLUSION

5.1 An evaluation of the site condition in relation to Odonata

The site is in Favourable Maintained condition in relation to the dragonfly assemblage feature. A good number of larvae were found for most of the species. In combination with the extent of suitable habitat on site, and large populations of these species surrounding the site, this means that there is a good breeding population here as well as regular “topping up” of the populations within the SSSI from other, nearby breeding sites.

5.2 Species assemblage

Ten species were found on the site with evidence of breeding of nine of these. This assemblage represents all bar two of the species recorded in the far north of Scotland. Only the keeled skimmer and northern emerald dragonfly are missing from the site’s species list.

5.3 Site management recommendations

The sites' wetlands appear to be in good condition with no threats seen due to habitat change or other factors that would affect the Odonata fauna on the site. LAM6 may be more affected in the future with increased storm frequency increasing the salinity of the water. However, this is a small site and contains species found in greater numbers elsewhere on the SSSI. No change in management is currently required for the Odonata on the site.

6. REFERENCES

Hewitt, S.M & Moran, S.A. 2002. *Odonata Site Condition Monitoring – Loch a' Mhuilinn*. Unpublished report for Scottish Natural Heritage.

Taylor, P. 2003. Dragonfly Conservation Group Special Report – criteria for Proof of Breeding in dragonflies. *Dragonfly News*, 43, 26-27.

Willet, J. 2011. *Site Condition Monitoring of dragonflies on Loch a' Mhuilinn SSSI – 2010*. Scottish Natural Heritage Commissioned Report No. 407.

ANNEX 1: ODONATA RECORDS FROM THE SURVEY

Common name	Date	OS Grid Ref	Site Code
Large red damselfly	04/07/2016	NC16613905	LAM4
Blue-tailed damselfly	04/07/2016	NC16613905	LAM4
Golden-ringed dragonfly	04/07/2016	NC16613905	LAM4
Black darter	04/07/2016	NC16613905	LAM4
Common blue damselfly	04/07/2016	NC16673935	LAM1
Four-spotted chaser	04/07/2016	NC16673935	LAM1
Blue-tailed damselfly	04/07/2016	NC16673935	LAM1
Large red damselfly	04/07/2016	NC16673935	LAM1
Common darter	04/07/2016	NC16673935	LAM1
Common blue damselfly	04/07/2016	NC16593944	LAM2
Common darter	04/07/2016	NC16593944	LAM2
Black darter	04/07/2016	NC16593944	LAM2
Blue-tailed damselfly	04/07/2016	NC16593944	LAM2
Four-spotted chaser	04/07/2016	NC16593944	LAM2
Large red damselfly	04/07/2016	NC16593944	LAM2
Emerald damselfly	04/07/2016	NC16593944	LAM2
Golden-ringed dragonfly	04/07/2016	NC16593944	LAM2
Blue-tailed damselfly	04/07/2016	NC16443942	LAM3
Large red damselfly	04/07/2016	NC16443942	LAM3
Emerald damselfly	04/07/2016	NC16443942	LAM3
Large red damselfly	04/07/2016	NC16233936	
Four-spotted chaser	04/07/2016	NC16233936	
Common darter	04/07/2016	NC16233936	
Four-spotted chaser	04/07/2016	NC16093928	LAM5
Blue-tailed damselfly	04/07/2016	NC16093928	LAM5
Large red damselfly	04/07/2016	NC16093928	LAM5
Black darter	04/07/2016	NC16093928	LAM5
Common darter	04/07/2016	NC16073923	
Emerald damselfly	04/07/2016	NC16223912	
Four-spotted chaser	04/07/2016	NC16613899	
Black darter	04/07/2016	NC16613899	
Blue-tailed damselfly	04/07/2016	NC16613899	
Common darter	24/08/2016	NC16613905	LAM4
Black darter	24/08/2016	NC16613905	LAM4
Blue-tailed damselfly	24/08/2016	NC16613905	LAM4
Golden-ringed dragonfly	24/08/2016	NC16673935	LAM1
Common darter	24/08/2016	NC16673935	LAM1
Emerald damselfly	24/08/2016	NC16593944	LAM2
Blue-tailed damselfly	24/08/2016	NC16593944	LAM2
Four-spotted chaser	24/08/2016	NC16593944	LAM2
Black darter	24/08/2016	NC16593944	LAM2
Common darter	24/08/2016	NC16593944	LAM2
Blue-tailed damselfly	24/08/2016	NC16443942	LAM3
Large red damselfly	24/08/2016	NC16443942	LAM3
Common hawk	24/08/2016	NC16093928	LAM5
Four-spotted chaser	24/08/2016	NC16093928	LAM5
Blue-tailed damselfly	24/08/2016	NC16093928	LAM5
Large red damselfly	24/08/2016	NC16093928	LAM5
Azure hawk	24/08/2016	NC16093928	LAM5
Four-spotted chaser	24/08/2016	NC15733905	LAM6

ANNEX 2: MAP OF THE ODONATA SCM SURVEY SITES

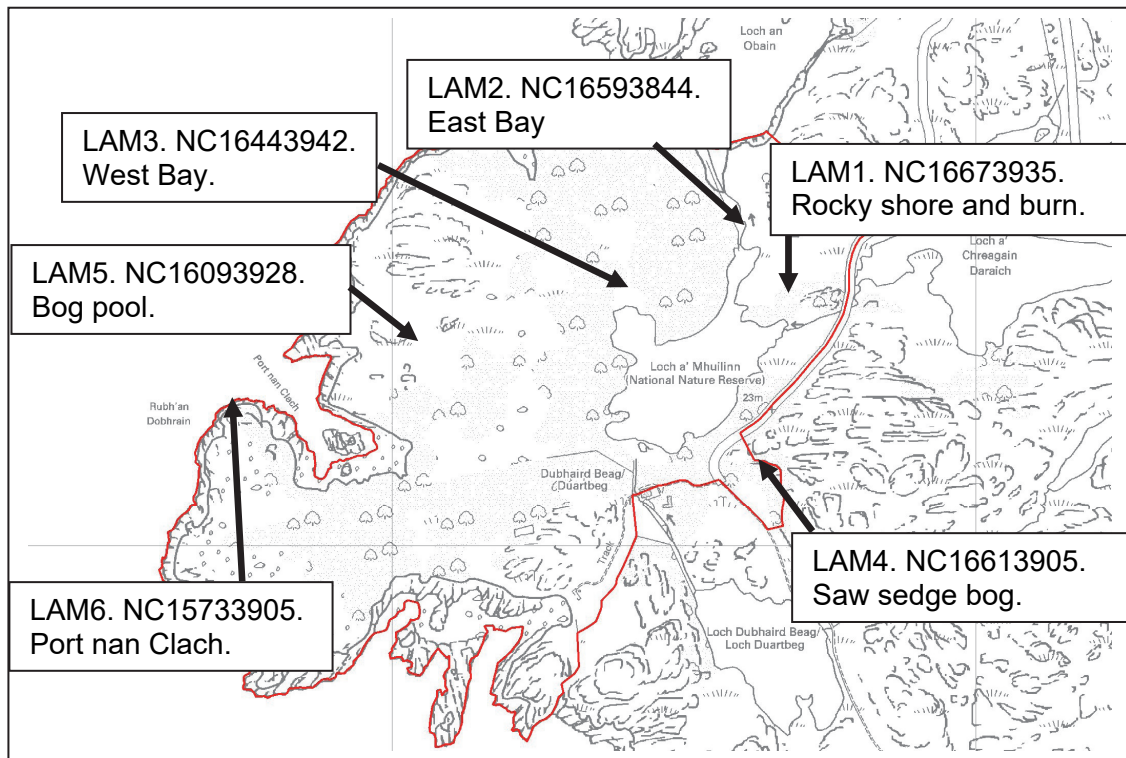


Figure 1. Map of the Odonata SCM sample sites on Loch a' Mhuilinn SSSI. © Crown copyright and database right 2017. Ordnance Survey 100017908.

ANNEX 3: PHOTOGRAPHS OF SURVEY SITES



Figure 2. LAM1.1. Rocky shore/ burn. 04/07/2016. NC16673936. Bearing 90°.



Figure 3. LAM1.2. Rocky shore/ burn. 04/07/2016. NC16653938. Bearing 135°.



Figure 4. LAM2.1. East bay. 04/07/2016. NC16583942. Bearing 0°.



Figure 5. LAM2.2. East bay. 04/07/2016. NC16603950. Bearing 90°.



Figure 6. LAM2.3. East bay. 04/07/2016. NC16603950. Bearing 180°.



Figure 7. LAM2.4. East bay. 04/07/2016. NC16603950. Bearing 180°.



Figure 8. LAM4. Saw sedge bog. 04/07/2016. NC16593905. Bearing 120°.



Figure 9. LAM5. Bog pool. 04/07/2016. NC16093928. Bearing 90°.



Figure 10. LAM5. Port nan Clach pool. 24/08/2016. NC15733905. Bearing 225°.



Figure 11. Golden-ringed dragonfly.



Figure 12. Just emerged common hawker.

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