Formica exsecta in Devon

in 2008

Report for Hymettus

Figure 1 *Formica exsecta* nest on Chudleigh Knighton heath

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Introduction

In 2008 Hymettus funded 4 aspects of work relating to the Narrow-headed ant (*Formica exsecta* Nylander 1846), described below:

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1. Chudleigh Knighton survey 2008

Chudleigh Knighton Heath SSSI in Devon (OS grid reference SX 835 775) appears to be the last remaining site in England for *Formica exsecta*. The species is Red Data Book listed and has its own Biodiversity Action Plan (BAP). Long term annual monitoring, on which the present survey is based, has been carried out to 2005 by Dr David Stradling.

From this previous work nest locations have been GPS-recorded and it has been possible to re-locate positions of nest colonies over successive years. The 2008 survey was carried out over 21 and 22 August.

1.1 Methodology

GPS grid reference locations of all nests recorded in 2005 and 2007 were investigated. Any new nests found were also recorded. Following the established methodology it was noted whether nests were active, inactive, or damaged/destroyed/taken over by another ant species. Diameters of nests were measured. Measuring of nests often triggered a defensive response, which was also noted in case this might give an indication of nest colony vigour.

Formica exsecta is often polydomous (that is, the colony may have several nests). The location, number, diameter, and activity status of any apparent 'satellite nests' were also recorded. Satellite nests, as termed here, are transient, subsidiary nest structures produced by the colony. A satellite nest was inferred when a nest structure was found that was smaller than, and in close proximity (within 5m) to, an existing known nest.

Because nest colonies have been demonstrated to change their position over time, it was sometimes not possible categorically to determine whether nest structures were satellite nests or autonomous colonies. As a result some of the recorded satellite nests may in fact be autonomous nest colonies; the numbers of nest colonies recorded for the 2007 and 2008 survey can therefore be regarded as a conservative estimate.

Chudleigh Knighton Heath is subdivided into several compartments. The compartment divisions and numbering adopted here are those used by Devon Wildlife Trust, who manage the site under lease.

In 2008, 42 active nests were located, plus 15 new nests, and 23 inferred additional satellite nests. This is an increase on 2007 nest numbers, enumerated by the same methodology. One single compartment, cmpt 8, supports the majority of *F. exsecta* nests.

Cmpts 1-3 (grassy heath) may offer suitable habitat, warranting further surveying. Compartment 5, which is predominantly dense scrub and *Molinia* tussocks (figure 2c), presents relatively difficult survey conditions and could also usefully be more thoroughly surveyed for presence of nests.

1.2 Summary of results

The full table of results, Table 1, is given below.

Cmpt 1 (figure 2a)	1 nest survives in compartment 1, which was newly colonised in 2005
Cmpts 2 – 4, 6 (cmpt 2 figure 2b)	no nests were found in these compartments. Cmpts 2 and 3 are grassy heathland. Cmpt 4 comprises woodland boundary areas of cmpts 5 and 6. Cmpt 6 is an active quarry without access (fig. 14e below).
Cmpt 5 (figure 2c)	7 nests were recorded in compartment 5. 1 nest has been lost, though 1 new nest was found in a new location. The nest which had multiple satellites in 2007 had none in 2008.
Cmpt 7 (figures 2d)	3 nests at least (with at least 1 satellite) survive in an enclosed, shady, Bracken-dominated woodland glade. High mobility of these nests from year to year makes identification difficult.
Cmpt 8 (figure 2e)	45 nests (plus numerous satellites), of which 15 were new nests, were recorded.
A38 road verge	a nest located in 2005 in the road verge 'island' between the A38 slip road and A38 main carriageway was reported by David Stradling as still active.

Photographs of these compartments are below.

Fig. 2a Chudleigh Knighton heath cmpt 1, newly colonised in 2005;

From top left: **Fig. 2b** cmpt 2 where no nests were found; **fig 2c** cmpt 5 showing dense vegetation; **fig. 2d** (*bottom left*) cmpt 7 woodland glade with Bracken where at least three nests persist; **fig. 2e** cpmt 8 which currently supports most of the *F. exsecta* nests in England.

Table 1. *Formica exsecta* survey results on Chudleigh Knighton Heath 2005-2008

Explanatory notes

- Nest numbering is those of previous surveys by D. Stradling. Nest numbers were assigned to identifiable nests wherever possible. OS grid references taken with Garmin TREX handheld GPS reader
- Compartment numbers are as used by Devon Wildlife Trust
- OS grid reference reading, nest diameter, and activity status (active, inactive, gone) shown

Nest no	Cmpt	Sept 05	August 07	August 08	Notes 2008
300	1	SX 83485 77657	SX 83488 77663	ACTIVE SX 83491 77660 22 cm	
301	1	SX 83484 77659	GONE	GONE	No sign in 2007
6	5	SX 83679 77405	GONE	GONE	No sign in 2007
37	5	SX 83829 76954	SX 83827 76950	GONE	No sign – in swaled area
43	5	SX 83940 76884	SX 83941 76887	ACTIVE SX 83946 76888 25 cm	Nest remains at SX83941 76887; *Lasius* nest at SX83942 76904
44	5	SX 83949 76890	GONE	GONE	No sign in 2007
52	5	SX 83712 76915	GONE	GONE	No sign in 2007
55	5	SX 83722 76914	SX 83726 76911	ACTIVE SX 83725 76912 32 cm	Abandoned nest at SX 83724 76909
88	5	SX 83859 76985	SX 83862 76986	ACTIVE SX 83862 76986 21 cm	
92	5	SX 83752 77369	SX 83752 77369	ACTIVE SX 83752 76361 21 cm	No satellite nest seen apart from 1 x defunct nest remains. Area becoming a bit shaded
98	5	SX 83866 76960	GONE	GONE	No sign in 2007. Area scrubbed over
99	5	SX 83831 77013	SX 83834 77011	ACTIVE SX 83834 77011 22 cm	
109	5	SX 83599 77475	GONE	GONE	No sign in 2007
216	5	SX 83875 76946	SX 83874 76945	ACTIVE SX 83874 76945 23 cm	
NEW 08	5			ACTIVE SX 83864 76903 23 cm	Near reptile tin
	5			INACTIVE SX 83708 76917	Remains of possible old nest
59 and other nests	7	SX 83830 76798	GONE	ACTIVE SX 83834 76795 13 cm ACTIVE SX 83834 76794 44 cm ACTIVE SX 838834 76794 23cm	 under bramble Nest reference numbers unknown for these nests; may be 59, 61 and 105 from 2005-7 SX 83826 76979/59, SX 83825 76802/61, 83829 76800 all scrubbed over; post (67) at SX 83812 76789 but no sign of nest

61	7	SX 83828 76789	GONE?	No sign	No sign of nest in 2007 at this grid reference
105	7	SX 83823 76792	GONE?	ACTIVE SX 83827 76795 33cm + ACTIVE satellite SX 83827 76795 18 cm	on bramble and satellite on nearby hummock SX 83827 76795; no sign of nest here in 2007 – unknown if is nest 105 from 2005
73 x 2	8	SX 83990 76675	SX 83987 76675	ACTIVE SX 83987 76675 36 cm + ACTIVE satellite SX 83989 76676 37 cm	+ defunct nest remains at SX 83986 76672
76	8	SX 83973 76634	SX 83973 76628	ACTIVE SX 83970 76632 39 cm	
77	8	SX 83944 76669	SX 83946 76665	ACTIVE SX 83943 76666 21 cm	Only weakly active; bit shaded satellite at SX 83936 76653 in 2007: nest intact but no activity satellite in 2007 at SX 83946 76666 GONE no sign
111	8	SX 83994 76770	SX 83994 76770	GONE	No sign in 2007
112	8	SX 84013 76758	SX 84018 76752	ACTIVE SX 84018 76752 26 cm + ACTIVE satellite <1m away at ~SX 84017 76752 10 cm	
120	8	SX 84026 76819	SX 84025 76814	ACTIVE SX 84025 76814 36 cm	+ defunct satellite at SX 84022 76811
121	8	SX 84018 76787	SX 84021 76787	ACTIVE SX 84021 76787 25 cm + ACTIVE satellite <1m away at SX 84021 76787 23 cm	
122	8	SX 84020 76778	SX 84020 76775	ACTIVE SX 84020 76775 29 cm	
128	8	SX 83942 76686	SX 83938 76682	ACTIVE SX 83938 76682 27 cm	+ possible defunct satellite nearby; surrounded by shade
130	8	SX 83990 76757	SX 84001 76750	ACTIVE SX 84002 76741 29 cm + 3 satellites nearby 30, 19 and 20 cm	
131	8	SX 83914 76712	SX 83913 76709	ACTIVE SX 83918 76701 19 cm ACTIVE nest at SX 83909 76712 37 cm	Old nest thatch at SX 83913 76709
133	8	SX 83980 76737	SX 83980 76732	ACTIVE SX 83979 76729 19 cm ACTIVE	+ discarded nest structure at SX 83984 76742 Nests at edge of shaded area

				SX 83977 76735 35 cm ACTIVE SX 83983 76739 24 cm	
134	8	SX 83951 76679	SX 83953 76671	ACTIVE SX 83953 76671 34 x 45 cm +small ACTIVE satellite at SX 83953 76672 15cm + ACTIVE satellite at SX 83954 76671 18cm + ACTIVE satellite at SX 83955 76669 22 cm + ACTIVE satellite at SX 82961 76675 23 cm	No sign of 2007 satellite at SX 83953 76672 but could be one of other 2008 satellites
201	8	SX 83990 76732	SX 83988 76729	ACTIVE SX 83989 76729 34 cm + ACTIVE satellite at SX 83983 732 29cm + ACTIVE satellite at SX 83984 76731 33cm + ACTIVE satellite SX 83986 76733 28 cm	No sign of 2007 satellite at SX 83987 76730 but could be one of other 2008 satellites Grid reference close to nest 133 – could these be the same colony?
202	8	SX 83960 76761	SX 83958 76757	GONE	Old abandoned nests at SX 83959 76754 and SX 83960 76754
203	8	SX 83890 76750	SX 83890 76750	GONE	GONE in 2007
204	8	SX 83919 76709	SX 83922 76704	GONE from SX 83922 76704 ACTIVE Nest at SX 83914 76699 No diameter taken	GONE in 2007 Nest at SX 83914 76699 could be 204
205	8	SX 83900 76728	SX 83898 76724	ACTIVE SX 83898 76724 23 cm	Small nest; grass growing through roof as though not maintained
206 x 2	8	SX 83970 76658	SX 83968 76648	ACTIVE SX 83968 76654 40 cm + ACTIVE satellite SX 83964 76661 32 cm	No other satellites from 2007 in use
207	8	SX 83994 76724	SX 83994 76722	ACTIVE SX 83994 76722 56 cm	
209	8	SX 83941 76747	SX 83934 76737	ACTIVE SX 83934 76737 No diameter taken	No satellites from 2007 seen Are nests 209 and 210 the same colony?
210	8	SX 83936	SX 83934	ACTIVE	Now a small nest. Looks like has

		76740	76737	SX 83934 76737 15 cm	been dug into (by badgers?). Are 209 and 210 the same colony?
212	8	SX 83928 76701	SX 83924 76692	GONE	No sign. Post knocked down. Nest at SX 83924 76692 now *Myrmica* instead
214	8	SX 83903 76718	SX 83902 76711	GONE?	Nest SX 83902 76711 29 cm present but no activity
215	8	SX 83910 76715	SX 83908 76710	ACTIVE SX 83908 76710 34 cm	Post with blue top
218	8	SX 84021 76797	GONE	GONE in 2007	
220	8	SX 83939 76732	SX 83943 76731	ACTIVE SX 83943 76731 17 cm + ACTIVE satellite at SX83944 76733 34 cm	Nest at SX 83943 76731 now small and shaded
221	8	SX 83967 76729	GONE	ACTIVE SX 83962 76724 38 cm	New use of nest 221 site?
222	8	SX 83921 76729	SX 83920 76730	ACTIVE SX 83917 76728 34 cm	Was inactive in 2007. New use of nest 222 site?
223	8	SX 84013 76809	GONE	GONE in 2007	Possible nest remains
224	8	SX 84062 76786	GONE	GONE in 2007	
225	8	SX 83996 76810	GONE	GONE in 2007	Some nest remains
226	8	SX 83960 76787	GONE	GONE in 2007	
227	8	SX 83919 76726	GONE	ACTIVE SX 83918 76729 42 cm	GONE in 2007 – new use of nest site
228	8	SX 83963 76727	SX 83962 76725	ACTIVE SX 83959 76718 34cm + ACTIVE satellite SX 83961 76724 38 cm	+ abandoned nest remains at SX 83960 76722
229	8	SX 83939 76708	SX 83939 76703	ACTIVE SX 83935 76705 19cm	Defunct satellite at SX 83941 76698. No sign of other 2007 satellites except possible old nest remains
230 New 07	8	NEW 1 2007	SX 83981 76685	ACTIVE SX 83981 76685 18 cm + ACTIVE satellite SX 83983 76683 No diameter taken	
New1 07	8	NEW?	SX 83974 76695	ACTIVE SX 83973 76694 29cm	Defunct nest remains at SX 83974 76695
New2 07	8	NEW 2 2007	SX 83961 76602	GONE	
New3 07	8	NEW 3 2007	SX 83975 76698	ACTIVE SX 83975 76698 27 cm	Not very vigorous
New4 07	8	NEW 4 2007	SX 83987 76693	ACTIVE SX 83989 76692 19 cm + 2 nearby ACTIVE	Not active in 2007

				satellites within 1m: 24 and 21 cm	
New5 07	8	NEW 5 2007	SX 84041 76719	GONE	
New6 07	8	NEW 6 2007	SX 83976 76704	INACTIVE SX 83973 76703	Intact and seemingly maintained nest structure present but no activity
New7 07	8	NEW 7 2007	SX 83996 76669	GONE SX 84000 76668 19 cm	Now quite shaded – seems to be *F. fusca* nest now
New8 07	8	NEW 8 2007	SX 84033 76699	GONE	No sign of nest nor satellite from 2007
New1 08	8	NEW 1 2008		ACTIVE SX 83944 76748 34 cm	Could be 202 or 211?
New2 08	8	NEW 2 2008		ACTIVE SX 83948 76740 28cm	Nest flat on ground level. Nearby post reads '211'
New3 08	8	NEW 3 2008		ACTIVE SX 83962 7674 20 cm	Could be satellite of 134?
New4 08	8	NEW 4 2008		ACTIVE SX 83961 76654 38 cm	Could be satellite of 206?
New5 08	8	NEW 5 2008		ACTIVE SX 83951 76628 28 cm	In new area behind scrub
New6 08	8	NEW 6 2008		ACTIVE SX 83961 76633 48 cm	Near edge of scrub line
New7 08	8	NEW 7 2008		ACTIVE SX 84001 76689 28cm	
New8 08	8	NEW 8 2008		ACTIVE SX 83956 7616 28 cm	
New9 08	8	NEW 9 2008		ACTIVE SX 83964 76756 35cm	Looks a bit damaged but active; close to 206 and NEW 4 2008
New10 08	8	NEW 10 2008		ACTIVE SX 83988 76730 38 cm	Apparent satellite nest at SX 83987 76726 is *Myrmica* nest
New11 08	8	NEW 11 2008		ACTIVE SX 83909 76682 23 cm	
New12 08	8	NEW 12 2008		ACTIVE SX 83913 76712 26 cm	+ abandoned inactive satellite within 1m at SX 83913 76713
New13 08	8	NEW 13 2008		ACTIVE SX 83948 76631 23 cm	
New14 08	8	NEW 14 2008		ACTIVE SX 83950 76638 23 cm	
New15 08	8	NEW 15 2008		ACTIVE SX 83962 76677 17 cm	Vigorous response
08	8			INACTIVE SX 84029 76765	Old inactive nest
08	8			INACTIVE SX 83960 76666	Inactive defunct small nest 12 cm
08	8			INACTIVE SX 83962 76690	Abandoned inactive nest 23 cm
08	8			2 x old nests at SX 83938 76643	In gorse; both now have *L. niger*

08	8			SX 83995 76811	Post (on ground) but no sign of nest
08	8			*Lasius niger* nest at SX 83981 76724	Seems to be old nest taken over

1.3 Notes on survey results 2005-2008, nest recruitment and survival

From results 2005-2008 nest numbers appear to fluctuate but are otherwise relatively consistent. Most of the nests remain in one compartment, cmpt 8. Over this period there has been a decline in cmpt 5 in numbers both of nests and satellites of those nests.

For 2005-2007 and 2007-2008 there has been an approximate annual turnover of a third of nests. For these years the number of previously known nests recorded as lost (inactive, destroyed or taken over) each year has been balanced by the number of new nests.

Of new nests approximately half have persisted to the next year. All 7 of the new nests from 2005 that survived their first year to 2007 also persisted to 2008. Interestingly numbers of nests new in 2005 and in use during 2008 was higher than this (10). This is because 3 nest structures apparently abandoned in 2007 were re-colonised in 2008.

Please note that these observations are based on 3 years only of survey data. A summary is shown below in Table 2.

Table 2. Summary of *Formica exsecta* survey results 2005-2008

Cmpt	No of nests			No of nests persisting from previous year			No of new nests		
year	**2005**	**2007**	**2008**	**2005**	**2007**	**2008**	**2005**	**2007**	**2008**
1	2	1	1	0	1	1	2	0	0
5	11	7 (+4)*	7	10	7	6	1	0	1
7	3	3	3 (+1)	3	3	3	0	0	0
8	36	32 (+13)	45 (+22)	24	23	30	12	9	15
Road verge	1	1	1	0	1	1	1	0	0
Total	53	44	57	37	35	41	16	9	16

*(+) refers to number of inferred satellite nests

No of new nests from 2005 active in 2007: 7of 16 (4 in cmpt 8, 1 each in cmpts 1, 5, road verge)
No of new nests from 2007 active in 2008: 4 of 9 (all in cmpt 8)
No of new nests from 2005 active in 2008: 10

2. Liaison with other agencies

2.1 Devon Wildlife Trust (DWT)
DWT manages Chudleigh Knighton heath on a lease from owners Watts, Blake & Bearn (WBB) minerals company. Until recently the leasing arrangement was for a 1 year revolving lease which effectively prevented any long term site planning or management. DWT manages two other nature reserves nearby in the Bovey Basin, which includes owning two main compartments of a former *F. exsecta* site, Bovey Heathfield SSSI. Landscape-scale planning, probably embracing several landowners and agencies, has been recognised by several agencies as offering the best chance for long term heathland, and thereby *F. exsecta*, conservation in the Bovey Basin. Hymettus funded DWT to carry out a Bovey Basin project scoping exercise in 2006.

DWT's Business Plan includes an organisational aim to initiate a landscape community conservation project for the Bovey Basin. In 2007 a SITA grant was awarded to DWT for heathland restoration work at Bovey Heathfield. Further funding was sought from SITA in 2008.

I maintained regular contact with DWT throughout 2007-8. In 2008 DWT submitted a £25,000 grant bid to SITA for management works on its Bovey Basin sites, comprising habitat and landscape restoration, landscape links, and specifically targeting *F. exsecta*. The bid had two components (from Andrew Taylor, DWT fundraising officer):

> Part 1 = fencing compartments 2 & 3 at CKH (the block north-east of Dunley Cross, with the football pitch). Aim being to create favourable conditions for heathland wildlife (*Formica exsecta* included).
>
> Part 2 = full condition assessments of Bovey Basin County Wildlife Sites and "Other Wildlife Sites", where these are overdue. Plus initial surveys of adjoining sites to assess likely wildlife value. Results being a detailed land use map of the Bovey Basin, which can be used to prioritise sites for possible habitat restoration / re-creation, establishment of wildlife corridors

Funding for Part 1 was granted in November 2008, but SITA are unable to fund work in Part 2. DWT will now seek other funding for this (some of the Part 2 survey work in the bid could be said to have been initiated already through the Hymettus 2008 work described in this present report). Perhaps significantly the Part 2 survey works have been stipulated as grant conditions, though not to be funded by SITA: Hymettus may then have an opportunity to offer direct support.

During 2007-8 ongoing management of Chudleigh Knighton heath continued. Scrub was cleared in compartment 5, where there has been a gradual decline in *F. exsecta* nests over 2005-8, largely due, it is believed, to historical scrub encroachment. Mosaic sections of approximately 1 hectare were swaled (burnt), and ponds and scrapes were created, operations which were followed up with pony and cattle grazing. Fencing provided under the SITA grant will allow livestock to be moved to other, currently ungrazed, compartments. Planned works for 2008-9 (from Andrew Bakere, DWT Reserves Officer) are:

> Continued thinning of some scrub, and rotational burning of the site. There is a little more scrub to be removed. Grazing re-introduction in C2 and C3 once the fence has gone in.

During a site visit in autumn 2008 it was noted that scrub clearance works in compartment 5 had greatly improved the condition of the habitat.

Discussions with DWT were also held regarding options for investigating succession and establishment of new *F. exsecta* colonies. This is described further in section 4 (page25) below.

2.2 Liaison with Ant Working Group (AWG)
Contact was established with Paul Gallagher, based at Scottish Wildlife Trust, who chairs AWG and is also main contact for the *F. exsecta* BAP. Outline details of current DWT work on Chudleigh Knighton and Hymettus *F. exsecta* projects were forwarded to AWG. An AWG December 08 meeting apparently did not take place. Contact is hopefully to be maintained.

2.3 Liaison with Natural England (NE)
In spring 2008 a meeting was held with Dr Simon Dunsford, Conservation Officer for the South Devon area, which includes existing and former *F. exsecta* sites. Natural England were consulted on DWT's SITA application, for which *F. exsecta* targeted actions were included, on Natural England's advice. As statutory regulating agency for SSSIs, Natural England would also be responsible for giving consent for any controlled management operations targeted towards *F. exsecta* on Chudleigh Knighton heath. Natural England Devon express broad support for efforts to safeguard and increase populations of *F. exsecta*.

2.4 Other liaison
Since October 2008 Devon County Council (DCC) and Teignbridge District Council (TDC) have held meetings regarding development of a Green Infrastructure (GI) plan under the Local Development Framework.

The GI area encompasses the Bovey Basin and Newton Abbot, for which Area Action Plans are to be prepared respectively by Devon CC, as planning authority for minerals sites, and TDC, as the local planning authority. The GI plan would include habitat restoration as an element and could potentially deliver landscape scale heathland creation and linkage projects.

Project partners include Environment Agency, RSPB and DWT, who are co-operating on assessing habitat restoration opportunities in the Bovey Basin. The South-west Nature Map, which defines landscape habitat character areas in the region, has been adopted by the Regional Spatial Strategy (RSS). Following the SW Nature Map the Bovey Basin is categorised as a Strategic Nature Area, targeted for habitat conservation and restoration. Adoption through the RSS lends this principle a sound policy basis in local government.

Funding support to develop the GI plan is currently provided by a Growth Point bid for Newton Abbot. TDC aims to produce a reporting stage of the GI plan by March 2009, with the full GI plan due to be completed by September 2009.

3. Review of former *F. exsecta* sites in the Bovey Basin

3.1 Background and methodology

The most recent report on the status of *Formica exsecta* in England is by David Stradling and Simon Hoy *The Ant* Formica exsecta *an endangered British species* WWF report project 199/88, dating from 1993. This report found *F. exsecta* remaining at four sites, all in South Devon in and around the Bovey Basin and south east edge of Dartmoor: Chudleigh Knighton heath, Lustleigh Cleave, Bovey Heathfield and Great Plantation. Since publication of this report and through regular monitoring, particularly by D. Stradling, *F. exsecta* was known by 2004 to have become extinct at each of these sites except for Chudleigh Knighton. Longer term survival of *F. exsecta* in England may involve future efforts to encourage re-establishment at former sites. This present review of former sites was carried out to

- ascertain whether *F. exsecta* may still be present at Lustleigh Cleave, Bovey Heathfield and Great Plantation
- assess suitability of former sites for possible re-establishment

The three former sites for *F. exsecta* in the Bovey Basin were visited in August 2008 and assessed for their current suitability as *F. exsecta* habitat, based on criteria and observations discussed in the 1993 report. These criteria were:

- openness of habitat/insolation at ground level, noting particularly south-facing slopes, gradients, banks, boundaries, areas of open habitat without shading
- numbers and variety of foraging trees, that would provide invertebrate prey throughout the active season, especially oak and birch, up to a certain age and size
- suitable habitat area size, in a mosaic of patches greater than 5m diameter, a distance recorded for establishment of satellite nests
- suitable micro-topography – grass tussocks in open sward to facilitate movement of nests; shelter features against which nests can be built
- suitable nest substrate – friable soil or tussocks that are 0.6 - 1.2m apart; availability of nest materials
- presence of habitat for, and nests of, host ant species such as *Formica fusca*, *Myrmica ruginodes*
- Presence of competing ants (*F. rufa* and *Lasius niger*), or habitat suitable for competitor species
- management - site in active suitable management, *i.e.* kept open, free from human disturbance, without build up of combustible material that might lead to uncontrolled fires, scrub cleared to prevent shading and/or colonisation by *F. rufa*
- existence of habitats, corridors and continuous links to other sites as a colonisation route

3.2 Summaries of surveys of former sites

3.2.1 Lustleigh Cleave SSSI NNR OS grid reference SX 767 815

This is a large upland heather moorland site on the south east edge of Dartmoor National Park. One *F. exsecta* nest was known from 1988. No evidence of *F. exsecta* nests was found in 2008. Being an upland site, temperature conditions are cooler than in the Bovey Basin sites (though the 1993 report notes that historically *F. exsecta* nests were known from other upland Dartmoor sites such as Yarner Wood and Haytor). There are southerly facing slopes which would receive more sunlight. Sheltered grassy areas with loose peaty soils may have potential as re-colonisation sites. However scrub and Bracken *Pteridium aquilinum* encroachment present a longer term threat and *F. rufa* was found to be common. Current management appears to be occasional grazing in accordance with Commoners' rights. Unless scrub can be managed the site is probably not currently suitable for *F. exsecta*. However historically the site has been known to sustain long-term populations, so useful further searches of the site and surrounding area could be carried out.

3.2.2 Bovey Heathfield SSSI LNR

Undulating lowland humid heath (NVC: H4) over three separate compartments owned by three different landowners. One smaller wet heath-grassland area is owned by Dartington Estates. The two larger compartments are owned and managed by Devon Wildlife Trust. A northern section contiguous with the

main DWT compartment (White Hill) is owned privately. The most recent *F. exsecta* presence was a single nest colony in the White Hill section until 2004. A nest returned to the DWT section from Paignton Zoo in 2004 did not survive. Until 2002 the two DWT compartments were in private ownership and subject to damage from unregulated damaging activities such as off-road motorbiking and 4x4 driving, car burning, neglect and vandalism. 7 nests were known over three of the compartments from the 1990s. By 2002 the White Hill nest was the only known surviving colony. No nests have been recorded since 2004.

The site is currently a mosaic of mature wet and dry humid heath heather stands, with early successional pioneer heather and grass on recovering bare tracks and scrub-cleared areas. There are also substantial woodland boundaries and an area of wet woodland in the second DWT compartment, which is much more wooded and scrub-encroached. Recent management (from 2002) has involved heather mowing, recovery treatments of bare tracks, scrub control of Silver Birch *Betula pendula*, Common Gorse *Ulex europaeus*, and Bracken, and tree removal, mainly of Scot's-pine *Pinus sylvestris*. Two cases of arson (2003 and 2007) have resulted in impromptu swaling of two sections. Efforts have been made to link up continuous stands of mature heather between damaged bare ground areas, creating mosaic conditions. Active and future management by DWT continues and would be secure.

The two DWT compartments have public access. There is some disturbance and periodic vandalism. Several areas away from main paths are relatively free from visitor pressure.

Cmpt 1 OS grid reference SX 824 766 (fig. 3)
Mature heather stands are dense and enclosed, with limited sunlight reaching ground level, though numerous scrapes and rides created within heather stands provide edge habitat which may be receive more sunlight. Recovered areas are more open (fig. 4) and could be managed to create conditions more similar to those at Chudleigh Knighton. In tree removal areas, and in burnt areas, Purple-moor Grass *Molinia caerulea* has burgeoned and produced a thick closed sward. However in this compartment as a whole generally there are few scattered trees such as Silver Birch and Pedunculate Oak *Quercus robur* to act as foraging sites, except perhaps at compartment boundaries.

It may be significant that *F. exsecta* nests at this site were concentrated along the northern edge boundary, where more tree scrub (fig. 5) and a boundary hedgerow would have provided greater foraging opportunities. *F. rufa* does not appear to be present in these areas, or within cmpt 1 generally. This suggests that this edge of the compartment would be more promising as a re-colonisation site.

Fig. 3 view south east overlooking Bovey Heathfield cmpt 1 main heather stand, from the highest point on the site, close to the north west boundary

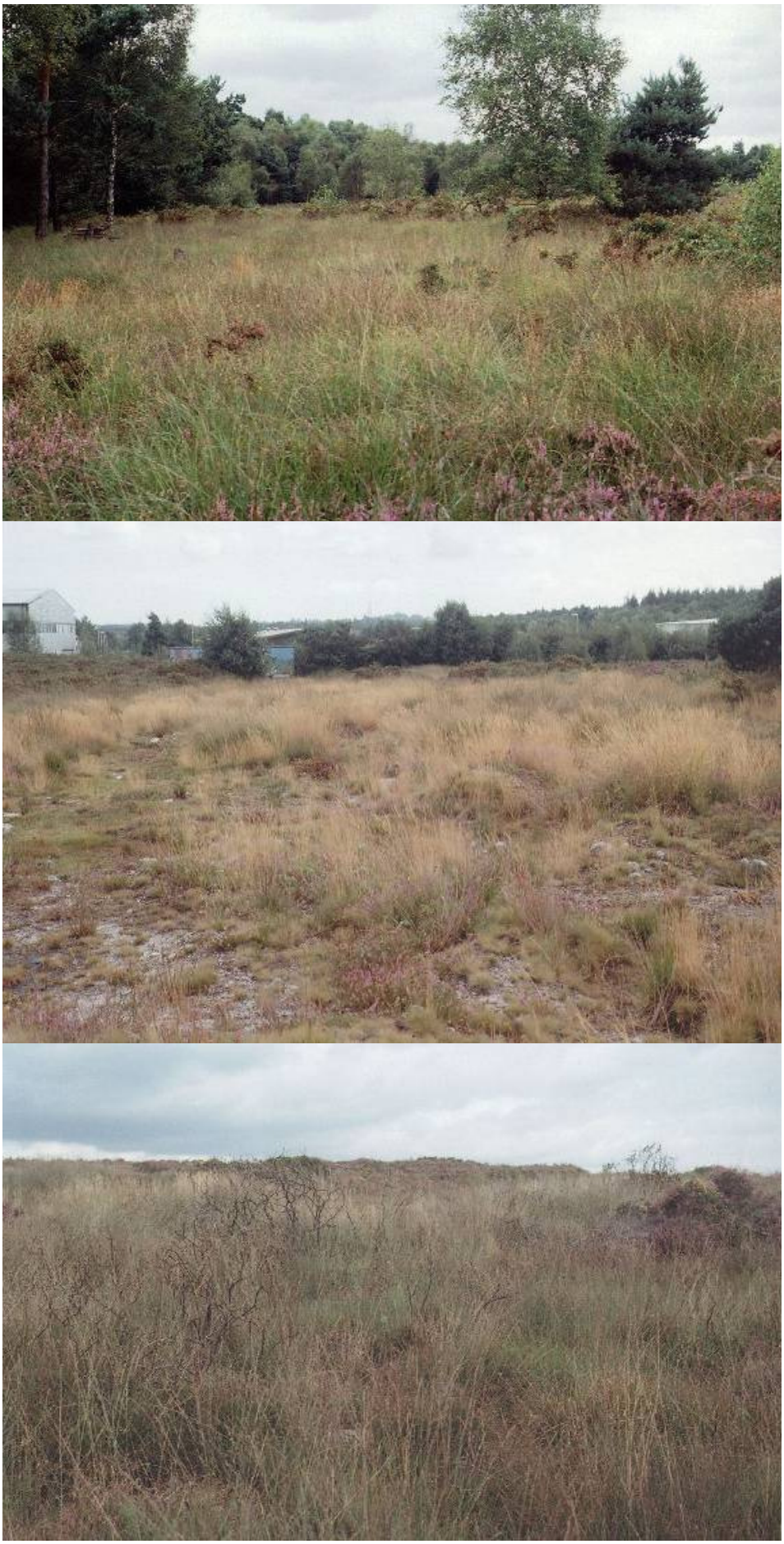

Fig. 4 recovery areas: 4 years after conifer clearance (top), 4 years after bare ground regeneration treatment (middle), and 18 months after fire (bottom)

Fig. 5 cmpt 1 view towards northern boundary, where in 1993 *F. exsceta* nests were concentrated

White Hill OS grid reference SX 821 758
A privately-owned section to the north of the site contiguous with the main DWT compartment. The habitat comprises a slope of mature heather, and a section of dense woodland along the northern boundary. A steep north-west facing grassy slope, and an adjacent grassy hummock, cleared of heather by an arson incident in 2003, now seem to provide suitable ant habitat, as evinced by the presence a *Myrmica* nest on the lip of the slope. There is little, if any, active management of the White Hill compartment, so it is uncertain as to whether favourable conditions could be maintained in the long term.

The last remaining Bovey Heathfield nest was present among tall Gorse scrub on the heathland-woodland edge of the densely wooded area until 2004. The nest was often overshadowed by scrub.

Fig. 6 grassy slope and hummock at woodland edge at White Hill 5 years after an arson incident. A *Myrmica* nest constructed from grassy material was found on the lip of the slope

The effects of the 2003 arson incident cover a boundary bank and northern section of the DWT compartment, in which are now pioneer heather, *Molinia* and numerous young Silver birch *Betula pendula* trees (fig. 7). No *F. rufa* were found in these areas and visitor pressure appears to be low. The relatively open conditions close to the tree line, with numerous foraging trees, would seem to be suitable as a re-establishment site.

Thorough searching of the last known nest site discovered the last nest remains from 2004. The immediate vicinity is now densely scrubbed over. However a grass-structured ant nest of some description was found nearby in dappled shade. This was not an active nest but suggests further searches of this area might be worthwhile.

Fig. 7 post-fire habitat on the boundary between the DWT cmpt 1 and White Hill, 5 years after arson, comprising an open mosaic of grass, heather and scattered Silver Birch on the boundary bank and adjacent area

Cmpt 2 OS grid reference SX 825 768

This compartment is also owned by DWT. The area is narrow and well wooded at the south eastern and north eastern boundaries, with the result that the three remaining areas of heathland vegetation, mostly dominated by mature Common Gorse, are each close to woodland edge, where *F. rufa* nests are abundant. The section of woodland to the south east comprises dense Silver Birch. The central and northern boundary sections are mature oak woodland. Industrial development has encroached into the southern boundary of the site. There is some bare ground near paths and where off-road biking and driving used to occur.

Three *F. exsecta* nests were known on this compartment from 1993; none was apparent when DWT became owners in 2002. Gorse scrub and dense birch cover large sections, including two of the nest sites from 1993 which were situated within glades within the birch section. Glades are currently shaded and the field layer is dominated by Bracken despite clearance work by DWT to re-open these areas since 2003. Further management work by DWT took place in 2007-8. Presently glades do not seem suitable for re-establishment, particularly as *F. rufa* nests are common. Clearance works in 2004 created heathland rides through one stand of dense Gorse (fig. 8). After 4 years this ride has become re-colonised by pioneer heather and *Molinia* and may offer some habitat suitable for re-establishment, though the total area is limited. Further habitat should become available as management work proceeds.

Other areas of scrub were cleared in 2007-8, including one section where one 1993 nest was recorded (fig. 9); these areas have since become invaded by Bracken and Bramble in a short space of time, less than 12 months (fig. 10). As a result this compartment does not seem suitable currently as a re-establishment site, apart from perhaps within the ride created in 2003. *F. rufa* is generally common and would threaten any re-establishment attempts.

Fig. 8 cleared heathland ride created in 2003 in compartment 2 after 4-5 years regeneration

Fig. 9 former site of nest in Bovey Heathfield cmpt 2

Fig. 10 encroachment by Bracken in recent scrub-cleared areas

3.2.3 Great Plantation OS grid reference SX 825 768

Extensive ~50 ha conifer plantation owned by The Forestry Commission. The site is designated a County Wildlife Site (CWS). One nest was last recorded at a forest ride edge in 1993 (fig. 11). Searches in 2008 did not locate any *F. exsecta* nests. Intensive timber harvesting has not been economically viable in recent years so current management is non-intensive rotational clearfelling of selected forestry compartments, followed by re-stocking through natural regeneration, and maintenance of some rides for access. Management gives rise to grassy rides of *Molinia* and resurgence of heathland vegetation, the original habitat type, between clear fell rotations. This mix is termed by Forestry Commission as 'wood heath'. One area is managed for butterfly interest. The site has public access and is well used for informal recreation such as dog walking. The Forest Design Plan (management plan) for the site elapsed in September 2007 and is due for revision.

Fig. 11 typical woodland ride; a former nest site was in this area to the right

Rides can be quite shaded, are prone to disturbance, and are used by *F. rufa*, which is fairly common throughout the site. Clearfell areas appear more promising: after felling operations these are open to the sun with pioneer heathland vegetation regeneration. Two or three such cleared glades of ~1-4 ha seem to be present at any one time. Without follow-up thinning however areas become progressively re-colonised by dense scrub and conifer seeding re-growth within 2-3 years (fig. 12). Scrub soon produces shade and habitat for *F. rufa*. Current clear fell rotations do not really allow habitat connections between areas to develop. There is also a 'butterfly compartment' (fig. 13) to the south which is kept clear of woody re-growth mainly by volunteers. This area comprises mostly tall ruderal and wetland plants enclosed within conifers, and seems unsuitable for *F. exsecta*.

Current site management seems inappropriate for re-establishment of *F. exsecta*. However the underlying heathland habitat appears suitable, and the site would have definite potential for re-colonisation should the site owners be willing to co-operate on site management. Bearing in mind the size of the site, suitable management may only be required in limited selected areas. The Forestry Commission have few resources for active management of Great Plantation at the present; provision for heathland and *F. exsecta* management would require external funding and support, perhaps in combination with a change in Forestry Commission strategic policy. Participation in a partnership landscape project could be a way of achieving this.

Several other wood-heath fragments in different ownership are adjacent to Great Plantation, which provide continuous habitat links the site.

Fig. 12 natural regeneration of conifers and scrub on clear felled compartments within Great Plantation. Top: newly cleared area. Middle: 2-4 years after clearance Bottom: semi-permanent glade with mature heather

Fig. 13. 'butterfly cmpt' within Great Plantation managed for Pearl-bordered Fritillary and other species

3.2.4 Other Bovey Basin sites

Several Bovey Basin small heaths and plantations with heathland fragments survive among many adjacent sites to the three former sites reviewed here. Some of these were visited incidentally as part of the current survey. Ownership is varied and management is not co-ordinated across the different sites. The importance of these fragmented sites is that strategically they could be part of a landscape scale habitat restoration project. Some of these sites are described below and shown in fig. 14.

Teignbridge District Council Heathfield Nature Reserve OS grid reference SX 824 763
A heathland corridor area created within the last 5 years from a cleared woodland strip, re-seeded with heathland topsoil in 2005-6, which is currently regenerating. Open conditions and grassy substrate, but few foraging trees except at edges, where there may be competition from *F. rufa*. Public access but rarely visited. The site links Bovey Heathfield SSSI to other heathland fragments.

TDC Drainage lagoon meadow CWS OS grid reference SX 825 762
Owned by local authority Teignbridge District Council (TDC). A drainage feature for the Heathfield industrial estate which has been built on former heathland. The drainage lagoon comprises grassland – wet heathland and is cut once/year. Tall grass and periodic flooding mean this site is probably not suitable but an appropriate management regime for areas around the lagoon perimeter might be negotiated. Forms part of a habitat corridor alongside the A382. No official public access. Rarely visited by general public.

Butterfly Conservation reserve CWS OS grid reference SX 825 761
Small grass-heath area reserved from development because of the presence in 1990s of Silver-studded Blue butterfly *Plebejus argus*. Nominally owned by Butterfly Conservation, and supported and managed by TDC and volunteers. The grassy heathland is intended to be managed as short turf for *Lasius niger* (ant associated with Silver-studded Blue). Open conditions are maintained but there is little in the way of micro-topographical features and no forage trees, apart from at the boundary edge. Forms part of the same heathland habitat corridor as the drainage lagoon and the Heathfield nature reserve described above. Silver-studded Blue last seen in late 1990s and believed now to be extinct from the Bovey Basin. Establishment of an appropriate management regime may be possible. No official public access and rarely visited.

Fig. 14 other heathland sites and sites with heathland in the Bovey Basin

from top row left:
14a A38 road verge; **14b**: Butterfly Conservation Silver-studded blue reserve; **14c** TDC Heathfield Nature Reserve heathland re-creation project 18 months after seeding with heathland topsoil;

bottom row from left:
14d heathland re-creation at a local landfill site; **14e** slope leading up to clay extraction works at Chudleigh Knighton compartment. Some suitable habitat appears to be present. Access restricted (view from road); **14f** TDCdrainage lagoon which supports some heathland habitat

Tom Brown's plantation OS grid reference SX 821 765
Conifer plantation on former heathland owned by Dartington Estates. Adjacent to Great Plantation, with similar low-intensity management and re-stocking by natural regeneration, giving rise to 'wood heath' conditions. The area is a proposed County Wildlife Site, but has not been surveyed. Officially no public access. Site management would appear to be unsympathetic: the owners' charitable purpose is to use the area for economic gain and there is an apparent wariness of restrictions on future activities. Little, if any funding. Otherwise the habitat represents similar opportunities as at Great Plantation.

Cardew Pottery site OS grid reference SX 818 768
Adjacent to Tom Brown's Plantation and a similar mix of conifer plantation and heathland glades. Previous owners established habitat areas and nature trails as a visitor attraction. Subject to development pressure: the larger area is in the process of being developed as housing, though there are nature areas and a small heathland creation scheme to be established as part of planning conditions. Some boundary areas are to be retained and may provide linkage to other sites.

British Candy Tiles (BCT) site CWS OS grid reference SX 832 763
County Wildlife Site, notified for presence of Schedule 8 plant Pennyroyal *Mentha pulegium*. Heathland - grassland and scrub, wet heath in places. Probably too overgrown with dense Common Gorse scrub to be suitable for *F. exsecta* but scrub clearance work for Pennyroyal could potentially create viable habitat. Subject to development pressure by the owners and long term management as heathland uncertain.

Stover Country Park SSSI OS grid reference SX 834 753
46 ha complex of heathland, woodland and wetland, owned by Devon County Council. SSSI notification is for dragonfly interest. Rhododendron-ised heathland and woodland gradually being returned to heathland, which may offer opportunities in the future.

Pitt's Plantation OS grid reference SX 827 747
Conifer plantation on former heathland near to Stover Country Park and Great Plantation. Conifer areas used for paintballing and recreational off-road driving. A grassy corridor section within the site supports relict heathland. An application for a motel and service station complex was given planning permission on appeal, so this site will presumably be developed. Ant nests were reported from the conifer areas in 2004 but these were almost certainly *F. rufa*. A subsequent application for a large scale housing development on neighbouring compartments, which would destroy any remaining areas of heathland character and restoration potential, is in progress.

Road verges to A38 near Chudleigh Knighton OS grid reference SX 837 763 to SX 839 765
Road verge along the A38 slip road supports *F. exsecta* nests and verges potentially extend some distance along the A38, linking Chudleigh Knighton heath to Great Plantation and sites alongside. Searches in 2007 and 2008 however found that many of these areas are scrubbed over and that *F. rufa* is common among the verges.

Clay pit edge at Chudleigh Knighton CWS OS grid reference SX 840 769
Large operational quarry that forms one quadrant of Chudleigh Knighton heath. The edges are designated CWS and are of a similar habitat to Chudleigh Knighton. The site will presumably will be restored as heathland once commercial operations finish. Suitable habitat may already be present. However there is no access permitted to the site. A full survey for *F. exsecta* nests could usefully be carried out.

Landfill and clay extraction sites OS grid reference SX 852 762
Capped landfill sites and quarries which are to be restored as heathland when operations are finished. These have potential as sites but one current restoration scheme has not succeeded in creating recognisable heathland habitat. Commercial use will cease, and restoration programmes begin, for many of these areas over the next 5-10 years. Some clay pits are to be extended into previously unmined areas; intentions are to restore these progressively as operations gradually re-locate. This would give opportunities for habitat re-creation in the mid and longer term. Restoration schemes are subject to consent from Devon County Council, the regulatory authority for mineral extraction activities.

3.2.5 Note about other heathland sites in Southern England

Other main blocks of heathland sites in Devon are on the Haldon ridge between Teignbridge and Exeter, and the East Devon pebble beds. *F. exsecta* has never been recorded at these sites, which are not the same humid heathland type as in the Bovey Basin. This means the next nearest suitable sites could be outside Devon, among the humid heath areas in the Poole Basin in south east Dorset, and in the New Forest in Hampshire; both of these areas historically have included former sites for *F. exsecta* and are identified in the recently revised Biodiversity Action Plan targets for *F. exsecta* as areas to consider for re-establishment. It is known however that *F. exsecta* used to be present on some upland heath sites on Dartmoor, so other heathland types apart from humid heath may offer suitable habitat. At least one former site is known from Cornwall, the current status of which is unknown.

3.3 Conclusions

- None of the former sites appears to have any clear current presence of *F. exsecta*

- According to the criteria identified in the 1993 report the best opportunities for re-establishment would be:

  Short term: Other compartments on Chudleigh Knighton heath
  Chudleigh Knighton clay pit edge area
  Cmpt 1 of Bovey Heathfield at the north-eastern boundary
  Cmpt 1 fire recovery area at the northern boundary and at White Hill
  Possibly cmpt 2 of Bovey Heathfield in managed areas such as the central ride

  Longer term: Bovey Heathfield, as active management continues
  Great Plantation, with suitable management
  Lustleigh Cleave, with suitable management
  Mineral restoration sites, with suitable management
  Other smaller sites where linked to existing heathland
  Stover Country Park, as heathland is restored

- Searches have been concentrated at lower altitude humid heathland sites. Investigations at other former upland Dartmoor sites such as Yarner Wood, Haytor, and Trendlebere Down, as well as further searches at Lustleigh Cleave and surrounding areas, could be worthwhile.

4. Ant succession study ideas

4.1 Background

Colonisation and dispersal of nests in *F. exsecta* is not well understood. Gaining more understanding of these processes would be a pre-requisite prior to any re-establishment attempts. Many studies remark on *F. exsecta*'s apparent poor dispersability, linked to its polygynous colony structure. Two strategies for colony establishment have been proposed: host parasitism of another species' nest (typically the related ant species *Formica fusca*, which has a widespread distribution), and budding of satellite nests, which could then become autonomous. It is not known which of these strategies may contribute more to population maintenance and expansion.

A literature search was carried out (see bibliography below). Studies of sexual selection and genetic composition of colonies show that certain autecological preconditions can influence adoption of the various reproductive strategies. These preconditions include age and number of queens in nests, amount of food resources available, and effects of population dynamics. Research reviewed to December 2008 was found to focus predominantly on the implications of polygyny; host parasitism of other species' nests apparently has not been studied in such depth.

As Chudleigh Knighton heath is the last known site in England for *F. exsecta*, sustaining and enhancing colonies at this site is imperative. Hymettus wishes to develop study methods to determine the process of succession and establishment of *F. exsecta* nests by host parasitism. Increasing the density of host species' nests in new and existing areas could provide opportunities for *F. exsecta* colonisation. During D. Stradling's investigations, as described in the 2003 report referred to above, several methods for boosting numbers and fecundity of *F. exsecta* nests were devised, and further *ad hoc* techniques have been attempted subsequently as opportunities have arisen. These are outlined below, and following discussions with Natural England, DWT and others, some practicable recommendations for research over the next 2 years into nest establishment are suggested.

4.2 Practicalities

Ideas for practical research were considered in light of:

- Possibility of restricted timescales and availability of sites. Time needed to carry out studies and make trial re-establishment attempts could be limited, should the existing *F. exsecta* nests on the site be approaching senescence. Some current nests are thought to be at least 15 years old and, although nest numbers and recruitment appear relatively stable over 2005-2008, and site management secure, a uniform age profile of nests could be responsible for a rapid decline in overall nest vitality and productivity. Also while the main concentration of nests is in one compartment of a single site, there is a greater vulnerability to a single catastrophic event. Colonisation to other compartments and sites needs to be prioritised.
- Co-operation of DWT and Natural England is essential for management and monitoring activities. Impressions so far are that both DWT and NE would be supportive, but practical assistance may not always be possible. Any research studies would otherwise need to be compatible with DWT's own management operations and resources allocated to the site.
- Certain actions are required under the revised 2007 BAP. *F. exsecta* is a priority species with 3 targets: Target 1 (popln size) maintain the size of populations in Scotland and England; target 2 (range) enhance the Scottish populations at Mar Lodge and Rannoch and the population at Chudleigh Knighton Heath (Devon) by 2015; target 3 (range) establish self-sustaining populations in appropriate locations in the south of England such as Devon, Dorset or the New Forest by 2030.
- Minerals extraction operations and development pressure imposes time constraints. Opportunities to take advantage of heathland restoration projects at minerals extraction sites are likely to commence over the next 5-10 years. It would be advantageous to have developed practicable re-establishment techniques in readiness for this. Economic viability of minerals extraction seems highly changeable at short notice; windows of opportunity may then be fleeting. Meanwhile several sites with remaining heathland in the Bovey Basin are subject to development

pressure. Ongoing liaison with planning and regulatory authorities is needed to ensure *F. exsecta* is considered as a part of any habitat restoration schemes.

4.3 Overview of techniques tried previously

- **Supplementary feeding** of nests with egg and honey mixture to increase the speed of production and number of ant gynes (sexual forms). This has been carried out at Chudleigh Knighton heath and Bovey Heathfield, at the latter site by volunteers. In practice this was found to be labour intensive. Feeding pots were highly attractive to ants and would sometimes act as pitfall traps, resulting in high mortalities. Supplementary feeding could not be specifically targeted and might have facilitated the taking over of nearby *F. exsecta* nests by competitor species such as *Lasius niger*.
- **Artificial solaria** of plastic covers over nests gave enhanced thermal properties, and as colony activity moved nearer to the tops of nests, allowed easier inspection. Maintenance was found to be relatively high, when related to protection from inquisitive livestock; fencing of nests proved somewhat obtrusive and of more interest to livestock as rubbing posts, requiring further maintenance. Mobility of nests would also prove problematic. DWT would not be amenable to presiding over methods with high maintenance requirements.
- **Release of mated queens**. Surplus mated queens, bred as part of laboratory studies, were released in cmpt 1 of Chudleigh Knighton heath and may have been the origin of the two new nests found in this area in 2005. Further investigation of this technique would be of value. However presently there is no means for producing a stock of mated queens.
- **Artificial nest sites for host ant species *F. fusca***. *F. fusca* is common and widespread, known to nest under flat stones and in partly rotted tree stumps. Increasing nest site density of the host species could provide more potential nest sites for *F. exsecta*, and could be used to prepare conditions for re-establishment at new and former sites. However it is not known whether density of host nest sites is a limiting factor for dispersal of *F. exsecta*; as *F. fusca* is common it would be expected to be present at heathland sites already. In 2007 three trial improvised 'stumperies' were constructed by volunteers at Bovey Heathfield using tree material cut as part of routine heathland management, but this was not part of a systematic study. Stumperies were colonised by ants (*Lasius* sp.) within a few weeks. Further trials would improve design and siting.
- **Provision of nest material** such as shredded dried grass. Provision of such nest material was found not to initiate establishment of new nest sites, though *F. exsecta* workers did collect material to take back to existing nests.
- **Translocation of nests**. Such an operation would be subject to Natural England consent and potentially also IUCN guidelines on re-introductions. Two translocation attempts have been made. A nest threatened by off-roading activities at Bovey Heathfield was successfully translocated to Paignton Zoo in the 1990s and maintained there in an enclosure for several years. In 2004 an attempt was made to return this nest to Bovey Heathfield. Despite supplementary feeding and control of competitor species the nest failed within 6 months, succumbing to successive invasion by *Lasius niger*.
- **Heathland management.** Chudleigh Knighton heath is managed by swaling, scrub cutting, and grazing. Effects of heathland management in relation to subsequent *F. exsecta* colonisation and survival has not been studied. Long term ongoing management of the site is likely to involve rotational clearance, by various methods, of relatively large areas. Information could be sought to determine the optimum management for *F. exsecta* within this scheme. Positive effects of management may take several seasons to become apparent if *F. exsecta* presence is most associated with a particular successional stage. However to some extent it would be possible to deduce dates of clearance from previous years from site condition and management records.

4.4 Recommendations for practical field studies 2009-2010

My recommendations for practical field research into *F. exsecta* autecology, which could be achieved within the 2009-2010 period are below. Guides to costs, per year where appropriate, are shown.

1. Continue annual surveys of nests

- Survey of main compartments 1, 5, 7 and 8 at Chudleigh Knighton heath.

- more thorough surveys of other compartments 1-4 and, if access can be arranged, cmpt 6
- further survey of former and potential sites

Costs: Nest survey of Chudleigh Knighton - 2 days
Surveys of other former sites and areas nearby – 2 days
Reporting – 1 day

2. Monitoring after management

- Systematic monitoring of areas after habitat management (*e.g.* after swaling , scrub cutting, grazing) relating to nest re-colonisation and establishment. DWT management might be carried out over ~ 5 days/year + any volunteer practical task events. Plots of approx. 0.3-0.5 ha are swaled or cleared. Stock (3 ponies year round + cattle during certain months) graze the site

Costs: Surveys of areas post-management; meetings with DWT – 1 day
Possible financial support for DWT site management

3. Artificial nest sites for host species

- DWT has agreed to help create a number of potential nest sites for *F. fusca* as part of their management of the site. Artificial 'stumperies' would be created from cut woody material cleared as part of DWT site management operations. These could then be routinely monitored and the succession of different ant species nesting in the stumperies recorded
- To create the stumperies 2 x DWT led volunteer days are proposed. From a similar volunteer task day at Bovey Heathfield, 8 or more stumperies could be created per volunteer day. As opportunities allow, flat stones or mats to simulate flat stones, could also be tested as artificial nest sites
- Monitoring would then take place by surveying the stumperies at least twice a year, taking in both spring nesting activity and post-breeding dispersal periods, and recording ant species present
- Routine monitoring on the site for *F. exsecta* would also record numbers of *F. fusca* nests present in grass tussocks and not in the newly created stumperies

Costs: 2 x volunteer tasks – (costings information from DWT as of January 2009)

Two days of DWT Nature Reserve Officer's time, including overheads	= £384.27
Travel (40p/ mile, 2 x 25 mile round trips Exeter – CKH)	= £20
Contribution to volunteers' expenses for gloves, tools, refreshments etc.	= £60
Total:	£464.27

Meetings with DWT, preparation and supervision of volunteer tasks – 2 days
Monitoring – 1 day

4. Nest translocation

- At present justifiable only in exceptional circumstances as a last resort. However, if necessary, as was demonstrated in the two 'emergency' translocation attempts so far, the operation could be achieved relatively quickly and straightforwardly

Costs: Mini-digger, driver and flat bed truck hire – 1 day approx. £400/day
Preparation, meetings and gaining consents - 1 day
Monitoring and aftercare - 1 day

APPENDIX

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Previous field research, surveys and information provided by David Stradling, Simon Hoy, and Julian Perrett have been used as the basis for this 2008 report.

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