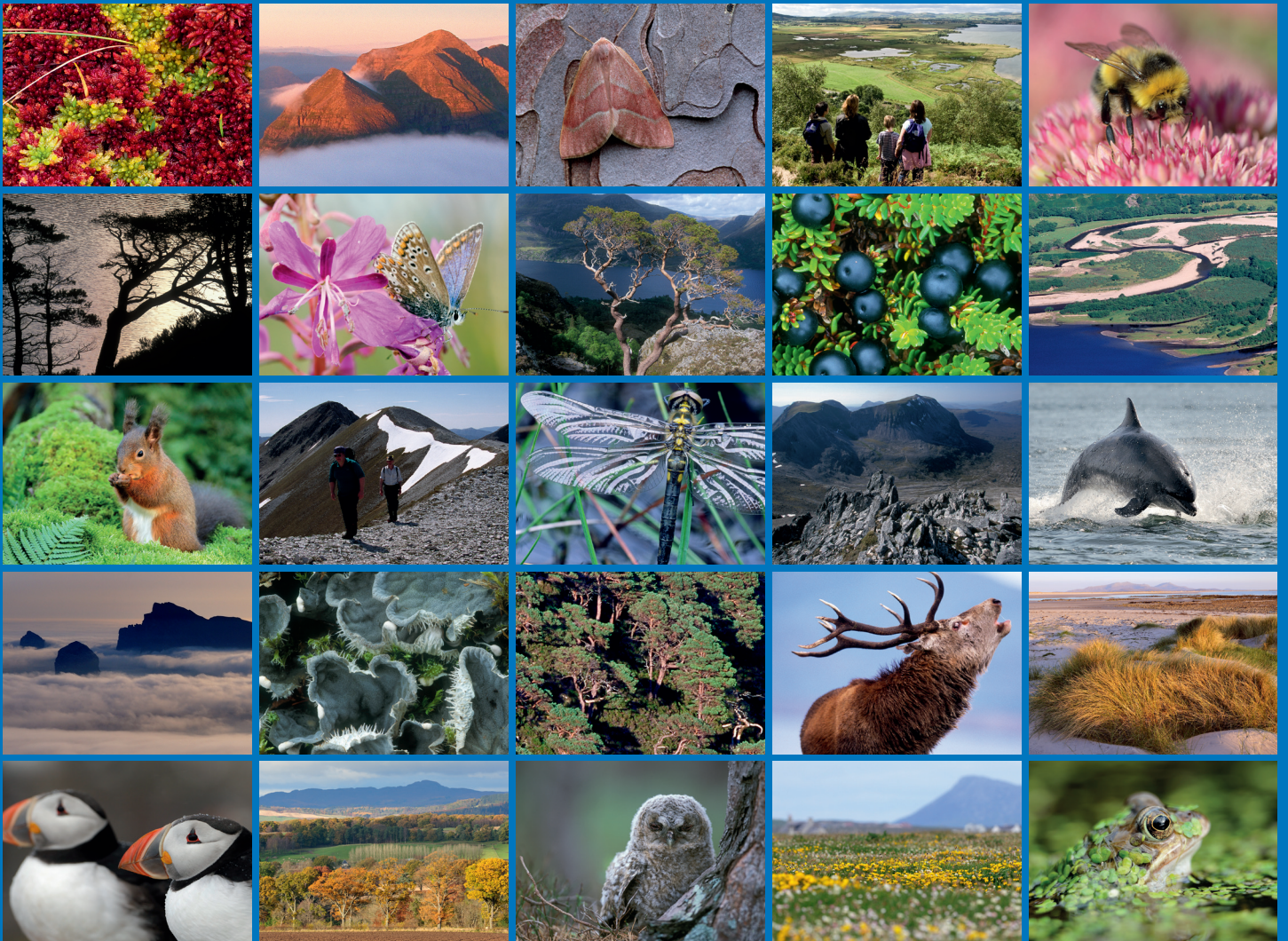


Survey for *Osmia inermis* (Zetterstedt, 1838) (Hymenoptera: Megachilidae) in Perthshire, 2015-2016





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COMMISSIONED REPORT

Commissioned Report No. 973

**Survey for *Osmia inermis* (Zetterstedt, 1838)
(Hymenoptera: Megachilidae) in Perthshire,
2015-2016**

For further information on this report please contact:

Athayde Tonhasca
Scottish Natural Heritage
Battleby
PERTH
PH1 3EW
Telephone: 01738 458671
E-mail: athayde.tonhasca@snh.gov.uk

This report should be quoted as:

Hymettus. 2017. Survey for *Osmia inermis* (Zetterstedt, 1838) (Hymenoptera: Megachilidae) in Perthshire, 2015-2016. *Scottish Natural Heritage Commissioned Report No. 973*.

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COMMISSIONED REPORT

Summary

Survey for *Osmia inermis* (Zetterstedt, 1838) (Hymenoptera: Megachilidae) in Perthshire, 2015-2016

Commissioned Report No. 973

Project No: 015963

Contractor: Hymettus

Year of publication: 2017

Keywords

Osmia inermis; mountain mason bee; Megachilidae; trap-nests; Scotland.

Background

The mountain mason bee, *Osmia inermis* (Hymenoptera: Megachilidae), is a bee distributed in boreo-alpine regions throughout the Holarctic. In Britain, *O. inermis* is rare, known only from the central Scottish Highlands - two Blair Atholl sites and two sites near Braemar, Perthshire. This bee was last recorded in Britain in 2005, when females were filmed while nest-building at Meall Gruaim. Recently, an inexpensive monitoring method with upturned terracotta saucers was developed for this species, with a success rate of 10%. This work was designed to reproduce the trap-nests methodology and establish the presence of *Osmia inermis* at the Blair Atholl sites.

Main findings

None of the trap-nests set out was used by *O. inermis* during 2015 or 2016. However, the presence of the bee could not be ruled out. Its population is likely to be low, and both sites monitored offered abundant options for nesting places. Other practical approaches to determining the status of the bee are limited. Direct observation of foraging bees would be very labour-intensive and restricted to warm, preferably sunny, days. Additionally, few people have the necessary skills to recognise the bee in the field. It may be significant that most of our knowledge of the bee at Meall Gruaim stems from observations from the former land manager, who was on the ground frequently and therefore able to make casual and opportunistic observations with no advance planning.

For further information on this project contact:

Athayde Tonhasca, Scottish Natural Heritage, Battleby, Perth, PH1 3EW.

Tel: 01738 458671 or athayde.tonhasca@snh.gov.uk

For further information on the SNH Research & Technical Support Programme contact:

Knowledge & Information Unit, Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.

Tel: 01463 725000 or research@snh.gov.uk

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Acknowledgements

We are indebted to Atholl Estates and the Factor Julian Clarke, and Mr Andrew Barbour of Fincastle for permission to work at Meall Gruaim and Tulach Hill, respectively. Athayde Tonhasca and Helen Taylor of Scottish Natural Heritage provided essential support and advice. Hayley Wiswell took part in the field visits as part of her role as Natural Heritage Officer for the Cairngorms National Park. Stewart Taylor, Phillip Buckham-Bonnett of the University of York, and Jimmy McKellar all provided invaluable assistance in the field.

1. INTRODUCTION

The mountain mason bee *Osmia inermis* (Hymenoptera: Megachilidae) is distributed in boreo-alpine regions throughout the Holarctic. In Britain, *O. inermis* is rare, known only from two sites near Blair Atholl and two near Braemar, Perthshire (Figure 1). This bee is one of Scotland's rarest insect species, and it may be at risk from intensification of grassland management and loss of habitat to afforestation. Moreover, as a glacial relict with an essentially boreo-alpine distribution, *O. inermis* may be particularly vulnerable to climate change.

Osmia inermis nests in crevices and underneath loose rocks lying on well-drained surfaces (Sandhouse, 1939; Else, 2012) in sites with short vegetation, where several females may construct a few hundred cells from masticated leaf material (Else & Edwards, 1996; Cane & Sipes, 2006). Analyses of pollen loads in the UK and Germany have shown that females only collect pollen from plants of the family Fabaceae, but in Scotland, birds-foot trefoil (*Lotus corniculatus*) seems to be the sole pollen source (Westrich, 1989; Else & Edwards, 1996).

In Scotland, *O. inermis* has a parsivoltine life history, that is, a portion of its brood delays its development and pupates in the following summer. This strategy reduces the chance of a generation being wiped out by chance events, such as exceptionally bad weather (Torchio & Tededino, 1982). Adult bees can be found from late May until the end of July (Else & Edwards, 1996).

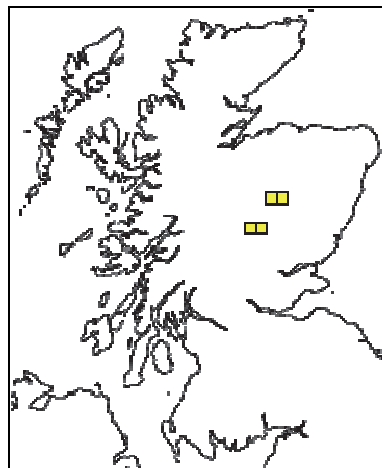


Figure 1. Distribution of *Osmia inermis* as shown on NBN Gateway, 11 October 2016. Map NBN Gridmap© Crown copyright and database rights 2011 Ordnance Survey [100017955]. Data Providers and the NBN Trust bear no responsibility for any further analysis or interpretation.

Casual survey trials at Meall Gruaim in the 1980s and 1990s with flat stones placed on the south-facing slope where bees were known to occur had limited success. Subsequent surveys are described by Edwards (1998, 1999). The last known encounter in Britain was in 2005 at Meall Gruaim, when film was taken of nest-building behaviour. In 2007-2009, attempts funded by the Cairngorms National Park Authority were made to establish the presence of the bee, but these were unsuccessful.

Sheffield *et al.* (2014) reported on the use of upturned terracotta saucers as trap-nests for *O. inermis* in Canada, with a success rate of 10% for uptake of these nests. As this level of success significantly exceeds that achieved by previous surveys with natural stones as trap-

nests in Scotland, 'saucer nests' were tested in the 2015 and 2016 seasons to determine their effectiveness and to try to confirm the presence of *O. inermis* in two of their known sites.

2. METHODS

We used 100 17-cm diameter terracotta saucers (B&Q, item number 5397007191134) as trap-nests. The saucers were placed in suitable habitat at Meall Gruaim and Tulach Hill (Figure 2), sites where *O. inermis* was present in 1998 and 1999 (Edwards, 1998, 1999). The saucers were arranged in 10 groups of five units laid within a few square metres of each other at Meall Gruaim (Figure 3) on 25 May 2015 and Tulach Hill (Figure 4) on 8 June 2015 (50 saucers at each site). The positions of the groups were recorded by GPS to 10-figure resolution (Table 1).

Table 1. Grid positions of the groups of saucers placed as trap-nests for *Osmia inermis*.

Group number	Tulach Hill	Group number	Meall Gruaim
1	NN8608263592	1	NN8970968245
2	NN8609263572	2	NN8957568221
3	NN8613663397	3	NN8946968203
4	NN8614663550	4	NN8946568121
5	NN8616863607	5	NN8953168071
6	NN8618463243	6	NN8927868132
7	NN8622763387	7	NN8918268051
8	NN8633563608	8	NN8912668014
9	NN8634963468	9	NN8906868016
10	NN8636363244	10	NN8918367914

Each saucer was placed on flat ground from which the vegetation had been stripped with a small spade or trowel. To stabilise the saucer, either stones were placed on top, or their back edges were slightly embedded in the soil behind (Figure 5). An entrance was created at the front by forming a small channel, around 2 cm diameter, allowing free access to the underside of the saucer (Figure 6). All units were positioned with a generally southern aspect to maximise exposure to the sun.

Stewart Taylor visited Tulach Hill on 15 June 2015 and searched patches of *Lotus* spp. for foraging *O. inermis*.

Saucers were examined on 3 September 2015 for the presence of *O. inermis* brood cells. On 30 May 2016, both sites were visited to check that the saucers were in suitable condition for use during the summer. All saucers were checked, the entrance gaps cleared if necessary, and any shading vegetation removed. A few had been broken, either trampled by livestock or cracked by frost, and were replaced. At the end, there was a surplus of saucers, so another group of five was placed at Tulach Hill, at OSGR NN8635863619.

The final visit was made on 20 September 2016. All saucers were checked for the presence of *O. inermis* cells, and as none was found to have been used, all were removed.

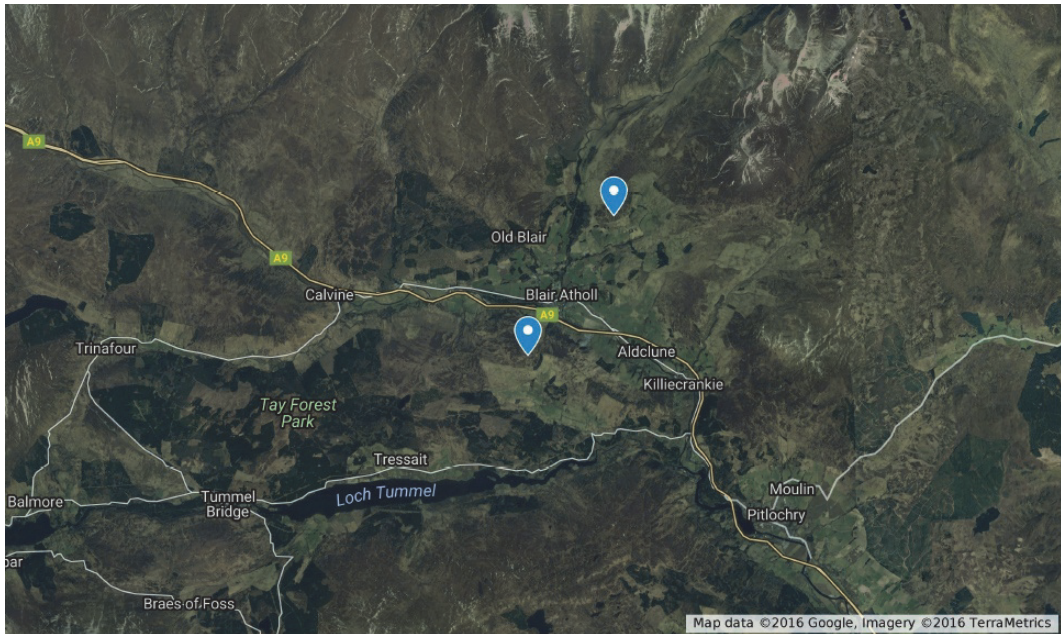


Figure 2. The locations of the study areas at Meall Gruaim (N) and Tulach Hill.



Figure 3. The study area at Meall Gruaim.



Figure 4. The study area at Tulach Hill.



Figure 5. Trap-nests for Osmia inermis in situ at Meall Gruaim.



Figure 6. Detail of a trap-nest and its entrance.

3. RESULTS

No foraging *O. inermis* was seen on patches of *Lotus* spp. at Tulach Hill, though the weather was not ideal for bee activity. After two summers, none of the 105 saucers had been occupied by the bee. A high proportion of the saucers at both sites had ants (*Formica lemani*, *Myrmica* spp., *Leptothorax acervorum*), attracted to the warmth and shelter to incubate their brood, while slugs and other invertebrates were also found in small numbers.

4. DISCUSSION

The lack of positive results is obviously disappointing, and we have failed to confirm the presence of *O. inermis* at either site. We had two or three tantalising glimpses of a small bee that resembled an *Osmia* species at Tulach Hill on 5 June 2015, but its identity could not be confirmed.

The method used appears to be generally appropriate for the task. The positions chosen for the saucers were in general appropriate, though at Tulach Hill a few were placed where bracken (*Pteridium aquilinum*) produced some unwanted shading. This only became evident after installing the trap-nests. The low rate of loss of saucers despite the presence of red deer (*Cervus elaphus*), sheep and cattle, was encouraging. We have no evidence to suggest that ants have discouraged bee occupation.

It is not, of course, possible to conclude that the bee is no longer present. Its population is likely to be low, and, perhaps significantly, there is no guarantee that nesting sites are limiting them. At Meall Gruaim, there is a relatively large dry stone dyke not far from the slope where the saucers were placed. At Tulach Hill there is a similar dyke at the base of the scarp where most saucers were placed, and the scarp itself has much bare rock with crevices and overhangs that could serve as nesting places.

It would not be practical to leave the saucers permanently on the sites and check them annually, as the growth of vegetation would require maintenance each spring, and there would always be loss of saucers through displacement and breakage.

Other practical approaches to determining the status of the bee are limited. Direct observation of foraging bees would be very labour-intensive and restricted to warm, mostly sunny, days. Few people have the necessary skills to recognise the bee in the field, and they do not live close to the sites, creating severe logistical problems. It may be significant that most of our knowledge of *O. inermis* at Meall Gruaim stems from observations from the former land manager who was on the ground frequently and therefore able to make casual and opportunistic observations with no advance planning.

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© Scottish Natural Heritage 2017
ISBN: 978-1-78391-446-3

Policy and Advice Directorate, Great Glen House,
Leachkin Road, Inverness IV3 8NW
T: 01463 725000

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