A survey of the mason bee *Osmia uncinata* in Caledonian pine woodlands and evaluation of its status in 2006-07
Commissioned Report No. 784

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A survey of the mason bee *Osmia uncinata* in Caledonian pine woodlands and evaluation of its status in 2006-07

**Commissioned Report No. 784**
**Project no: 582**
**Contractor: Royal Society for the Protection of Birds (RSPB)**
**Year of publication: 2014**

**Keywords**

*Osmia uncinata*; mason bees; solitary bees; Caledonian pine; pollination; artificial nests.

**Background**

*Osmia uncinata* is a species associated with gaps and open edges in Caledonian pine woodland. This study aimed to survey potential habitats of *O. uncinata* to better understand the species' status and range, and to undertake an experimental investigation of trap-nests as monitoring tools.

**Main findings**

- *Osmia uncinata* is not confined to old-growth Caledonian pine woodland, but is extant in commercial plantations with suitable conditions. Its presence was confirmed for three formerly occupied 10-km squares and it was recorded in two new 10-km squares, bringing the total distribution to 15 10-km squares recorded since 2000.
- Although the bees did not use the trap-nests, the survey results confirmed the bees’ requirements of open areas for foraging. Forest managers need to be made aware of the importance of track verges and entrances as forage areas and ensure that these are maintained to prevent overgrowth.
- Further research into the foraging and nesting requirements of the bee would help fine-tune management advice to forestry managers. Recommendations for further work are provided.

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# Table of Contents

1. INTRODUCTION 1
2. SURVEY OF OPEN EDGES AND GAPS IN CALEDONIAN PINE WOODLAND 1
   2.1 Rationale 1
   2.2 Methods 1
   2.3 Results 2
3. AN EXPERIMENTAL INVESTIGATION OF TRAP-NESTS AS MONITORING TOOLS FOR *OSMIA UNCINATA* 9
   3.1 Rationale 9
   3.2 Methods 9
   3.3 Results 10
4. DISCUSSION 11
5. RECOMMENDATIONS FOR FURTHER WORK 12
6. REFERENCES 12
7. APPENDIX 13
Acknowledgements

We would like to thank Athayde Tonhasca and Chris Sydes of SNH for arranging the funding for this project, and Mike Edwards of Hymettus Ltd for his helpful advice. This survey would not have been possible without the co-operation of FC and private forest managers who allowed Stewart Taylor and Murdo MacDonald onto their land. Jeremy Roberts, manager of RSPB’s Abernethy Forest reserve, is to be thanked for sparing Andy Amphlett’s and Stewart Taylor’s time to carry out the project. Ronnie Graham patiently experimented with the design of the trap-nests and finally produced 60 masterpieces. It was just a shame that the bees didn’t appreciate them as much as we did!
1. INTRODUCTION

*Osmia uncinata* is a RDB3 species with a UK distribution restricted to Scotland, and a BAP Priority Species for which RSPB is the Lead Partner. This bee nests in old beetle galleries on trees found in sunny locations, generally at the edge of tree stands and gaps in the forest. It forages in disturbed, open areas within and adjacent to the trees, particularly in meadows, along road-side verges and streams. *Osmia uncinata* represents a suite of species that are dependent on successional habitats in Caledonian pine forests.

The project comprised two parts:

1. A survey of open edges and gaps in Caledonian pine woodland to better understand *O. uncinata* status and range.
2. An experimental investigation of trap-nests as monitoring tools.

2. SURVEY OF OPEN EDGES AND GAPS IN CALEDONIAN PINE WOODLAND

2.1 Rationale

During the first comprehensive survey of *O. uncinata* in Scotland (Edwards, 2001), nests were found in old-growth pine woodland, but it now appears that burrows in plantation trees are used as well. Additionally, it was believed that in Scotland *O. uncinata* collects pollen almost entirely from bird’s foot trefoil, *Lotus corniculatus* (Figure 1). However, subsequent pollen analysis indicated that 10 or more other plant species are also utilised (P. Westrich, pers. comm.), which implies that *O. uncinata* is not confined to bird’s foot trefoil habitats and therefore may be more widely distributed than previously known. Edwards (2001) suggested that *O. uncinata* is under-recorded, and may use a wider range of locations for breeding and foraging. A survey of additional areas of potential habitat within the species’ known range was undertaken to help clarify its status and range.

![Figure 1. Osmia uncinata foraging on Lotus corniculatus (photos by Murdo Macdonald).](image)

2.2 Methods

In the Highlands, *O. uncinata* is known from Strathspey, Glen Affric (1 site), Moray coast (2 sites), the Black Isle (1 site), Mid Ross (1 site), and SE Sutherland (1 site) (Figure 2).

Survey locations were selected to cover gaps in the current known distribution, working generally within the known distribution of historic records. All selected pine plantations were in open, sunny areas, had dead wood or beetle burrows and suitable forage plants (especially *L. corniculatus*). Visual searches were carried out by inspecting holes in trees made by *Rhagium inquisitor* and other beetles and then carrying out timed walks (30-40 min)
through nearby areas containing *L. corniculatus* and other Fabaceae species. Surveys were restricted to days forecast to be sunny, a necessary condition for the bee to forage, but some sites were in shade when visited. A total of 60 sites were surveyed during the two years; five in 2006 (Table 1) and 55 in 2007 (Table 2). The survey included three areas where the bee had previously been recorded: Monadh Mor (2004 and 2005), Abernethy (1982 and 1999) and Inshriach (1982).

![Figure 2. Osmia uncinata known sites as at 15 July 2005, including historic records.](image)

### 2.3 Results

In 2006, the only sightings of *O. uncinata* were at four locations within the Mondhuie area of RSPB’s Abernethy National Nature Reserve (Table 1), although suitable habitat existed at the four other sites.

In 2007, there were 11 sightings of *O. uncinata*, of which eight were within three previously recorded sites, Monadh Mor, Abernethy Forest and Inshriach, and the remainder were at three new sites: Dulnain Bridge (NH92), near Nether Port (NJ02) and Upper Tomvaich Wood (NJ03) (Table 2).

Five of the 11 sightings were within the Forestry Commission plantation woodland near Inshriach House, where the bee has not been recorded since a single record in 1982, and two were within two hectads within Abernethy Forest. Figure 3 shows the distribution of the sites visited and where the bee was recorded.

Most sightings of the bee were from open areas either alongside tracks or track entrances (five sites), on a roadside verge (two sites) and at a quarry (one site). There appears to be an association between *O. uncinata* and *L. corniculatus* but this is not always the case; one of the sites near Inshriach where *O. uncinata* was seen only had very small scattered patches of *L. corniculatus*.

Of the 48 locations where *O. uncinata* was not recorded, at least 19 had good amounts of *L. corniculatus* and are considered worth re-visiting. The weather was very poor in June 2007 and even on sunny days the temperature was below 15°C and the sun often had..
disappeared at the time some sites were visited, which may account for the absence of sightings.

*Table 1: Results of Osmia uncinata survey in 2006. Surveyed in June by Murdo Macdonald (MM) and Stewart Taylor (ST)*

<table>
<thead>
<tr>
<th>Location</th>
<th>Grid Ref</th>
<th>Surveyor</th>
<th>O. uncinata seen?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lairg</td>
<td>NC50</td>
<td>MM</td>
<td>no</td>
</tr>
<tr>
<td>Glen Aldie</td>
<td>NH77</td>
<td>MM</td>
<td>no</td>
</tr>
<tr>
<td>Glen Glass/Foulie</td>
<td>NH65</td>
<td>MM</td>
<td>no</td>
</tr>
<tr>
<td>Little Garve/Longart</td>
<td>NH46</td>
<td>MM</td>
<td>no</td>
</tr>
<tr>
<td>Abernethy Mondhuie</td>
<td>NH98031950</td>
<td>ST</td>
<td>yes</td>
</tr>
<tr>
<td>Abernethy Mondhuie</td>
<td>NH99602002</td>
<td>ST</td>
<td>yes</td>
</tr>
<tr>
<td>Abernethy Mondhuie</td>
<td>NH99531997</td>
<td>ST</td>
<td>yes</td>
</tr>
<tr>
<td>Abernethy Mondhuie</td>
<td>NJ03811399</td>
<td>ST</td>
<td>yes</td>
</tr>
</tbody>
</table>
Table 2: Results of *Osmia uncinata* survey in 2007. Surveyed by Murdo Macdonald (MM) and Stewart Taylor (ST)

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Grid Ref</th>
<th>Surveyor</th>
<th><em>O. uncinata</em> seen?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/5</td>
<td>Knockbain</td>
<td>NH630551</td>
<td>MM</td>
<td>no</td>
<td>Much <em>Lotus</em> in superficially suitable habitat but not in full flower.</td>
</tr>
<tr>
<td>27/5</td>
<td>Dunmaglass</td>
<td>NH614245</td>
<td>MM</td>
<td>no</td>
<td>Good weather for foraging, other solitary bees active on small amount <em>Lotus</em> but habitat unsuitable.</td>
</tr>
<tr>
<td>31/5</td>
<td>Knockbain</td>
<td>NH630552</td>
<td>MM</td>
<td>no</td>
<td><em>Lotus</em> was in flower and good foraging conditions. Worth revisiting.</td>
</tr>
<tr>
<td>31/5</td>
<td>Monadh Mor</td>
<td>NH593532</td>
<td>MM</td>
<td>yes</td>
<td>One male seen in previously known location. Recent felling has involved stacking of timber on the <em>Lotus</em>-rich verges, with some temporary loss of forage. Increased shading by tree growth can be anticipated. FCS is aware of the presence of the bee on the site, but some direct approach should perhaps be made with a view to establishing management principles to accommodate the needs of <em>Osmia</em>.</td>
</tr>
<tr>
<td>1/6</td>
<td>Coneas/Glen Glass</td>
<td>NH5568</td>
<td>MM</td>
<td>no</td>
<td>Good weather for foraging and many other solitary bees active on plentiful <em>Lotus</em> but no evidence of <em>Osmia</em>. This site looks favourable, but has been visited several times in good conditions with no result. It should not be rated as a priority for survey in future.</td>
</tr>
<tr>
<td>1/6</td>
<td>Loch Morlich</td>
<td>NH96283 09730</td>
<td>ST</td>
<td>no</td>
<td>Walked right round loch, very few <em>Lotus</em> plants.</td>
</tr>
<tr>
<td>1/6</td>
<td>Allt Mor bridge</td>
<td>NH98353 08354</td>
<td>ST</td>
<td>no</td>
<td>Masses of <em>Lotus</em> close to road verge, a possible site for future checks.</td>
</tr>
<tr>
<td>1/6</td>
<td>Ex Council Yard</td>
<td>NH95191 18992</td>
<td>ST</td>
<td>no</td>
<td>Intermittent sun, good <em>Lotus</em> clumps with kidney vetch.</td>
</tr>
<tr>
<td>1/6</td>
<td>Coire na Ciste car park</td>
<td>NH997 075</td>
<td>ST</td>
<td>no</td>
<td>Too windy and probably too high, more <em>O. inermis</em> territory, lots of <em>Lotus</em> however.</td>
</tr>
<tr>
<td>2/6</td>
<td>Coneas/Glen Glass</td>
<td>NH5668</td>
<td>MM</td>
<td>no</td>
<td>As in 1/6 visit.</td>
</tr>
<tr>
<td>7/6</td>
<td>B970 opposite Boat</td>
<td>NH89714 10320</td>
<td>ST</td>
<td>no</td>
<td>Good clumps of <em>Lotus</em>.</td>
</tr>
<tr>
<td>Date</td>
<td>Location Details</td>
<td>Grid Ref</td>
<td>Site Type</td>
<td>Access</td>
<td>Observations</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------</td>
<td>----------</td>
<td>-----------</td>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7/6</td>
<td>Forestry Commission track Inshriach</td>
<td>NH87205 06868</td>
<td>ST</td>
<td>yes</td>
<td>One Osmia seen on Lotus along track, a perfect location.</td>
</tr>
<tr>
<td>7/6</td>
<td>FC workshop entrance</td>
<td>NH86362 06504</td>
<td>ST</td>
<td>yes</td>
<td>One or two Osmia seen, large amount of Lotus.</td>
</tr>
<tr>
<td>7/6</td>
<td>FC track</td>
<td>NH85414 04457</td>
<td>ST</td>
<td>no</td>
<td>Scattered patches of Lotus along track side.</td>
</tr>
<tr>
<td>7/6</td>
<td>same FC track Inshriach</td>
<td>NH86187 04349</td>
<td>ST</td>
<td>yes</td>
<td>One to two Osmia seen despite there only being very small scattered patches of Lotus.</td>
</tr>
<tr>
<td>7/6</td>
<td>FC track Inshriach</td>
<td>NH86196 03591</td>
<td>ST</td>
<td>yes</td>
<td>One Osmia seen, good patches of Lotus along track side.</td>
</tr>
<tr>
<td>9/6</td>
<td>FC track entrance Inshriach</td>
<td>NH85488 01814</td>
<td>ST</td>
<td>yes</td>
<td>Big patches of Lotus in layby by road, Osmia found on small patch just by road nearby.</td>
</tr>
<tr>
<td>9/6</td>
<td>FC track</td>
<td>NH83667 02967</td>
<td>ST</td>
<td>no</td>
<td>A few good clumps of Lotus.</td>
</tr>
<tr>
<td>9/6</td>
<td>FC track entrance</td>
<td>NH83871 02233</td>
<td>ST</td>
<td>no</td>
<td>Many small clumps of Lotus by road and into track entrance.</td>
</tr>
<tr>
<td>9/6</td>
<td>FC track</td>
<td>NH83508 01485</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>9/6</td>
<td></td>
<td>NH83496 01484</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>9/6</td>
<td></td>
<td>NH83376 01470</td>
<td>ST</td>
<td>no</td>
<td>Huge patch of Lotus.</td>
</tr>
<tr>
<td>14/6</td>
<td>FC track</td>
<td>NH83667 02967</td>
<td>ST</td>
<td>no</td>
<td>Sun was out but a very cool breeze persisted.</td>
</tr>
<tr>
<td>14/6</td>
<td>FC track entrance</td>
<td>NH83871 02233</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>14/6</td>
<td>FC track</td>
<td>NH83508 01485</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>14/6</td>
<td></td>
<td>NH83496 01484</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>14/6</td>
<td></td>
<td>NH83376 01470</td>
<td>ST</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>19/6</td>
<td>Roadside verge Dulnain Brg (west side)</td>
<td>NH99749 24675</td>
<td>ST</td>
<td>yes</td>
<td>One Osmia found.</td>
</tr>
<tr>
<td>19/6</td>
<td>Finlarig</td>
<td>NH9955</td>
<td>ST</td>
<td>no</td>
<td>Few Lotus plants.</td>
</tr>
<tr>
<td>19/6</td>
<td>Glenbeg</td>
<td>NJ0126</td>
<td>ST</td>
<td>no</td>
<td>Few Lotus plants.</td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Grid Ref</td>
<td>ST Code</td>
<td>Reply</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>19/6</td>
<td>road verge Upper Port Wood</td>
<td>NJ05819 29467</td>
<td>ST</td>
<td>no</td>
<td>Several small patches of <em>Lotus</em>.</td>
</tr>
<tr>
<td>19/6</td>
<td>Upper Tomvaich Wood quarry</td>
<td>NJ06346 30286</td>
<td>ST</td>
<td>yes</td>
<td>Quarry site, one <em>Osmia</em> seen, good patches of <em>Lotus</em>.</td>
</tr>
<tr>
<td>19/6</td>
<td>roadside verge B9102</td>
<td>NJ09156 32231</td>
<td>ST</td>
<td>no</td>
<td>Good patches of <em>Lotus</em>, mainly birch woodland adjacent.</td>
</tr>
<tr>
<td>19/6</td>
<td>track Tom na Laimh wood</td>
<td>NJ10569 33452</td>
<td>ST</td>
<td>no</td>
<td>Few <em>Lotus</em> plants, mainly birch wood adjacent.</td>
</tr>
<tr>
<td>19/6</td>
<td>Craigvarren Wood</td>
<td>NJ1114 33813</td>
<td>ST</td>
<td>no</td>
<td>Few <em>Lotus</em> plants.</td>
</tr>
<tr>
<td>19/6</td>
<td>Woods of Knockfrink</td>
<td>NJ12207 33374</td>
<td>ST</td>
<td>no</td>
<td>Managed Scots pine wood, few patches of <em>Lotus</em>.</td>
</tr>
<tr>
<td>19/6</td>
<td>Tom an Uird (west)</td>
<td>NJ09640 31844</td>
<td>ST</td>
<td>no</td>
<td>Reasonable amount of <em>Lotus</em>, possibly worth another visit.</td>
</tr>
<tr>
<td>19/6</td>
<td>Road verge nr Nether Port track entrance</td>
<td>NJ06203 29047</td>
<td>ST</td>
<td>yes</td>
<td>Good patches of <em>Lotus</em>, one <em>Osmia</em> seen at north verge of road.</td>
</tr>
<tr>
<td>19/6</td>
<td>Track entrance Craig Revack</td>
<td>NJ02834 25600</td>
<td>ST</td>
<td>no</td>
<td>Good patches of <em>Lotus</em>, sunshine intermittent, to re-visit.</td>
</tr>
<tr>
<td>22/6</td>
<td>Track entrance Craig Revack</td>
<td>NJ02834 25600</td>
<td>ST</td>
<td>no</td>
<td>Sunshine intermittent.</td>
</tr>
<tr>
<td>30/6</td>
<td>Forestry track nr Ardachy</td>
<td>NH77876 25252</td>
<td>ST</td>
<td>no</td>
<td>Few <em>Lotus</em>, not worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>Forestry track nr Dalarossie Cott</td>
<td>NH76691 24607</td>
<td>ST</td>
<td>no</td>
<td>Few <em>Lotus</em>, not worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>forestry track same wood as 31</td>
<td>NH76225 24556</td>
<td>ST</td>
<td>no</td>
<td>Track verges sprayed with herbicide, not worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>by Garbole to Farr single track road</td>
<td>NH75304 24617</td>
<td>ST</td>
<td>no</td>
<td>No sun, small patches of <em>Lotus</em>, not worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>same road further along</td>
<td>NH74296 25275</td>
<td>ST</td>
<td>no</td>
<td>As above.</td>
</tr>
<tr>
<td>30/6</td>
<td>FC car park Feyglass Wood</td>
<td>NH68310 31015</td>
<td>ST</td>
<td>no</td>
<td>No sun, worth re-visiting, walked track to NH68128 30558.</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Coordinates</td>
<td>Type</td>
<td>Access</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------</td>
<td>-------------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>30/6</td>
<td>FC car park School Wood</td>
<td>NH68536 33576</td>
<td>ST</td>
<td>no</td>
<td>No sun, not worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>lay-by B851 nr Tombreck</td>
<td>NH69206 35075</td>
<td>ST</td>
<td>no</td>
<td>No sun, but worth a re-visit, plenty of <em>Lotus</em> on recently disturbed ground.</td>
</tr>
<tr>
<td>30/6</td>
<td>B851 council lay-by &amp; FC loading bay</td>
<td>NH69647 35825</td>
<td>ST</td>
<td>no</td>
<td>No sun, good amounts <em>Lotus</em>, worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>FC Littlemill Wood entrance B851</td>
<td>NH70078 36559</td>
<td>ST</td>
<td>no</td>
<td>No sun, lots of <em>Lotus</em> and worth re-visiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>Lamington</td>
<td>NH7375</td>
<td>MM</td>
<td>no</td>
<td>Little <em>Lotus</em> in evidence, and no obvious nesting habitat. Not worth revisiting.</td>
</tr>
<tr>
<td>30/6</td>
<td>Lamington</td>
<td>NH7376</td>
<td>MM</td>
<td>no</td>
<td>As above.</td>
</tr>
<tr>
<td>30/6</td>
<td>Lamington</td>
<td>NH7475</td>
<td>MM</td>
<td>no</td>
<td>As above.</td>
</tr>
<tr>
<td>30/6</td>
<td>Edge of Abernethy Forest</td>
<td>NH995199</td>
<td>ST</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>30/6</td>
<td>Abernethy Forest</td>
<td>NH9962002</td>
<td>ST</td>
<td>yes</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3. Distribution map of areas surveyed in 2006 and 2007 with location of records.
3. AN EXPERIMENTAL INVESTIGATION OF TRAP-NESTS AS MONITORING TOOLS FOR OSMIA UNCINATA

3.1 Rationale

The availability of suitable nest and foraging sites in sunny locations appears to be a limiting factor for *O. uncinata*. Potentially this could become a severe problem if management practices do not maintain these features. For example, management advocated for capercaillie and other closed-forest species, such as continuous tree canopy through extended rotations and thinning rather than clear-felling, and reducing grazing levels to facilitate natural regeneration of woodland, may reduce the length of sunny stand edges and cause the loss of foraging sites. Clear fells and other open spaces (above a certain size) are considered to fragment woodland habitat for species such as capercaillie. Management prescriptions seeking to maximise woodland area and continuity of woodland cover, have the potential to conflict with the interests of invertebrates that require gaps within the forest, including *O. uncinata*.

3.2 Methods

*Osmia uncinata* occupies beetle galleries in the bark of pine trees. Trap-nests were used to test whether bees would accept them as nesting sites. The nests comprised larch blocks divided in six sections with 6-8 grooves bored into each section. When the sections were joined together, the grooves formed holes. Three hole sizes were used: 5, 6 and 10 mm diameter, with one size per block. The blocks were mounted in sets of three to form one trap nest. They were wrapped in black waterproof tape and the exposed surface with the holes was waterproofed with beeswax. The roof of the trap-nest was overhanging by 2 cm and the bottom edge was grooved to avoid water dripping into the holes (Figure 4).

![Figure 4. Trap-nest on a Caledonian pine tree.](image)

Trap-nests were erected in early May 2006 within the RSPB Abernethy Nature Reserve at five locations; four where the bee had been sighted during the last four years and one site (River Nethy South) in suitable habitat in the far south of the forest where the bee had not
been seen but not adequately searched (Table 4); three trap nests were placed at most locations. They were erected on trees in SE-SW facing positions at approximately 3 m above the ground, and were angled downwards to prevent water running into the holes. They were mounted about one week before the bee is known to be active and retrieved on 27 and 28 September 2006. The trap nests were opened and the contents examined by Murdo Macdonald during October 2006. It was planned to transfer any cells of *O. uncinata* into gelatine capsules (as used in the pharmaceutical trade) in order to rear them through the winter and release emerged adults back on site in the following spring.

Table 4: Location of trap-nests in 2006

<table>
<thead>
<tr>
<th>SITE</th>
<th>GRID REF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mondhuie power line</td>
<td>NH 9920 1948</td>
</tr>
<tr>
<td>near Nethy Bridge</td>
<td>NH 9954 2001 (2 nests)</td>
</tr>
<tr>
<td>River Nethy Ford</td>
<td>NJ 0216 1455</td>
</tr>
<tr>
<td></td>
<td>NJ 0217 1445</td>
</tr>
<tr>
<td></td>
<td>NJ 0219 1448</td>
</tr>
<tr>
<td>River Nethy South</td>
<td>NJ 0229 1272</td>
</tr>
<tr>
<td>Tomdhu gate</td>
<td>NH 9829 2039</td>
</tr>
</tbody>
</table>

A second pilot study was undertaken in 2007. To increase the likelihood of occupancy, more trap nests were placed at each of three sites: Mondhuie (four nests), River Nethy Ford (five nests) and Tomdhu gate (five nests). These were erected in late May, retrieved in February 2008, and opened and examined by Murdo Macdonald. Characteristics of sample sites are shown in the Appendix.

### 3.3 Results

No *O. uncinata* were found in the trap nests, and only one hymenopteran, an *Apis mellifera* worker occupied them, possibly attracted by the bee-wax on the structure. Spiders were the main occupants and they produced a lot of silk, which potentially could have deterred bees from using the holes. Some of the spiders and most of the dipterans found were alive.

Despite careful, positioning, several trap nests were very wet and three contained slugs. As the trap-nests were exposed to the SW, the rain may have been driven into them by the wind.

The spiders were retained for identification (by IK Dawson) and included:

*Clubiona subsultans* (Clubionidae), 3m, 10f: restricted to Caledonian pine forest in the UK where it lives on pine trees and juniper; a RDB2 species.

*Moebelia penicillata* (Linyphiidae), 1m: thinly but widely distributed across Britain, living typically in crevices on conifer trunks.
Cryphoea silvicola (Dictynidae), 1f: a common species in dry litter and under loose tree bark in the north and west.

Amaurobius fenestralis (Amaurobiidae), 3f: widespread and very common under loose tree bark.

Philodromus aureolus (Philodromidae), 3f: widespread and common on shrubs, trees, etc. All spiders were previously known from Abernethy.

4. DISCUSSION

The results of the survey have confirmed that O. uncinata is not confined to old-growth Caledonian pine woodland, but occurs in managed plantations, provided there are suitable conditions. A previous survey of mature pinewoods in Strathspey, Deeside, and areas around Inverness, where beetle galleries were examined for occupation, demonstrated that the bee only nests in trees standing in sunny sites (Edwards, 2001). All the sightings in this study were in open areas within the forests, alongside tracks, roadside verges and at a quarry site, confirming the value of such open sunny features.

It is unknown why the trap nests were not used by O. uncinata. Some of the possible reasons are:

a) Design of the trap nests, such as hole size: the ones used in the study were based on the requirements of a similar species, O. bicornis. Testing variations in design was outside the scope of this project.

b) Abundance of alternative natural sites.

c) Nest locations were based on where O. uncinata was sighted foraging, but bees may be nesting far away from these sites. Areas of L. corniculatus tend to be small, so bees have to use many foraging areas and may not nest near a particular one.

d) The bees may be site-faithful. Having emerged, it is possible that they prefer to nest in the same area.

Given the lack of success with trap nests, it was concluded that it was not feasible to continue with the experiment.

It is unknown where the bees were nesting, but it is possible to be in the vicinity of the areas of forage. It was common to see a bee coming back to the same patch of flowers every 5-10 min; assuming it was the same bee returning each time, this would suggest that the bee was nesting within a few hundred metres.

Our results have shown that O. uncinata is found in plantation as well as semi-natural Caledonian pine forest, therefore being more widespread than originally thought. As a result of this survey, its presence was confirmed in three formerly occupied 10-km squares and it was recorded in two new 10-km squares (NH92 and NJ03), bringing the total distribution to 15 10-km squares recorded since 2000.

Known populations are, however, highly localised and their sizes are unknown. Although management for species characteristic of larger contiguous woodland areas such as capercaillie may conflict with the interests of O. uncinata and other invertebrates that require gaps in forest cover, it is unlikely that all woodland within the bee’s range will be managed in this way. In addition, O. uncinata is likely to be favoured by management for black grouse, which require a patchwork of young and widely spaced trees, and woodland edges with a
well-developed understorey. Management practices for black grouse include the widening of rides and creation of open ground plus the thinning of tree cover at the edge of compartments, all of which should benefit *O. uncinata* and the other invertebrates of open areas (http://www.blackgrouse.info/management/woodland.htm).

5. RECOMMENDATIONS FOR FURTHER WORK

It is recommended that continued effort is put into advocacy. In particular, forest managers need to be made aware of the importance of track verges and entrances as forage areas and ensure that these are maintained to prevent overgrowth. Forest managers should be made aware of the importance of sites where *O. uncinata* has been recorded, and provided with advice to avoid accidental destruction of forage areas, e.g. by inappropriate placement of log-stacks (as was noted at Monadh Mor in 2007) or the over-use of verges as turning places for vehicles (some degree of disturbance is essential to maintain these successional habitats, so occasional use by vehicles may be beneficial).

Further surveys should be considered to better establish the status of the bee. Several of the sites visited during 2007 were considered to have suitable conditions, although the bee was not seen, possibly due to bad weather at the time of the visits.

Further research into the foraging and nesting requirements of the bee would help fine-tune management advice to forestry managers. For example, it is unknown whether the bees can nest in high stumps produced by timber harvesting. It would be useful to know whether bees are faithful to patches of forage to ascertain the importance of retaining particular ones. Research into foraging distances using marked bees would help ascertain the minimum distance between nesting and foraging sites and the amount of suitable foraging plants needed.

Experimental management of track-side verges could be carried out to determine what is required to maintain the right conditions for *L. corniculatus*. Sites where no active woodland management is carried out are likely to become overgrown and some form of rotational ground disturbance may be required. In commercial plantations, this may be achieved through normal operations of timber extraction, provided the same areas are not disturbed too often.

6. REFERENCES

7. APPENDIX

a. Sites used for the trap-nest study in 2006

Mondhuie power line

Near Nethy Bridge
River Nethy Ford

River Nethy South
b. Some sites used for the trap-nest study in 2007

Forestry Commission track near Inshriach House   NH87205 06868
Forestry Commission Workshop site west side B970 NH86362 06504

Forestry Commission track Inshriach Forest NH86187 04349
Forestry Commission track (north side) Inshriach Forest  NH86196 03591

Roadside (east) - Forestry Commission track entrance  NH85488 01814
West roadside Dulnain Bridge  
NH99749 24675

Quarry in Upper Tomvaich Wood  
NJ06346 30286
Roadside verge (north) close to Nether Port track entrance NJ06203 29047