GROUND NESTING BIRD SURVEY REPORT

A report on the ground nesting birds of Greenham and Crookham Commons (West Berkshire Council) and Bowdown Woods nature reserve (BBOWT).

Ringed Plover

Lapwing

Little Ringed Plover

Redshank

Dartford Warbler

Meadow Pipit

Woodlark

Stonechat

Skylark

For:

Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust

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Table of contents

Index of figures

Maps

Tables

Graphs and Pie Chart

Photographs

Front cover Photographs (acknowledgements)

Species	Source
Ringed plover	Wikipedia
Little Ringed plover	Wikipedia
Lapwing	Wikipedia
Skylark	Wikipedia
Redshank	Marek Walford
Woodlark	Marek Walford
Stonechat	Marek Walford
Dartford Warbler	Andy Bright
Meadow Pipit	Colin Fitzpatrick

Executive summary

i In 2010 as part of the West Berkshire Living Landscapes project, run jointly by the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) and West Berkshire Council, a survey of ground nesting birds was carried out on the former USAF airbase at Greenham and Crookham Commons and Bowdown Woods nature reserve.

ii The species surveyed were: Lapwing, Little Ringed Plover, Ringed Plover, Redshank, Skylark, Woodlark, Stonechat, Dartford Warbler and Meadow Pipit. Being ground or near ground nesters, these species are considered to be most vulnerable to disturbance from visitors.

iii Two main types of surveying were involved: Territory mapping and Nest monitoring. Also timed nest-watch sessions were carried out to attempt to determine the causes and levels of disturbance to nesting Lapwings.

iv **Territory mapping**: The principal aim of the territory mapping survey was to determine population estimates, i.e. number of territories, of all listed species (except lapwing), so that their status can be monitored over time.

v Territory estimates were achieved for all target species. Compared to the 2009 survey there were no significant changes. The small increase for Dartford Warbler was welcome in view of the preceding harsh winter. Although the skylark population appears stable there is some concern about their breeding success as very little evidence of proved breeding was recorded.

Species:	Ringed Plover	Little Ringed Plover	Redshank	Skylark	Woodlark	Stonechat	Dartford Warbler	Meadow Pipit
2009	2	6	1	32	10	5	5	23
2010	2	5	1-2	31	10	7	7-8	18

Table 1: Ground nesting bird territory estimates for 2009 and 2010

vi **Nest monitoring**: The aim of the nest monitoring was to obtain a detailed picture of breeding success of lapwing, Ringed and Little ringed Plover: Breeding productivity, the number of young fledged per pair, was estimated and the levels and causes of predation of Lapwing, in particular were assessed.

vii This involved field observation, ringing chicks and the use of temperature data loggers in Lapwing nests to determine the cause of egg predation. The loggers record the temperature during incubation and if the nest fails, the data indicates when predation occurred and if a mammal or avian predator was responsible.

viii Data loggers were not installed into Ringed or Little Ringed Plovers nest's so breeding success was assessed by field observations and ringing the chicks.

ix Lapwings had a very poor breeding season. Twelve-thirteen pairs made 18 nesting attempts, laying 70 eggs, of which 31 hatched but only three fledged. Breeding productivity was 0.25-0.28 chicks per pair, well short of the 0.6-0.8 required to sustain a population. Predation was equally split between egg and chick losses. In total 31 eggs were predated and Foxes/badgers and Crows are believed to be responsible. Fifteen were *confirmed* by the data loggers to have been taken at night by a mammal and one was taken by a Crow during daylight. Crows were probably responsible for the *majority* of chick losses. Breeding success was much higher on the '616' gravel area NW of the Control Tower car park, than elsewhere.

x Further monitoring is recommended to investigate if this low productivity is normal for the site as Lapwings don't need a successful season every year to maintain population levels.

xi **Ringed and Little Ringed Plovers** fared much better. One pair of Ringed Plover fledged three young and three pairs of Little Ringed Plover fledged a total of seven young. One pair fledged an entire brood of four. The success of these species may in part be due to their less conspicuous, more secretive nesting behaviour making them less prone to predation. As with lapwing breeding success was much higher on the '616' gravel areas.

xii **Timed Lapwing nest watch sessions** were carried out on six nests to attempt to determine the causes and levels of disturbance to incubating birds. All potential and actual disturbance events were logged. Lapwings were absent from the nest, regardless of cause, about 32% of the 25 hours observation time. About 60% of the absence was benign i.e. voluntary, 17% attributed to avian predators like Crows and Buzzards and 23% due to disturbance by humans or dogs. There was no correlation between the logged absences and data recorded on the loggers. Figures for the '616' gravel area showed a proportionately higher level of disturbance than at the Fireplane gravel area. This is unexpected as fledging success was highest in this area.

xiii **Causes of low Lapwing productivity:** Predation is clearly at very a very high level, but habitat quality, food availability and disturbance are likely to be important contributory factors. An apparent lack of sufficient, disturbance free cover, for developing chicks, is exacerbated by the current high levels of grazing on the Common. To obtain enough food, chicks need permanent wet features around which to feed and cover in which to hide. Little rain fell during spring 2010 so many pools became dry. Low numbers of invertebrates were indicated by *Coleoptera* and *Hemiptera* surveys carried out in the summer (Garvey, L. pers. com). Inadequate food resources can result in higher predation, as chicks have to travel further to find food and are therefore more vulnerable. It is likely that disturbance from visitors is compounding the situation by hindering chicks from finding and staying in good feeding and cover areas. The disparity of breeding success on different areas of the Common is likely to be related to differences in habitat quality, food availability and disturbance found across the site. A variety of measures are recommended to address these

issues including grazing reduction, scrub management and removing trees used by Crows as lookout posts.

1. Introduction

Since 1997, the former American air-force base on Greenham and Crookham Commons has been managed by West Berkshire Council as a nature reserve and in 2000 the site was officially re-opened to the public. In 2002 The Greenham and Crookham Commons Act was passed to conserve the natural beauty and grant public access over the land in perpetuity and to restore and extend commoners' rights.

This 500 hectare site is nationally important for its rich diversity of flora and fauna. It has also become an important green space resource for the population of Newbury, which exceeds 55,000, and the surrounding area and is very popular for cycling, walking and dog walking. There is concern that pressure from high numbers of visitors combined with the open accessibility of the site is leading to detrimental levels of disturbance to the wildlife and ground nesting birds in particular. This includes species that are nationally scarce or declining, including Dartford Warblers, Woodlarks, Nightjars, Lapwings and Little Ringed Plovers.

In 2007 the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) entered into an agreement with West Berkshire Council (WBC) to implement the West Berkshire Living landscape project. This is one of a new generation of landscape scale conservation initiatives that are being pioneered around the Country. The purpose of this landscape-scale project is to connect previously fragmented pockets of good wildlife habitat over an area covering 2,700 hectares. Greenham and Crookham Commons, and the Bowdown and Baynes Woodland complex (BBOWT) that lies to the north of Greenham form a substantial and important part of the project area.

BBOWT has successfully secured funding mainly through '*Grantscape*', plus a number of other sources, to finance the Living Landscapes project which includes measures that specifically relate to the plight of ground nesting birds on Greenham and Crookham Commons and Bowdown Woods. Funding and support have also been provided by West Berkshire Council who are working in partnership with BBOWT.

Funded measures relating to ground nesting birds:

- Heathland restoration/creation at Bowdown Woods and at Crookham Common in an area known as the 'Birch coppice'.
- The employment of seasonal wardens to monitor and influence/educate visitors to the site about the vulnerability of ground nesting birds.
- A comprehensive 'Ground nesting bird survey' on Greenham and Crookham Commons and Bowdown woods.

The author was contracted by BBOWT to undertake and project-manage the Ground nesting bird survey and this report presents the methodology and results of this in detail.

Two main types of surveying were involved: Territory mapping and Nest monitoring. Timed nest-watch sessions were carried out to attempt to determine the causes and levels of disturbance to nesting Lapwings.

1.1 Species included in the surveys

The species chosen to be included in the survey were those which were considered most at risk from disturbance by visitors. Anecdotally it is perceived that visitors, especially those with dogs, have had a negative impact on breeding populations of ground nesting birds such as Lapwings, Larks, Pipits and Dartford Warblers. The following table lists the species and summarises the reasons for their inclusion.

Species	Reason for inclusion/conservation status	Conservation status	BBOWT Living Landscape priority list	BBOWT Living Landscape secondary list
Ringed Plover	Ground nesting species vulnerable to disturbance from visitors.	Amber listed (BOCC)		✓
Little Ringed Plover	Ground nesting species vulnerable to disturbance from visitors.	Schedule 1 listed (WCA 1981)		
Lapwing	High profile ground nesting species on Common.	Red listed because of recent population decline (BOCC), UK BAP listed.	✓	
Redshank	Ground nesting species vulnerable to disturbance from visitors.	Amber listed (BOCC)		
Skylark	Ground nesting species vulnerable to disturbance from visitors.	Red listed (BOCC), UK BAP listed.	✓	
Woodlark	Ground nesting species vulnerable to disturbance from visitors.	Amber listed (BOCC), Schedule 1 listed (WCA 1981), UK BAP listed	✓	
Stonechat	Gorse nesting species vulnerable to disturbance from visitors.	Amber listed (BOCC)		✓
Dartford Warbler	Gorse habitat specialist. Direct relevance to gorse management.	Amber listed (BOCC), Schedule 1 listed (WCA 1981)		✓
Meadow Pipit	Ground nesting species vulnerable to disturbance from visitors.	Amber listed (BOCC)		✓

Table 2: Species included in survey and reasons for inclusion

1.2 Surveys undertaken

A combination of surveys was employed:

- Territory mapping of all species listed in table 2 ,except Lapwing
- Lapwing, Ringed Plover and Little ringed Plover nest monitoring using temperature data loggers (Lapwing only), field observation and ringing (chicks).
- Lapwing nest watch sessions to attempt to assess disturbance cause and levels

1.3 The aims of the surveys

Overall the survey has aimed to provide site managers with information to assist in management decisions in respect of disturbance caused by visitors, factors leading to predation of key ground nesting species and the condition of habitats occupied by those species. More detail is given below.

1.3.1 **Territory mapping**:

- To determine population estimates by estimating the number of territories, of all target species, so that their status can be monitored over time. This follows on from the full 'all-species' survey carried out in 2009 (N Cleere).
- To provide information on the current status of ground nesting birds in the 'birch coppice' area of Crookham Common and at Bowdown Woods before undergoing heathland restoration by BBOWT. Future surveys, employing the same methodology, can be used to monitor the effectiveness of the restoration using the 2009/2010 data as a baseline.

1.3.2 **Nest monitoring**:

To provide a comprehensive account of the breeding success of Ringed Plover, Little Ringed Plover and Lapwing in particular, to assess the impact of disturbance from visitors, as a possible cause for poor breeding success. In particular to:

- Establish the number breeding pairs and outcome of all nests.
- Ascertain the causes and levels of predation of eggs and chicks.
- Determine breeding productivity totals for each species. This is the number of chicks *per pair* that survive to fledging.
- Determine Lapwing nest survival percentage. This is the percentage of nests with at least one egg surviving to hatching.
- Determine Lapwing chick survival percentage. This is the percentage of chicks that survive to fledging.

1.3.3 **Lapwing nest-watch sessions:**

- To attempt to quantify the levels of nest disturbance of incubating Lapwings to see if this has a direct effect on the outcome of the nest.
- Identify what types of events cause disturbance and those that don't.
- Identify if any of the three areas used by the Lapwings for nesting, are more prone to disturbance than others so that appropriate management strategies can be devised.
- See if it is possible to correlate the times of disturbance events with temperature changes shown on the data recorded by the data loggers.

1.4 The role of ringing in the nest monitoring surveys

Whenever possible the chicks of Lapwing, Ringed Plover and Little Ringed Plover were ringed. As well as providing useful data for the national ringing scheme (BTO), this proved very useful to the nest monitoring surveys. Together with field observations, the ringing has helped determine the fortunes of broods and individual chicks through to fledging. By catching and checking the ring numbers on previously ringed developing chicks it was possible to confirm which nests they hatched from.

The ringing was carried out by licensed Ringers: Jan Legg, Ian Weston and Pat Martin; members of Newbury Ringing Group. Pat Martin had responsibility for the Crookham end of the site, but unfortunately, no nest reached chick stage in this area. All the Ringers held the appropriate licenses during 2010 to visit nests and ring including valid licenses for species listed in schedule 1 of the Wildlife and Countryside Act (1981).

Report structure

Descriptions of the methods and results of each survey followed by Concluding comments and recommendations, are presented in five main sections, as listed below.

Territory Mapping

Lapwing nest monitoring

Lapwing nest watch sessions

Ringed Plover and Little Ringed Plover nest monitoring

Concluding comments and recommendations

Appendices

2 Territory mapping

2.1 Introduction and methods

The Territory mapping method is based on the British Trust for Ornithology's (BTO) 'Common Bird Census' (CBC). This was the main method of surveying UK bird populations during 1962-2000. It has now been replaced by the less labour intensive BBS' survey method now used extensively in County and National atlas schemes. Although considered more onerous, the CBC is still very useful particularly on individual sites where it is important to know actual population sizes and to be able to monitor changes in those populations over time. It is also possible to link bird distribution with habitat and such information can be invaluable for habitat management on nature reserves.

The methods focus on establishing the number of territories of each species within a specified survey area. This exploits the fact that many bird species actively defend a territory and spend much time around the nest area. This means that during the breeding season the same individuals are likely to seen or heard in the same general area. It is this information that forms the basis of identifying individual territories when plotted onto maps of the survey area. It is essential that the methods are applied consistently between years so that the results are fully comparable and reliable results are to be achieved.

The number of territories determined by this method can indicate the number of pairs on a site. However, because territories of some birds may shift due to breeding failure or the attempts of an unpaired male to attract a mate by 'trying' new areas, the total number of territories can exceed the number of pairs. Despite this apparent ambiguity, using the number of territories as a measure of population size is regarded as an established and effective option.

Standard CBC methods normally involve all breeding species and usually require the observer to carry out 10 field visits during the breeding season. On each visit all records relating to breeding activity, especially birds in song but also nest building, courtship, feeding young, alarm calling etc are plotted onto a large scale map of the site using standard BTO codes.

At the end of the season these 'registrations' are transferred onto individual 'species maps' which then provide a visual history of the spatial positioning of each species on the site. Using standard BTO guidelines the number of territories can then be determined by identifying discrete clusters of registrations that relate to individual pairs or at least territory holding males (Marchant, J. 1983).

In 2009 a full territory mapping survey, involving 10 field visits, was carried out on Greenham and Crookham Commons (Cleere, 2010). The results of this survey, where relevant to the current report, are provided in the results section (table 4).

It was decided that the 2010 survey would focus on ground nesting species only as these are the most vulnerable to disturbance. Also the number of visits that would produce meaningful and

reliable results was determined by reference to 'Bird Monitoring Methods (Gilbert, et al 1998). This describes specific methods for surveying Key UK species, including field visit requirements. A summary of the recommended visit requiremnts for the species included in the 2010 territory mapping survey is shown in table 3.

Species	No. and timing of visits	Time of day
Ringed Plover	Three, at least 10 days apart in May and June	08:30-18:00
Little Ringed Plover	No method recommendations so survey as for Ringed Plover	
Redshank	Three: first: 15-30 April Second: 1-21 May Third 22 May 18 June	Dawn-12:00
Skylark	Four, evenly spaced, between mid April and mid June.	Start within first two hours after sunrise
Woodlark	Three: First:15 Feb-21 March, second: 22 March-25 April, third: 26 April-1 June	Before midday
Stonechat	Three, all in April at least one week apart.	Dawn-10:00
Dartford Warbler	Three: First: April-mid May, second: Mid-late May, third: June	From about one hour after dawn
Meadow Pipit	No method recommendations so survey as for Skylark	

Table 3: Summary of recommended visit requirements for species included in survey

Given that the required number of recommended visits for each species varied between only three and four it was decided that four full field visits would be sufficient. An additional visit was made early in the season to cater for the early breeding habit of Woodlark.

2.2 Survey area covered and route walked

The areas covered by the survey are shown in map 1 and include all the habitats that are occupied by the listed ground nesting species:

- The course of the old airbase runway
- The four heathland **lozenges** positioned either side of the runway that were originally mown very short when the airbase was operational.

- Large expanses of sparsely vegetated gravel that were formerly areas of aircraft 'hard-standing' with their associated buildings. In this report these areas are referred to as: the '**Fireplane**' gravel, so called because of the presence of a mock plane used by USAF

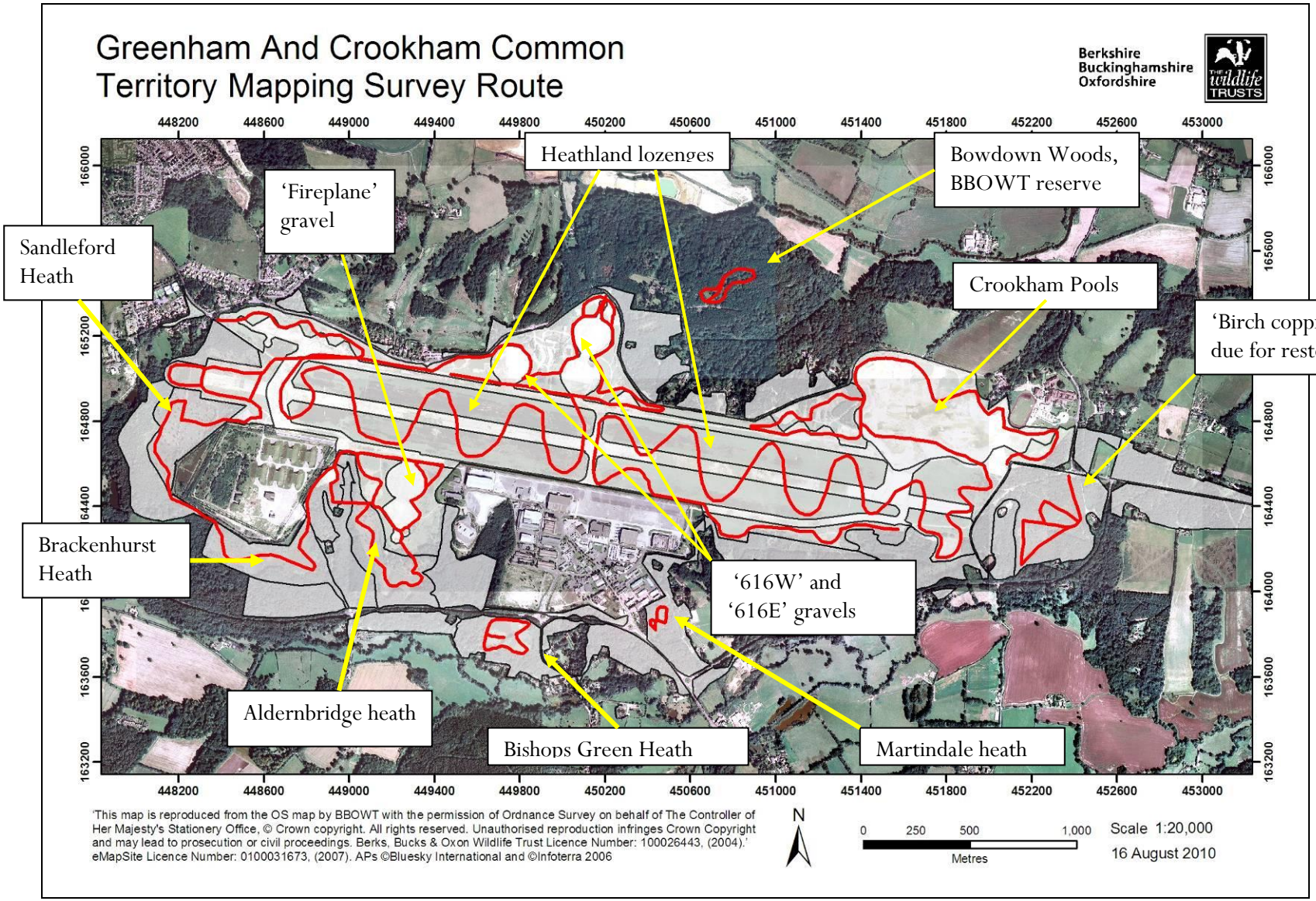
personnel in fire fighting training, '**616W**'and '**616E**' gravels, named because they are positioned to the west and east of the rangers building known as '616' and **Crookham Pools** at the east end of the site.

- Outlying heaths: **Sandleford, Brackenhurst, Aldernbridge, Bishops Green and Martindale**.

The birch coppice' site at Crookham and the area of the BBOWT 'Bowdown Woods' nature reserve, known as the 'bomb site' destined for heathland restoration work, were also surveyed. Effectively, only unbroken woodland was excluded from the survey.

Due to the large size of the survey area, the site was divided up into a number of manageable sections. A full visit therefore took several days to complete. All visits were started during early morning to coincide with the higher levels of bird activity that occur at this time (visit details: appendix A).

The same route, more or less, was followed on all visits to try to ensure consistency of coverage and so the survey can be repeated in subsequent years. A map showing the basic route and area covered is shown overleaf. The order in which sections were visited was sometimes altered due to time availability and/or weather conditions.



Map 1: Territory mapping survey, route in red and site names mentioned in text

2.3 Results

Compilation and analysis of 'species maps' at the end of the season provided estimates of the number of territories for each species are shown in table 4. Territory estimates from the 2009 survey are also shown together with the actual and percentage differences.

Species	2009	2010	Actual Difference	% change
Ringed Plover	2	2	0	0
Little Ringed Plover	6	6-7	0	+0-16.7
Redshank	1	1-2	0	0-100
Skylark	32	31	-1	-3.12
Woodlark	10	10	0	0
Stonechat	5	7	+2	+40
Dartford Warbler	5	7-8	+2 or 3	+40-60
Meadow pipit	23	18/19	-4-5	-17.4-21.7

Table 4: Estimated maximum number of ground nesting bird territories for 2009 and 2010

2.3.1 Comments on the results and comparison between the 2009 and 2010 surveys

In spite of the difference in the number of field visits between the two years the figures are remarkably consistent. They suggest that there has been no significant change in the breeding populations of the surveyed species between the two years. The large percentage changes, particularly shown by Stonechat, and Dartford Warbler should not be regarded as significant due to the very small sample sizes involved. However even a small increase in numbers is to be welcomed especially for scarce and enigmatic species like Dartford Warbler.

No territories of ground nesting species were found in either of the two areas destined for heathland restoration i.e. the 'Birch coppice' area and BBOWT Bowdown Woods.

2.3.2 Species accounts and maps

The following accounts include brief statements giving the National status of each species, their basic habitat requirements and their status on Greenham and Crookham Common, followed by a summary of the findings of the survey. The maps show the approximate positions of all territories found during the survey for each species.

2.3.2.1 **Ringed Plover** *Charadrius hiaticula*

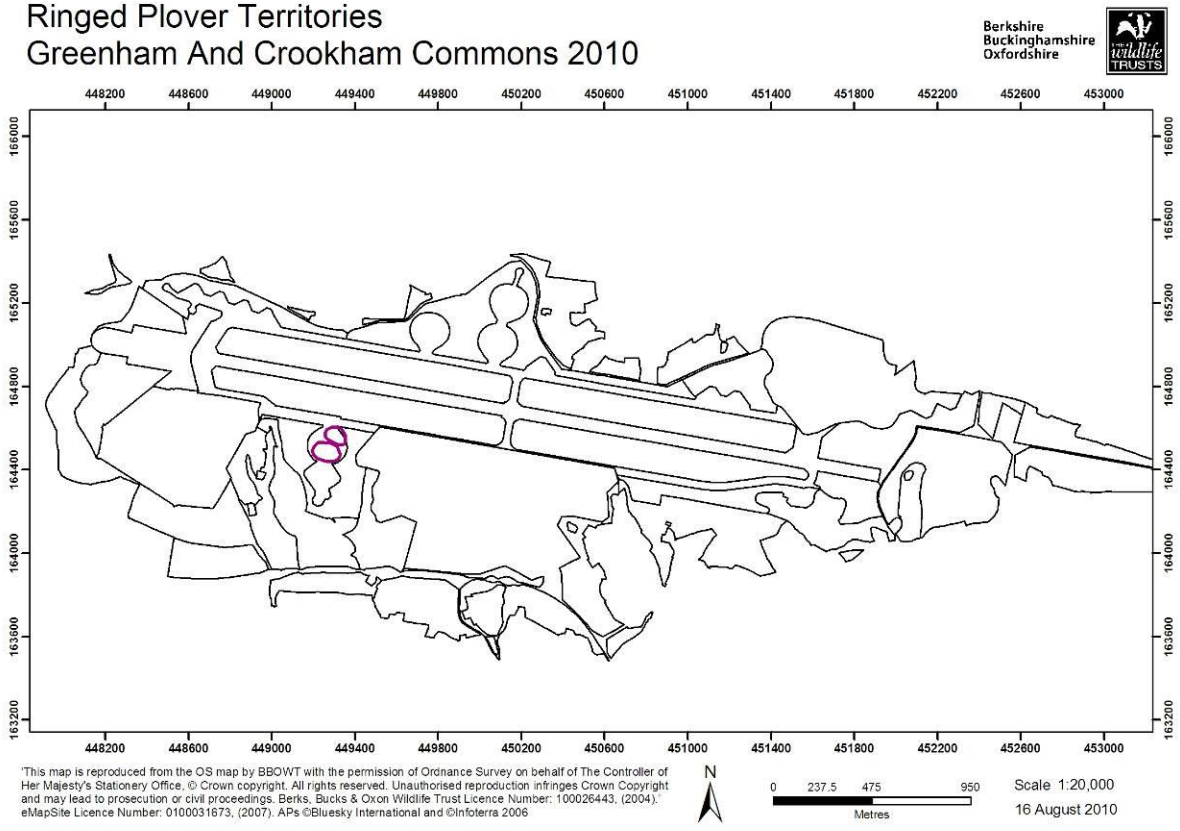
Amber listed: overall decrease in UK population of around 37% since 1984. (BTO national survey, 2007). Latest estimated UK population: about 5,500 pairs (Conway,2008)

Two territorial pairs

Ringed Plover nest on open shingle/sandy beaches or other bare ground on the coast or near inland waters. On Greenham Common small numbers occur during the breeding season and nest on the open gravel areas.

There were a minimum of two territorial pairs on Greenham Common in 2010, the same as in 2009. They were both present on the gravel area next to the 'Fireplane'. One pair fledged three young, but two further nesting attempts were unsuccessful, at least one of which was a second attempt by the parents of the earlier successful brood. See Para 5.2, 'Ringed and Little Ringed Plover nest monitoring' for more detail.

Although a displaying male seen along the old runway on 15 June technically constitutes an extra pair this has not been included in the total. It is believed to be one of the birds from the 'Fireplane gravel' area that had either already bred, or attempted to do so. Another bird recorded at the Crookham pools on 10 June was believed to have been a wandering individual and this has not been included in the total number of pairs either.



Map 2: Ringed Plover territories 2010

2.3.2.2 **Little Ringed Plover** *Charadrius dubius*

Green listed: of no conservation concern at present. Population estimate: 1046 to 1181 pairs in 2007 (Conway, 2008)
Schedule 1 WCA 1981

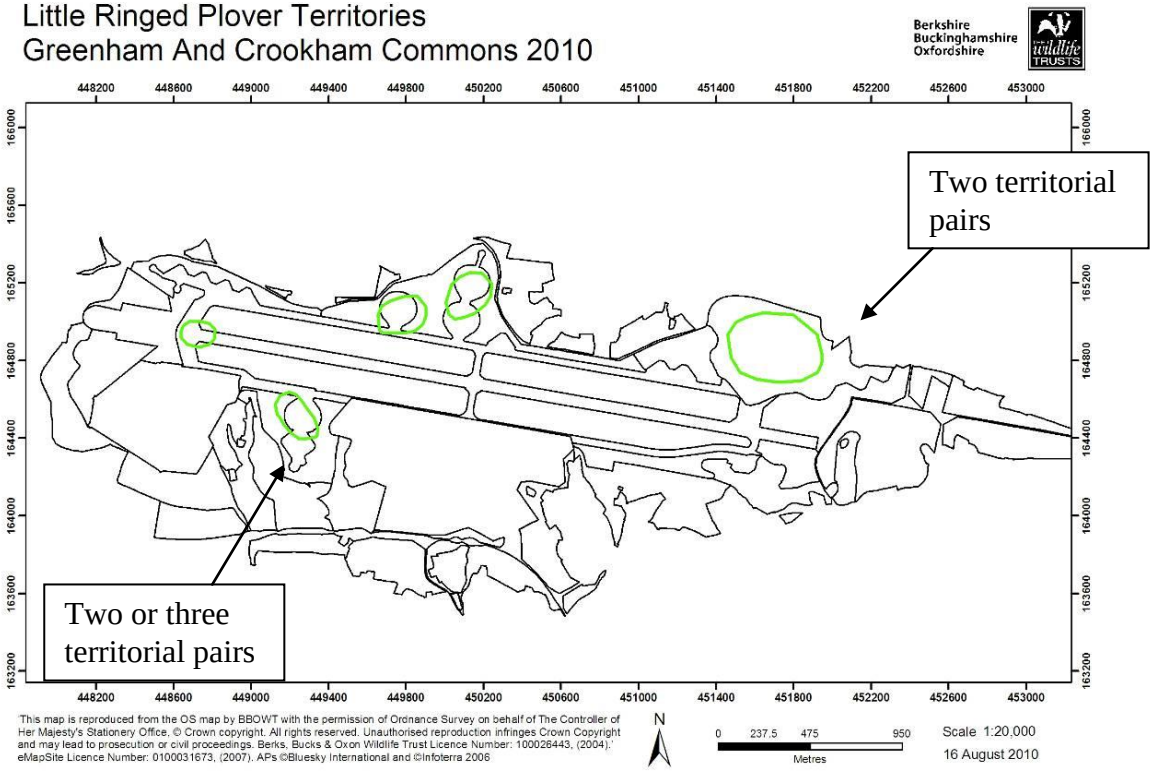
Six-seven territorial pairs

The Little Ringed Plover is an uncommon summer visitor to the UK breeding mainly inland on the shores of gravel pits, river shingle and flat waste ground. The nest is a scrape on bare ground. It is usually present on Greenham Common in higher numbers than Ringed Plover which generally favours coastal sites.

Little Ringed Plovers occur around the pools at Crookham Common and the gravel areas along the old runway, east and west of the main 'Control Tower car park' and near the Fireplane.

Sightings on the species maps indicated 6-7 territorial pairs. Two territories were identified at Crookham pools; one was on either side of the 'Control tower car park' with two or three by the Fireplane. Early in the season it was difficult to establish how many pairs were present as the birds were continually moving around the site, presumably prospecting for territories. Another pair, indicated by two sightings at the western end of the runway early in the season (visits A & B), occurred during this unsettled phase so may have been double counted.

Three pairs were confirmed breeding: One on each side of the 'Control tower car park' and one on the gravel near the Fireplane. They fledged 4, 2 and 1 young respectively. See Para 5.3, 'Ringed Plover and Little Ringed Plover nest monitoring' for more detail.



Map 3: Little Ringed Plover territories 2010

2.3.2.3 **Redshank** *Tringa totanus*

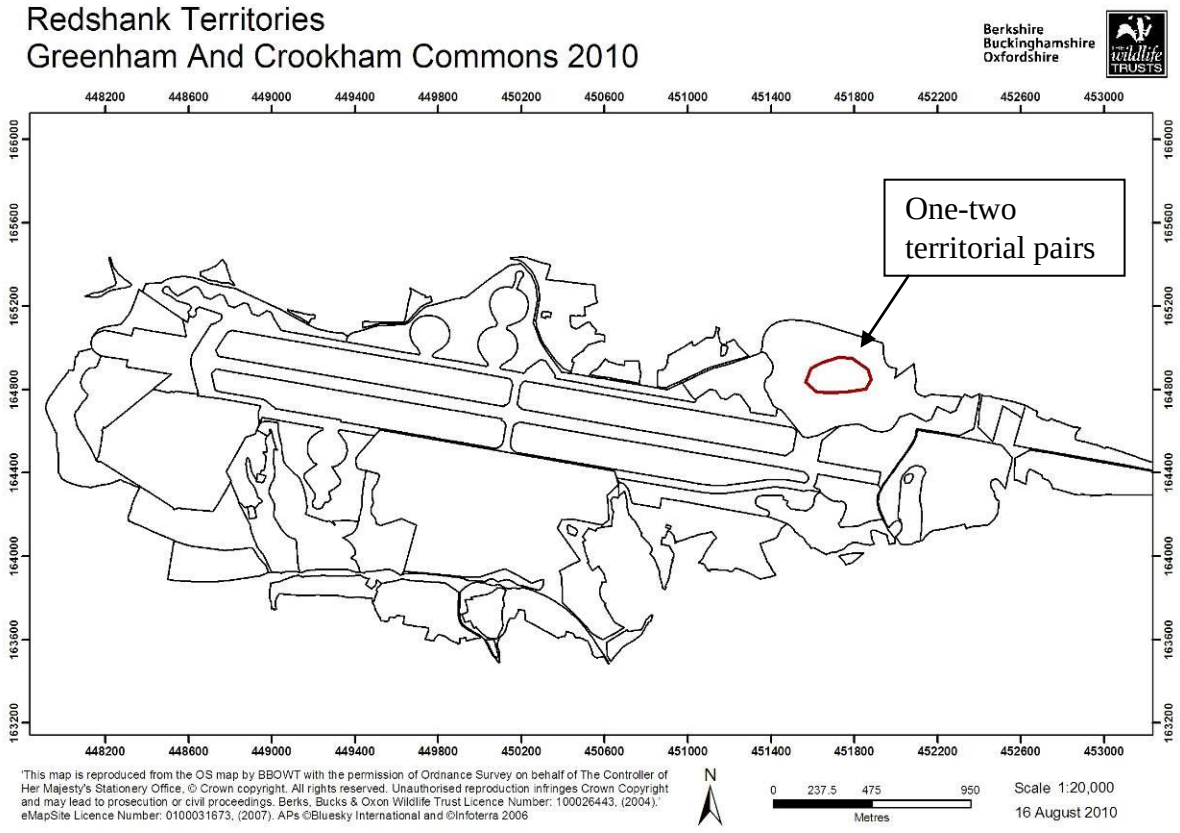
Amber listed: species of European concern, recent breeding population decline, and important non-breeding population. UK breeding population estimate: 39 thousand pairs in 1985-98 (Baker, et al. 2006)

1-2 territorial pairs

This species breeds mainly on coastal marshes and wet meadows/grassland. Nests are usually in tussocks of vegetation.

On Greenham Common it regularly occurs on passage in small numbers and bred regularly during the early 1970's. Since then breeding has been sporadic. In 2009 one territory was occupied at the Crookham Pools but breeding was not confirmed.

In 2010 up to three birds were seen at the Crookham Pools during the breeding season. Courtship display and a male song in flight were observed but as in 2009 there was no further evidence of breeding. Note that for this species the number of pairs is derived from the mean number of birds seen over all visits (O'Brien and Smith 1992).



Map 4: Redshank territories 2010

2.3.2.4 **Skylark** *Aluada arvensis*

Red listed: recent breeding population decline (1969-2007) (Easton, et al. 2009.). UK breeding population estimate: 1.7 million territories in 2000 (Browne, et al, 2000)

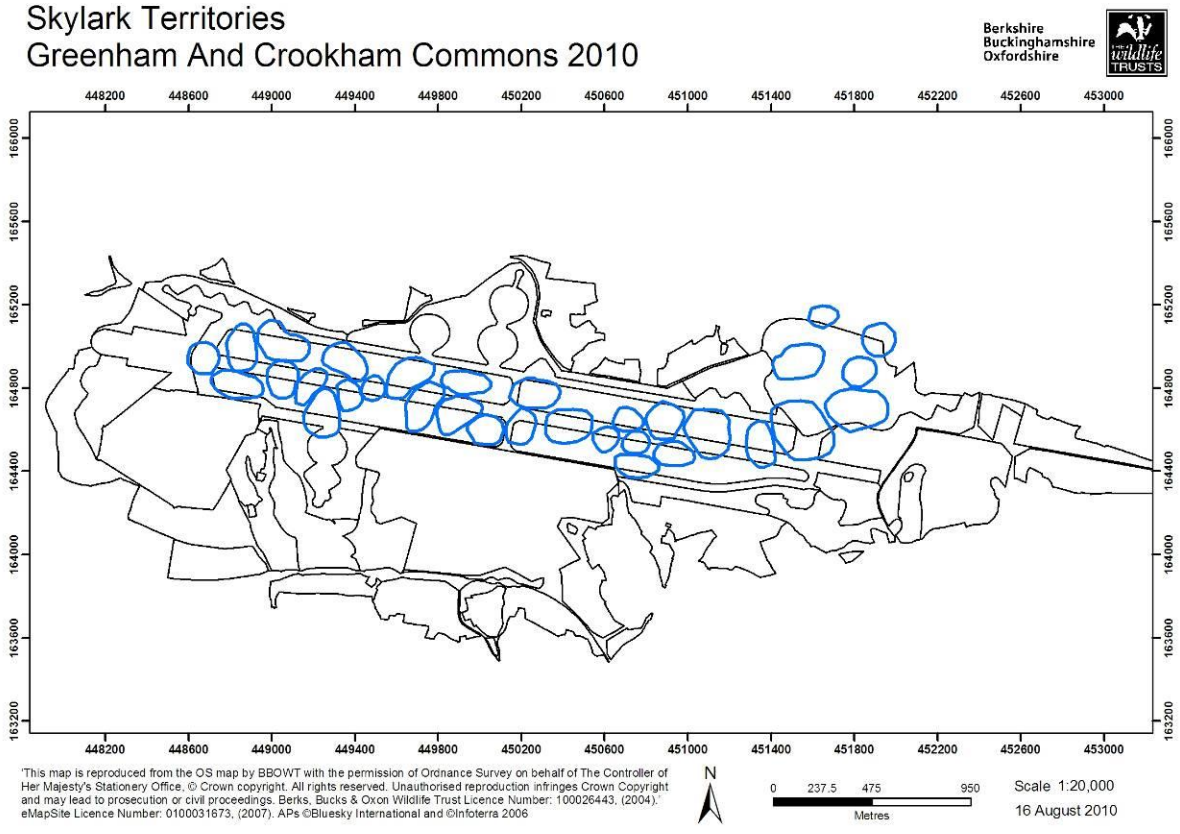
Thirty two territories

This is a common species on the site which breeds on the open areas, especially on the grassland along the heathland lozenges but also on the gravel at the Crookham pools. Nests on the ground often in a grass tuft.

Thirty one territories were identified during 2010 which is very close to the 2009 figure of 32, clearly indicating that there has been no significant change in breeding population.

Unfortunately Skylarks seem particularly susceptible to disturbance and no evidence of successful breeding was observed during the survey visits. The only proof of breeding that the author is aware of is the sighting of a fledged juvenile on 5 June by seasonal warden Joe Harris.

It is recommended that consideration be given to carrying out a more in depth survey of Skylarks on the Common to determine actual breeding productivity. This can be on a sampled area rather than the whole site.



Map 5: Skylark territories 2010

2.3.2.5 **Woodlark** *Lullula arborea*

Amber listed (previously Red): species of European concern, recent breeding range decline (1969-2007) and localised breeding population: UK Population estimate: 1426 to 1552 pairs in 1997 (Wotton, & Gillings, 2000)

Schedule 1 WCA, 1981

Ten territories

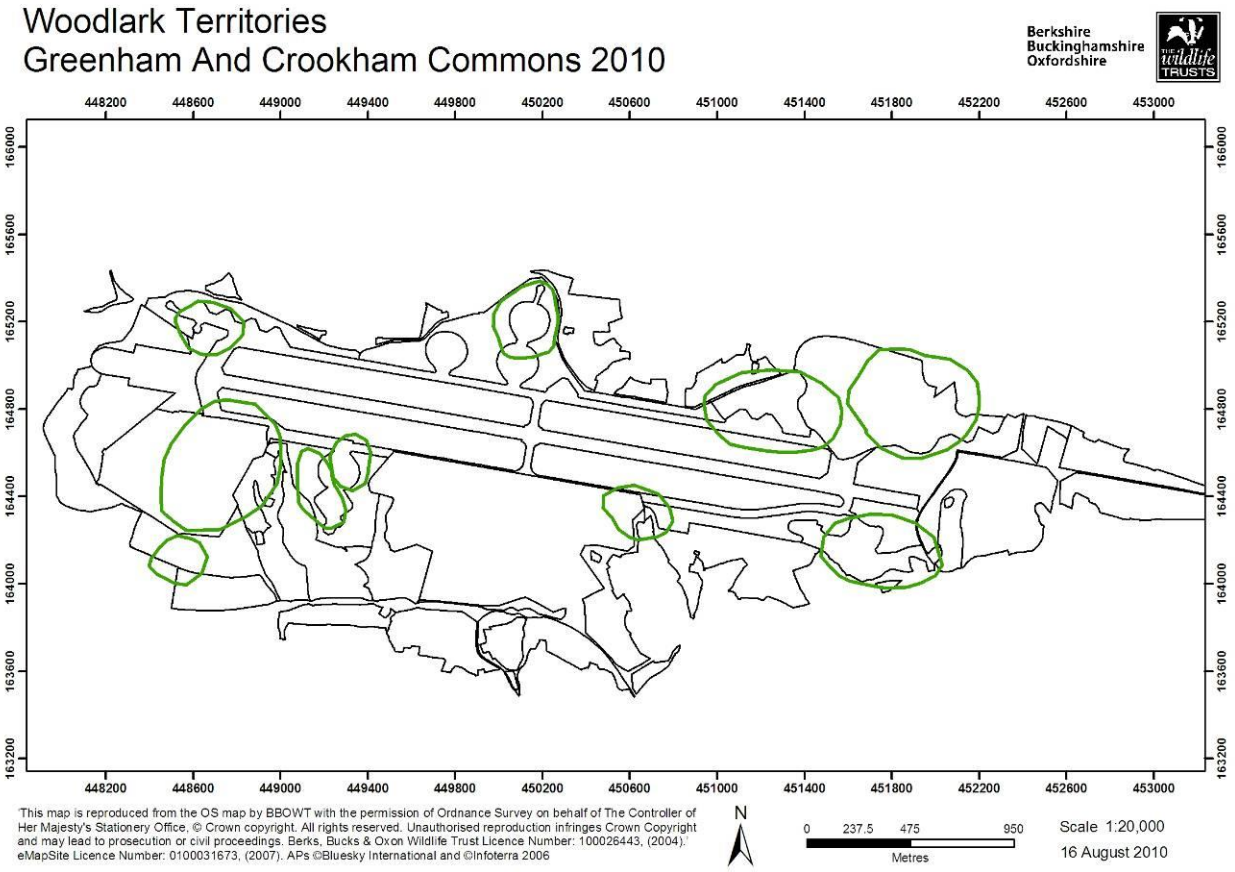
Unlike the skylark which breeds on open grassland in relatively high density across the centre of the site, this species mainly occupies areas of short heath, and sparsely vegetated ground, including the gravel areas, around the outskirts of the site and at much lower density.

A maximum of ten territories were detected during the survey. This is the same number as in 2009, although there are some differences in distribution between years. Of particular note is the absence of a territory in the 'birch coppice' area at the Crookham end of the site where there was one in 2009. This is likely to be due to the habitat having become too overgrown with insufficient bare or sparsely vegetated ground. Fortunately this is one of the areas undergoing heathland restoration work by BBOWT which should improve the habitat for this species and encourage it to return.

Three pairs were proved breeding, either by the sightings of adults carrying food to the nest or the presence of fledged young: 1) '616E', 2) the Fireplane gravel area and 3) at Crookham Common.

Evidence of probable breeding was indicated on 8 March by a nest-building female, with the male nearby, immediately east of the silo compound, west of the Fireplane gravel area. Unfortunately the pair was not seen again having abandoned the site possibly due to disturbance from visitors. However it is not unusual for several trial nests to be built before one is chosen so it may be that this pair eventually successfully nested elsewhere on the Common.

On 15 June, a pair was found feeding young in a nest in the SW lozenge. This pair has not been added to the territory total as it is likely they had already failed elsewhere on the site and are therefore already included in the count. As far as the author is aware this is the first record of Woodlark nesting in the lozenges.



Map 6: Woodlark territories 2010

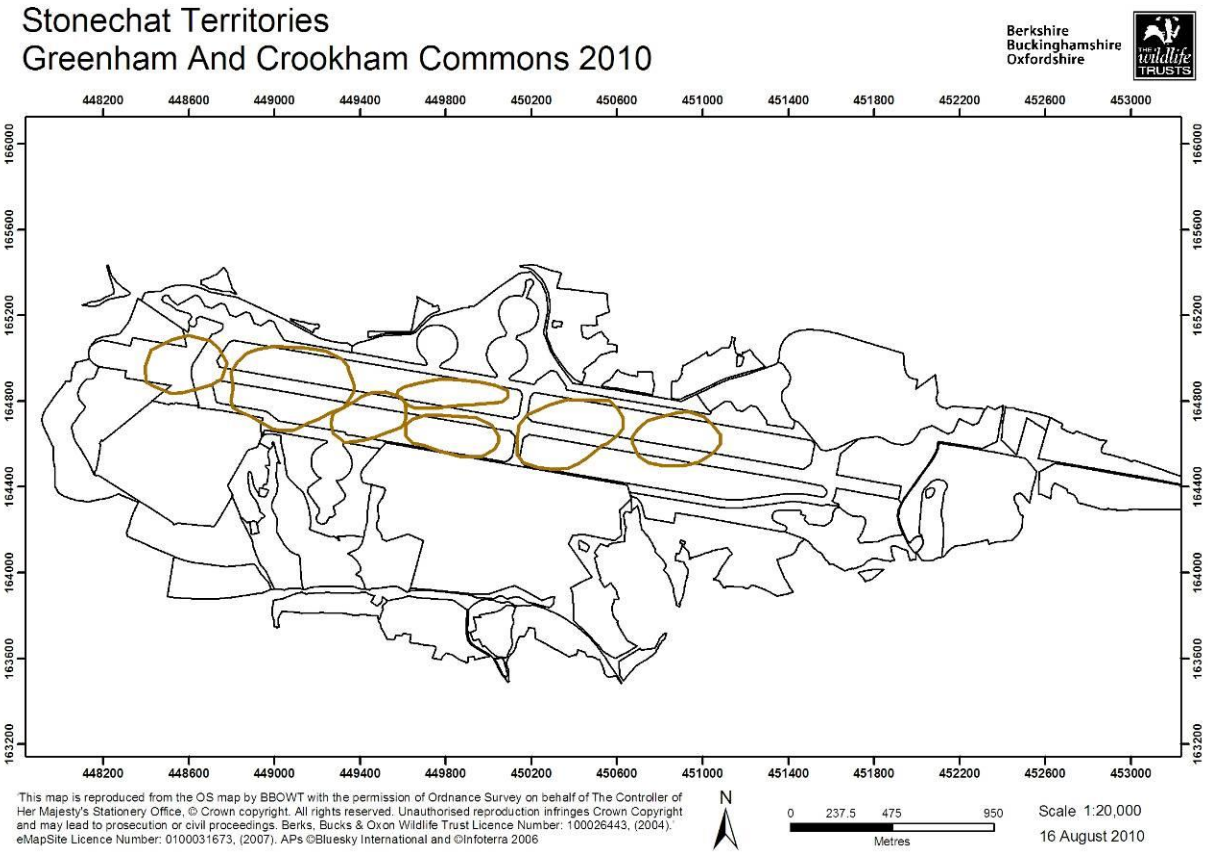
2.3.2.6 **Stonechat** *Saxicola torquata*

Green listed: No current conservation concern. Has recently apparently recovered after a decline during latter two thirds of twentieth century. Previously amber listed. UK breeding population estimate: 19,300–49,400 pairs in 2000 (BBS trend: BiE04).

Seven territories

Breeds annually in small numbers on the Common, mainly in the gorse dominated 'lozenge' areas. The nest is usually close to the ground and frequently in gorse.

Seven pairs were found holding territories during 2010, two up from 2009. There were two in the eastern lozenges, four in the western lozenges and one at the extreme western end of the course of the runway. Breeding was confirmed for all seven pairs with sightings of either fledged young (five pairs) or adults carrying food (two pairs).



Map 7: Stonechat territories 2010

2.3.2.7 **Dartford Warbler** *Sylvia undata*

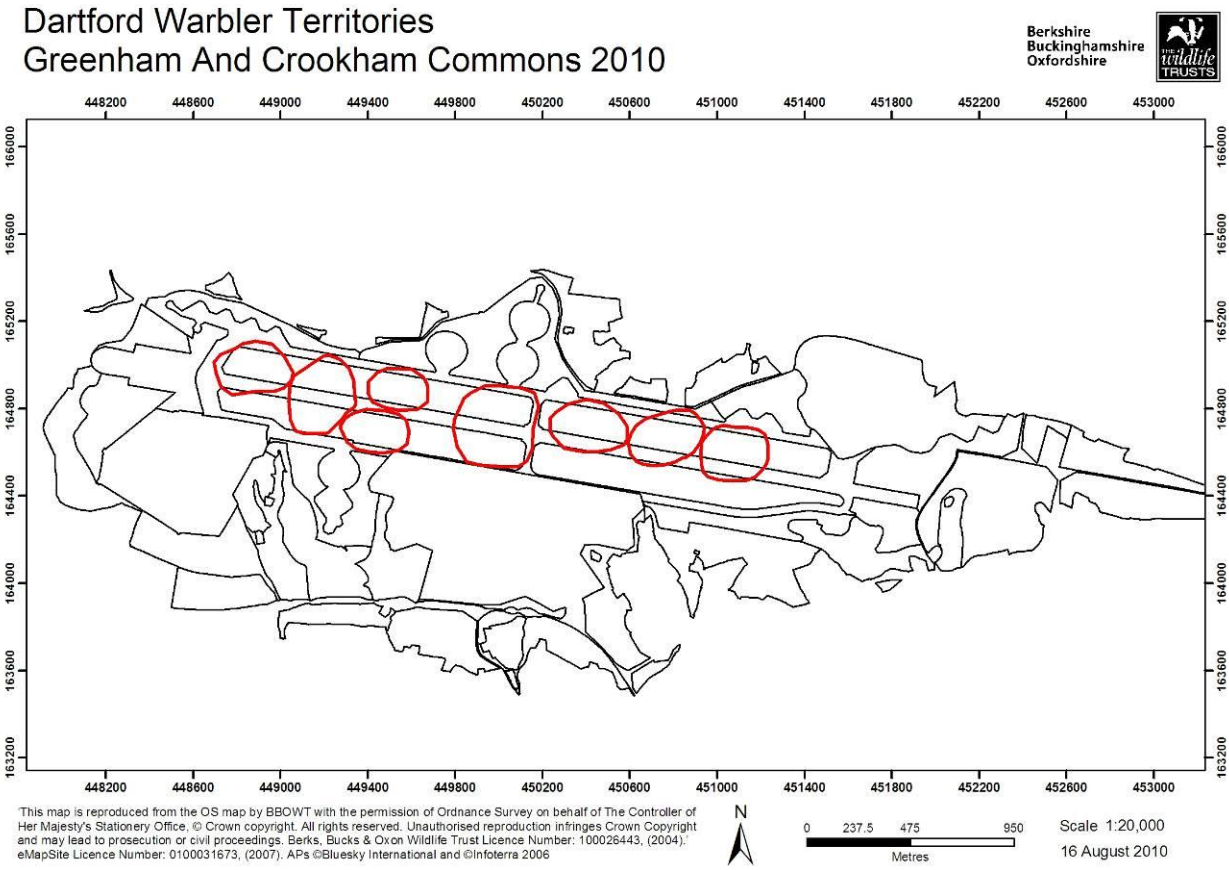
Amber listed: species of European concern and localised breeding population (Eaton, M.A. et al. 2009). Estimated UK breeding population: about 3,200 territories (BTO *birdfacts* webpage). Scarce in the UK and reliant upon stands of gorse for breeding. Recent evidence of range expansion in UK but highly susceptible to hard winters

Seven-eight territories

Like Stonechat, the Dartford Warbler breeds annually in small numbers, often in close proximity to the former species and exclusively amongst the stands of gorse on the heathland lozenges. It nests close to the ground in gorse.

In 2010 seven or possibly eight territories were occupied on the Common: three on the eastern lozenges and four or five on the western lozenges. This is up by two or three on 2009 which is surprising considering the relatively hard winter of 2009/10 which apparently took its toll on other UK populations. There were apparently at least seven territories during 2005 (Clere 2009) so between five-eight territories could be normal for the site.

Three pairs on the western lozenges were proved breeding, initially from sightings of adults carrying food to their nests. Later, successfully fledged juveniles were seen near one of the nest sites in the south west lozenge. Also, probable breeding was indicated by the sighting of a female carrying nest material in the eastern most territory on the eastern lozenges.



Map 8: Dartford Warbler territories 2010

2.3.2.8 **Meadow pipit** *Anthus pratensis*

Amber listed: recent breeding population decline (Eaton, M.A. et al. 2009). UK population 'best' estimate: 1.7 million territories in 2000 (Baker, H. et al. 2006)

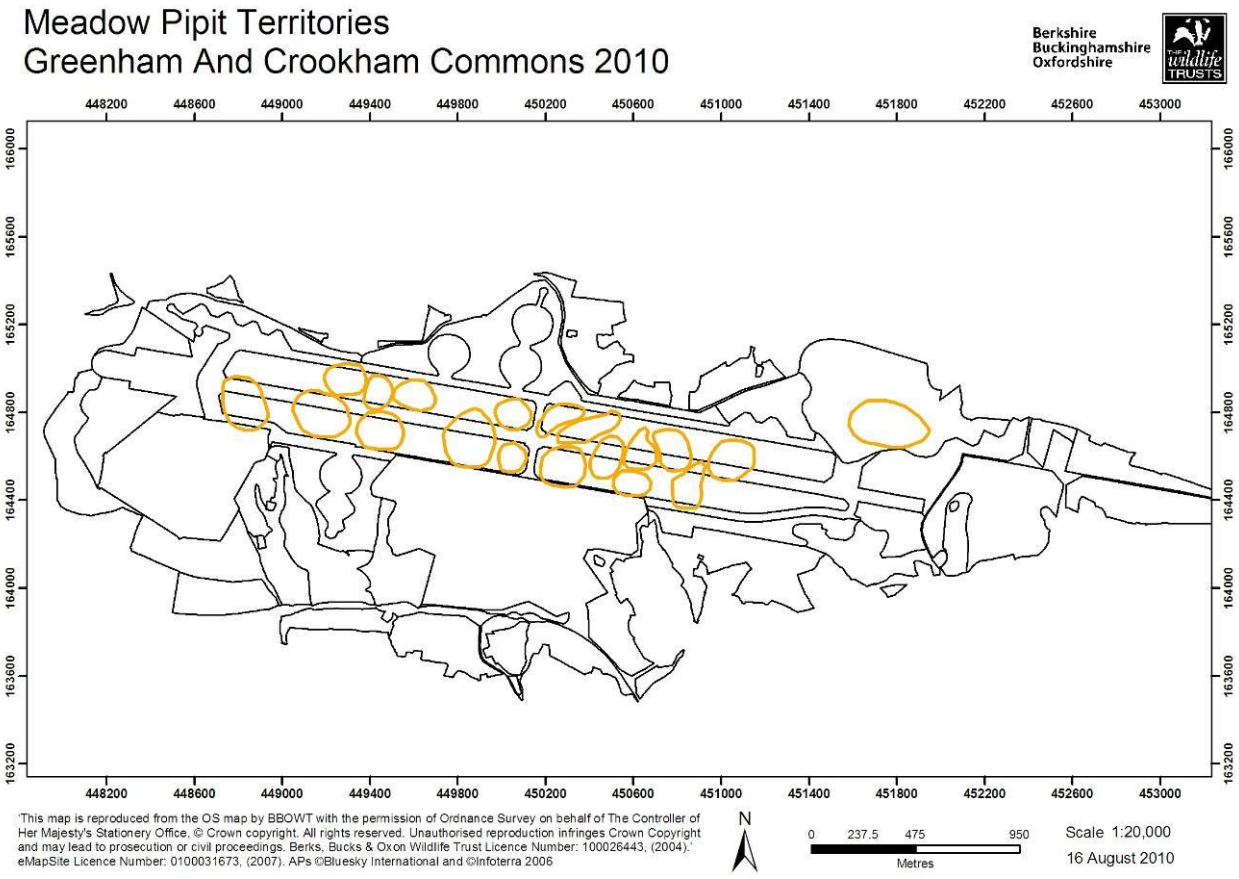
18-19 territories

This is a common species throughout the UK breeding in open country such as hills, moors, rough grassland, heaths and dunes. It nests on the ground next to or in a tussock and the nest is usually invisible from above.

There were about 18/19 territories identified on the Common during 2010.
Although the number of territories is four or five down on 2009 the difference is probably not significant. When surveying a common species like Meadow Pipit in a relatively featureless

habitat like the Greenham Common lozenges the likelihood of double counting or incorrectly positioning individual birds is increased.

In contrast to the paucity of breeding records for Skylark, confirmation of breeding was recorded in seven of the territories, mostly with sightings of adults carrying food or of fledged young. Two were along the eastern lozenges and five were along the western lozenges.



Map 9: Meadow Pipit territories 2010

Section 1.01 References for Territory mapping survey

- Baker, H. et al. 2006 British Birds 99:25-44
- BiE04 BirdLife International (2004) *Birds in Europe: population estimates, trends and conservation status.* BirdLife Conservation Series No. 12. BirdLife International, Cambridge. (BiE04)
- Browne, S. et al, (2000) Bird Study, 47:52-65)
- Conway G.J. 2008 UK population estimates from the 2007 Little Ringed and Ringed Plover surveys, BTO, Thetford
- Easton, M.A. et al. 2009. British birds, 102:296-341
- Wotton, & S.R. Gillings, S (2000) Bird Study 47:212-224

3 Lapwing (*Vanellus vanellus*) breeding survey

A detailed nest monitoring survey was undertaken to produce a comprehensive picture of Lapwing breeding success on Greenham and Crookham Common, including breeding productivity estimates i.e. number of young fledged per pair and the levels and causes of predation.

Lapwings were chosen for this more in-depth investigation because their breeding biology is reasonably well understood; their nests are relatively easy to find; the methodology for using data loggers is well established and they are known to be vulnerable to disturbance and predation.

To achieve this, a combination of methods was employed:

- The use of temperature data logger technology, used at the incubation stage to determine the probable cause of predation.
- Extensive field observation to follow the fortunes of pairs, nests and hatched broods.
- Ringing of chicks to follow the fortunes of individual chicks through to fledging.

3.1 Thermochron data loggers (ibuttons)

The Thermochron data loggers, otherwise known as *ibuttons*, are battery powered single-chip digital thermometers with a data logging memory, housed in a stainless steel casing. They are robust in design, water resistant and only about 1cm in diameter.

They are used in industry in a variety of applications including monitoring the temperature of potentially perishable foodstuffs on long journeys to ensure they reach their destination in good condition.

Photo 1: Thermochron data logger

The Thermochron takes time-stamped temperature readings at equal intervals, and then stores the data in a log format in an on-board 'datalog' memory. The standard Thermochron (DS1921G), the type mostly used in this survey, allows 2048 readings with time intervals of between 1 to 255 minutes. A small number of high capacity loggers, (D1922L), which are able to take temperature readings at twice the frequency of the standard loggers were also purchased. These were used in nests which were the subject of nest-watch sessions to see if it

is possible to correlate disturbance incidents with temperature changes recorded on the loggers (Para 4, Lapwing nest watch sessions).

The capability of the Thermochron lends itself well to monitoring temperature fluctuations in birds' nests as a means to determine the cause of predation and as such has, in recent years, been increasingly used by conservation organisations, such as the RSPB, particularly to monitor the success of Lapwings.

3.1.1 How the temperature data is used to determine the probable cause of predation

One data logger is installed into each active Lapwing nest with an additional logger installed near the nest to act as a 'control' (Para 3.1.3 Installing loggers). This enables direct comparison between the temperature in the nest, which is influenced by the incubating bird and the ambient temperature, which is not.

The eggs are weighed and measured at the time of logger installation and these figures are used to calculate a potential hatching date for the whole clutch using a standard formula, based on egg density.

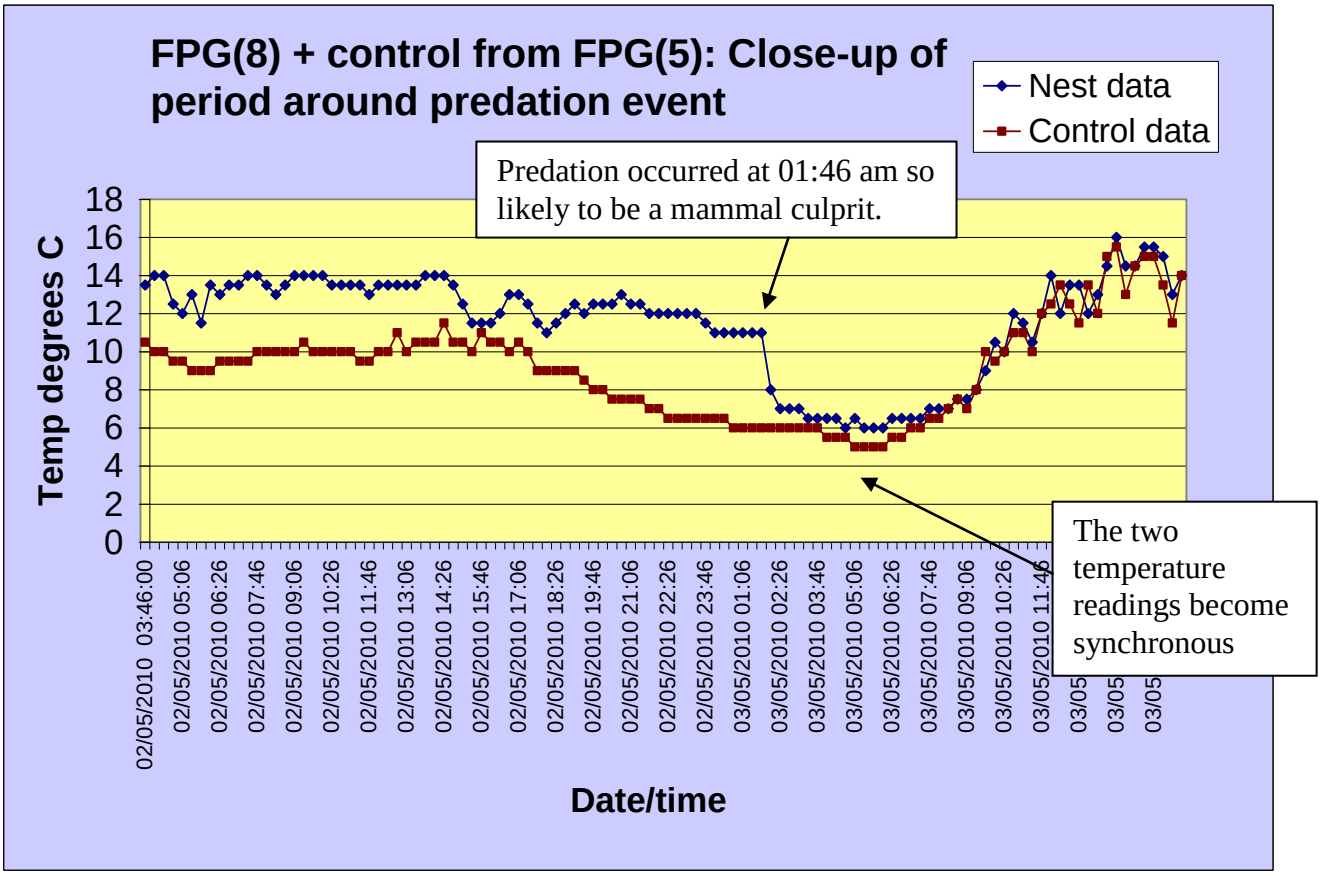
The logger is removed from the nest, either soon after the calculated hatch date or earlier if field observations indicate that the nest is empty due to hatching or predation.

The temperature data is then downloaded onto a PC and expressed in an 'Excel' graph which provides the best way to analyse the data (graph 1). The temperature graph of an incubating bird tends to show regular albeit moderate fluctuations. Compared to the ambient temperature pattern shown by the 'control' data, these fluctuations, although broadly similar never or rarely reach the extremes of temperature of the 'control' data and are therefore not 'synchronous'. This is because, for example, during a cold night an incubating bird will use its body heat to maintain a suitable higher temperature for the eggs and during the day, if the temperature is high the incubating bird will act as an insulator so that the eggs do not over heat.

Temporary, short term 'breaks' in an otherwise regular pattern indicate periods when the incubating bird has left the nest, perhaps to feed or possibly as a result of disturbance. If the more or less regular pattern is subsequently re-established it is assumed that incubation has resumed. However if a predation (or indeed hatching) event occurs the graph is likely to show a sudden deviation from the normal pattern and most importantly the pattern of the nest temperature will become **synchronous with that of the 'control** (graph 1). The point at which the temperature deviates from its regular pattern just prior to becoming synchronous with the control data is the point and therefore time, at which predation is assumed to have occurred.

If regular field observations reveal that a bird has not been seen 'sitting' for a prolonged period *before the due hatching date*, it is likely that egg predation had occurred so the logger is retrieved from the nest for data analysis.

If the graph data confirms that predation has occurred then it is possible to infer a likely cause based on the time of the predation event. If the event is during the hours of darkness the predator is most likely to be a mammal. If it is during daylight then it is likely to be avian. To determine the actual times of daylight and darkness, standard British *Twilight* times are used.



Graph 1: Example graph of confirmed night predation event

3.1.2 Preparing the data loggers for use

Firstly, in order to be able to secure the logger into the nest the RSPB recommends gluing a nail with a large flat head to the smooth side of the logger (i.e. the side without etched numbers). This was done with the first nesting attempts but the nails proved to be unsuitable for the gravel-dominated ground in the nesting areas. Loggers from four nests could not be re-found and in two instances only the nail was recovered.

Photo 2: Data logger ready for installation

This is believed to be because the smoothness and small diameter of the nail meant the logger was effectively 'loose' in the nest cup and therefore easily detected and regarded as a nuisance object by the Lapwing. Once detected it is likely that the lapwing picked it up, took flight and dropped it well away from the nest. Indeed one logger was found about 5m from the nest but unfortunately no data was recorded, probably due to a set-up error.

For the second phase of nests one-and-a-half inch or one inch screws were used and these were more successful, having been installed more securely by literally screwing them into the ground by hand! Only one of the loggers used on the second phase nests was not recovered.

The loggers were then programmed (missioned) using free software provided on the manufacturers website and set to record the temperature at intervals of 20 minutes. This ensured that the data log memory would last the full lapwing incubation period of 28 days.

A function called 'Mission start delay' was often used. This allowed the loggers to be missioned either the night before or early in the morning before starting field work so that the first temperature reading would not taken be until needed.

Once *missioned* a piece of dull coloured insulation tape was attached to the top of each logger to cover the shiny surface and make it less likely to be removed by the parent bird or found by predators.

3.1.3 Installing the loggers

Once the positions of active Lapwing nests had been determined by field observations, visits were undertaken to find them and install the data loggers. When a nest was found, each egg was weighed and measured using digital scales and callipers (max breadth and width) and placed in a fleecy hat for safety and warmth.

Photo 3: Working at nest FPG(8)

Photo 4: weighing and measuring the eggs

The nest lining, comprising mainly small twigs, was then removed to gain access to the bottom of the nest cup. After a small hole had been made, the logger was pushed or screwed into the centre of the nest so that it was flush with the ground surface. The nest lining was then put back in the nest over the logger and the eggs were replaced, as close as possible to the position they were first found.

It was noticeable that most nests had an unusually large amount of lining in the nest cup. This is possibly because the nests were placed on gravel, which, thermodynamically, will absorb greater extremes of temperature than the substrates of other more typical nesting habitats such as the soil of arable fields. Consequently the nests require a higher level of insulation to prevent the eggs from overheating in the day or chilling at night.

During logger installation, disturbance was kept to an absolute minimum in order to minimise the threat of nest abandonment and/or predation of the Lapwing nest or any other ground nesting bird in the vicinity. The large amount of nest lining often made the nests stand out a little from the surrounding gravel and this together the fact that they were in relatively confined areas meant that most were found reasonably quickly. On average the amount of time it took to 'process' each nest was only 7.6 minutes. Each nest was allocated a unique code which referred to the location it was found and a GPS reading was taken so that its position could be accurately plotted on a map of the nesting area.

Photo 5: Nest CP(1) befrore logger installed

Photo 6: Nest CP(1) with logger, prior to being re-covered by lining

3.2 Field observations

In an attempt to keep track of the fortunes of each nest, field observations were made on a regular basis by the author, seasonal wardens and Jan Legg. Information recorded included the presence or absence of incubating adults, newly hatched broods, the whereabouts of existing broods, the number of young in each brood and their size, alarm calling adults indicating the presence of young and predation events. Nest watch sessions were also carried out on a

selection of six nests by the seasonal wardens to assess disturbance levels, (Para 4). The records from these sessions supplemented the general field observations.

3.3 Ringing the chicks

To supplement the field observations an attempt was made to ring all Lapwing chicks as soon after hatching as possible. By catching and checking the ring numbers on developing chicks it was possible to confirm which nests they hatched from and ultimately which individual chicks survived to fledging. Ringing was carried out by licensed ringers Jan Legg and Ian Weston; members of Newbury Ringing Group (1.4).

3.4 Results

Lapwings nested in three main areas of the site as shown in map 10 (page 34). Each area was allocated a code and each nest was given a further code relating to the site where it was found. The following table gives details of the three sites and the type of codes used.

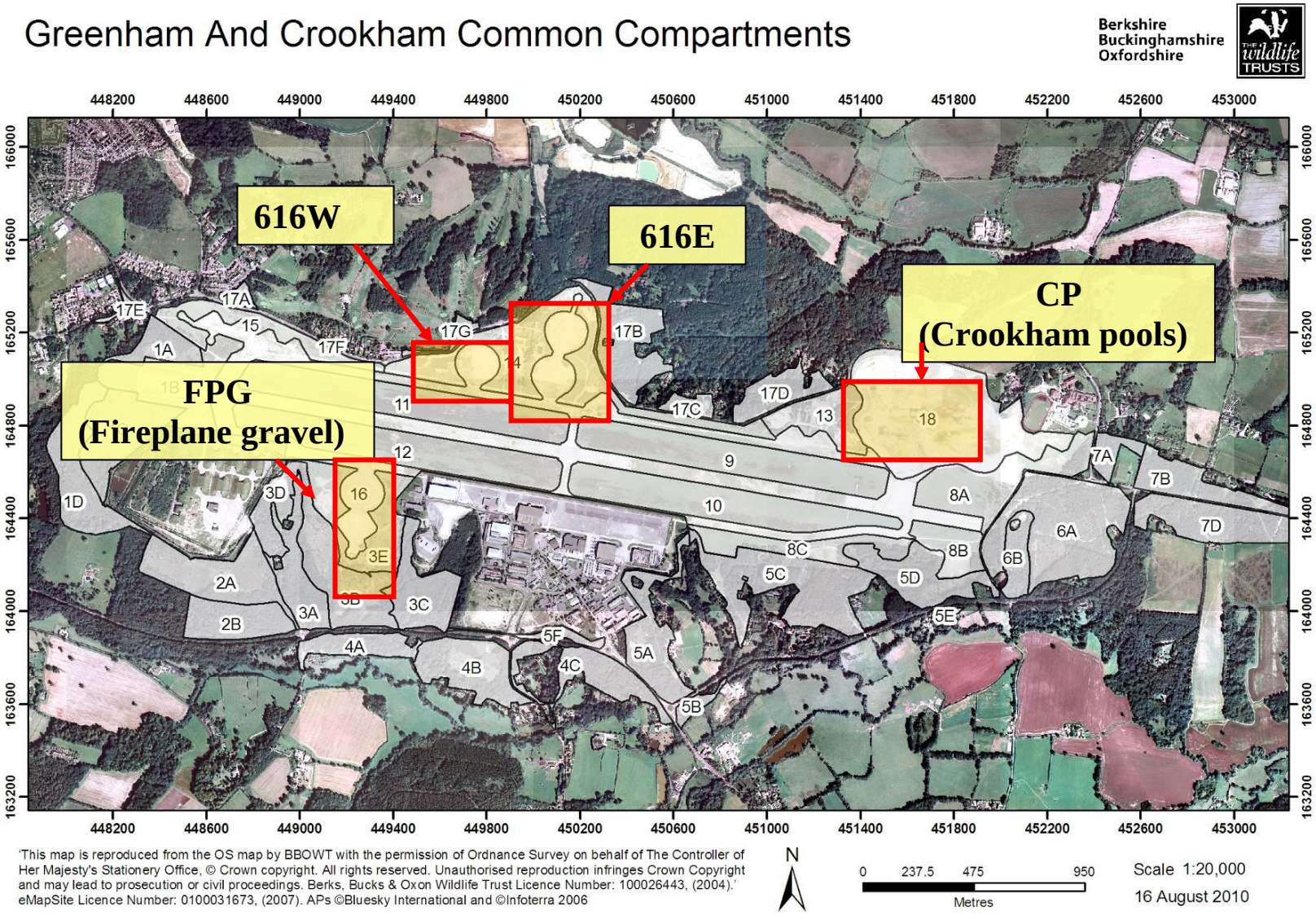
Main code	Description of area	Nest designation
616E	The area of gravel NE of the Control Tower car park and E of building '616' used as the site ranger's workshop/office. This area is referred to as 616E in this report.	Single number in brackets, e.g. 1,2,3 etc
FPG (Fireplane gravel)	The area of sparsely vegetated gravel on the S side of the Common, W of New Greenham Business park and near to a mock aeroplane used by USAF personnel for training in fire fighting/rescue during their occupation of the site. This area is referred to as FPG in this report (i.e. Fireplane Gravel).	Single number in brackets, e.g. (1),(2),(3) etc followed by 'n' (north) or 's' (south) denoting the appropriate half of the area *
CP (Crookham pools)	Sparsely vegetated gravel at the west end of the landscaped 'wetland' pools area at the NE section of the site at Crookham Common. This area is referred to as CP in this report.	Single number, e.g. 1,2,3 etc

Table 5: Description of nest and site codes

* Note that in the text, north and south designations are deemed unnecessary and are omitted.

The results of the Lapwing nest monitoring are presented in three main sections:

- First phase nesting attempts
- Second phase nesting attempts
- Combined results of first and second phase nesting attempts



Map 10: Lapwing, Ringed Plover and Little Ringed Plover nesting areas

3.4.1 Lapwing first phase nesting attempts

Lapwings make up to two nesting attempts during the breeding season but only do so if the first attempt is unsuccessful, either because of egg or chick predation. This section details the fortunes of the first nesting attempts. At Greenham Common small numbers of male Lapwings had returned to their nesting sites by as early as the end of February but the main arrival did not occur until mid March with egg laying beginning towards the end of the month.

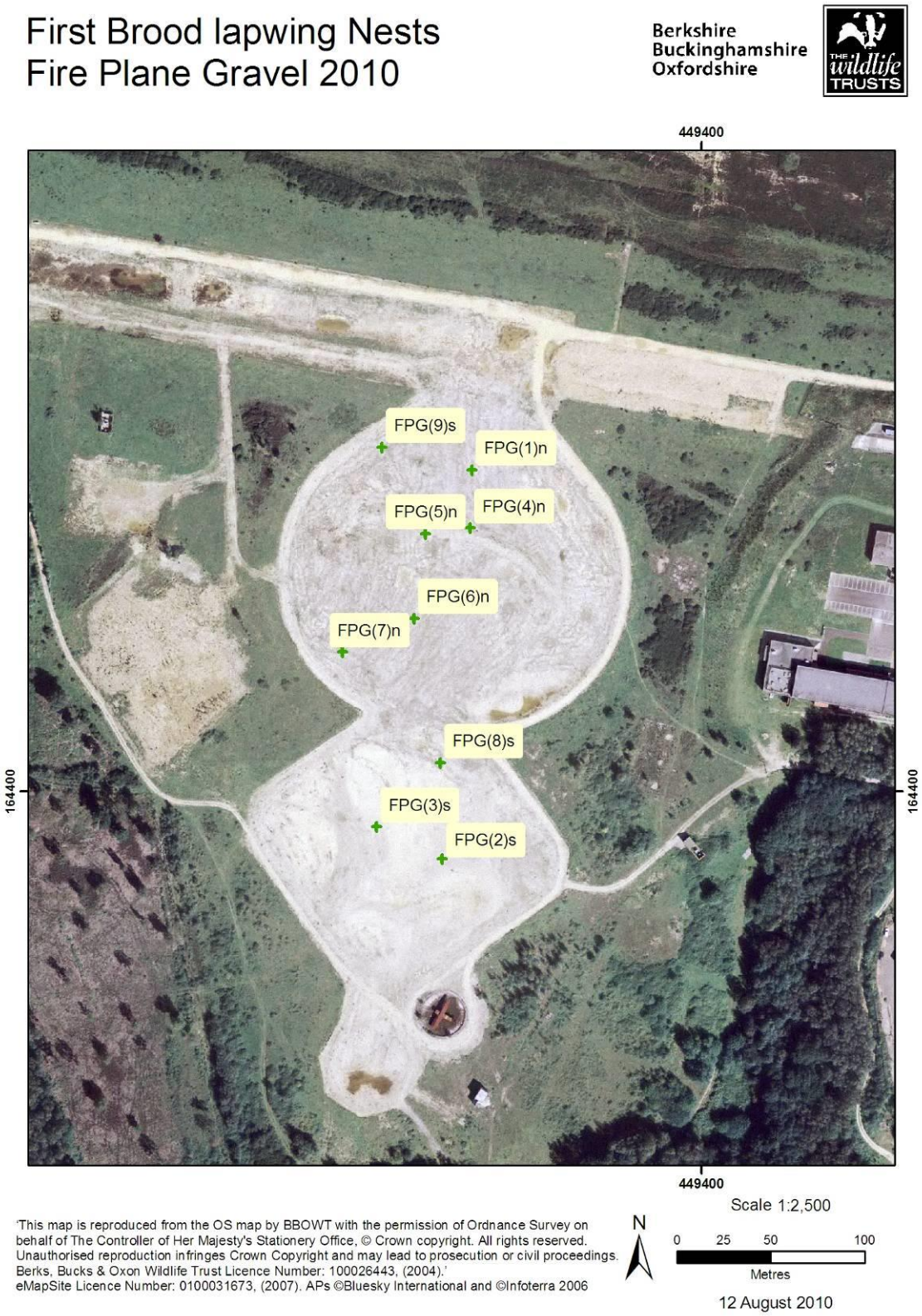
3.4.1.1 Number and location of nests and eggs

In total there were 12 first phase' nesting attempts: two on the 616E gravel, nine on the FPG area and one at CP (Maps: 11, 12 & 13). This corresponds to an estimate of about 12 or 13 pairs on site, calculated using a combination of counts of adults and nests that were active simultaneously. Data loggers were installed in all 12 nests during 8 April-5 May. Two of the nests, 616E(1) and FPG(5), had an additional 'control' logger placed about 20cm from the nest cup. Based on advice (L Davies pers.com) it was originally thought that two 'controls' would be sufficient. However due to the loss of several loggers that were probably removed by Lapwings (see Para 3.1.2) this proved inadequate and in the second phase nesting period 'controls' were installed next to all nests.

In total 47 eggs were laid and all were weighed and measured to determine the potential hatch date. Eleven clutches contained four eggs, the standard clutch size for Lapwing, while the twelfth nest, FPG(9), contained three.

Map 11: Lapwing nest site map. Crookham Pools, first nesting attempt

Map 12: Lapwing nest positions, '616E' gravel, first nesting attempts



Map 13: Lapwing nesting positions. Fireplane gravel, first nesting attempt

3.4.1.2 Egg-laying dates

Lapwings lay one egg every other day or so, so it can take about a week for a typical clutch of four to be completed. Incubation does not begin until the clutch is complete and this enables chick hatching to be synchronous. Typically, incubation takes about 28 days.

The approximate egg laying period for each nest has been calculated by working back from either the actual hatch date, confirmed by field observation, or the date that was derived from the egg density (Para 3.1.1). Incubation dates were determined by field observation and by counting back 28 days from hatching dates.

The entire egg-laying period for the first phase of nesting attempts ranged from 20 March to 3 May. The incubation period for all nests ranged from 27 March to 28 may.

This information may be useful in determining what periods require most vigilance from the seasonal wardens and ensuring that adequate signage is in place. It may help in determine the timing of any grazing management regimes that may be implemented.

3.4.1.3 Egg predation of first nesting attempts

Of 47 eggs laid, 19, from five nests were predated. Four nests were predated in the FPG area and one in the CP area. No eggs were lost from the two 616 nests (Table 6).

FPG nests: Predation of seven eggs from nests, FPG(8) and FPG(9), was confirmed by temperature data recorded on the loggers. Both clutches were taken at night so the culprit is deemed to be a mammal, probably a fox or badger. Because the 'control' logger from near nest FPG(5) recorded data over a compatible period this was used this to verify that predation had occurred, and at what time, at both nests.

No data was available from the loggers installed in nests FPG(3) and FPG(5). The logger for FPG(3) could not be found while the one for FPG(5) was found about five metres from the nest but had no data was recorded, possibly due to a 'missioning' error. However both nests, each containing four eggs, are believed to have been predated because:

1. There was no sign of any egg shell fragments that would have indicated hatching.
2. No chicks that could have come from these nests were seen on or after the due hatching date, in spite of regular field observations.

Evidence of predation of nest FPG(3) by a mammal at night was provided by the presence of adult Lapwing feathers found near the nest and a partly eaten adult Lapwing carcase found to the south of the gravel area near woodland. A plausible explanation is that the Lapwing was taken by a fox or badger while sitting on the eggs. This is the only known incident of an adult being predated during the survey.

CP nest: Nest CP(1), situated west of the main pools, was attacked by Crows on 7 May and one egg was seen to be taken at about 10:00. When the logger was recovered on 13 May the nest was empty but may have been empty for a few days as no bird was seen incubating on or after 11 May. It is likely that the nest was abandoned either during the Crow attacks or after all the eggs had been taken during 8-11 May.

The data from the logger showed a sudden drop in temperature at 02:01am on 8 May which *suggests* that a night predator was responsible for taking the remaining eggs. However this interpretation may not be reliable because the only available 'control' logger was from 2.3Km away so the temperature readings may not be compatible. Also given that one egg had already been taken by a Crow it is feasible that the Crow returned later to take the remaining eggs. Because of this uncertainty the cause of predation of the three remaining eggs has been recorded as unconfirmed.

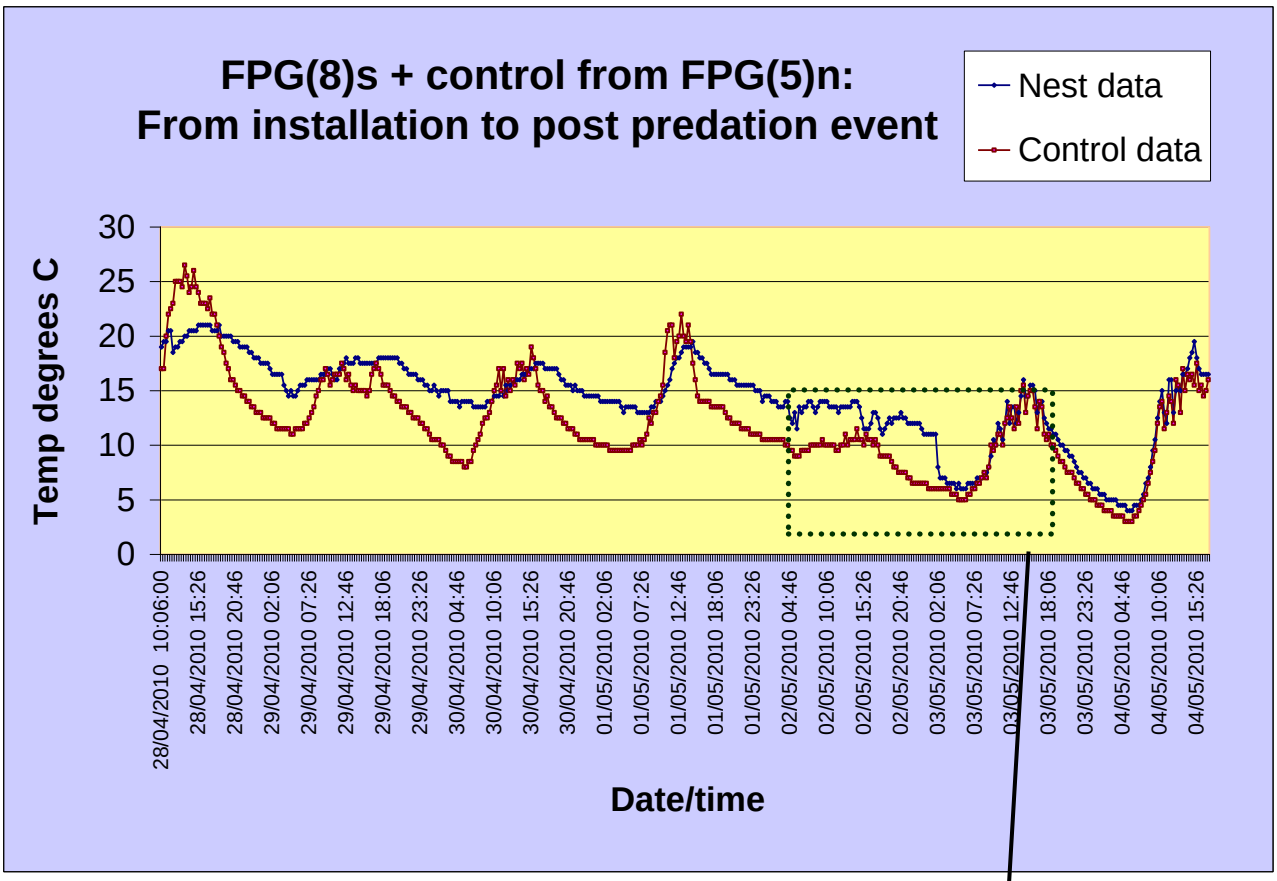
Nest	Eggs laid	Eggs predated			Infertile eggs	Eggs hatched	Chicks predated	Chicks Fledged
		Night (mammal)	Day (bird)	Unconfirmed cause				
FPG(1)	4				1	3	3	
FPG(2)	4				1	3	2	1
FPG(3)	4			4		0		
FPG(4)	4					4	4	
FPG(5)	4			4		0		
FPG(6)	4					4 (1 dead by nest)	3	
FPG(7)	4					4	4	
FPG(8)	4	4				0		
FPG(9)	3	3				0		
CP(1)	4		1	3		0		
616E(1)	4				1	3	3	
616E(2)	4					4	2	2
TOTALS	**47**	**7**	**1**	**11**	**3**	**25**	**21**	**3**

Table 6: Lapwing, summary of egg and chick out-comes, first nesting attempt

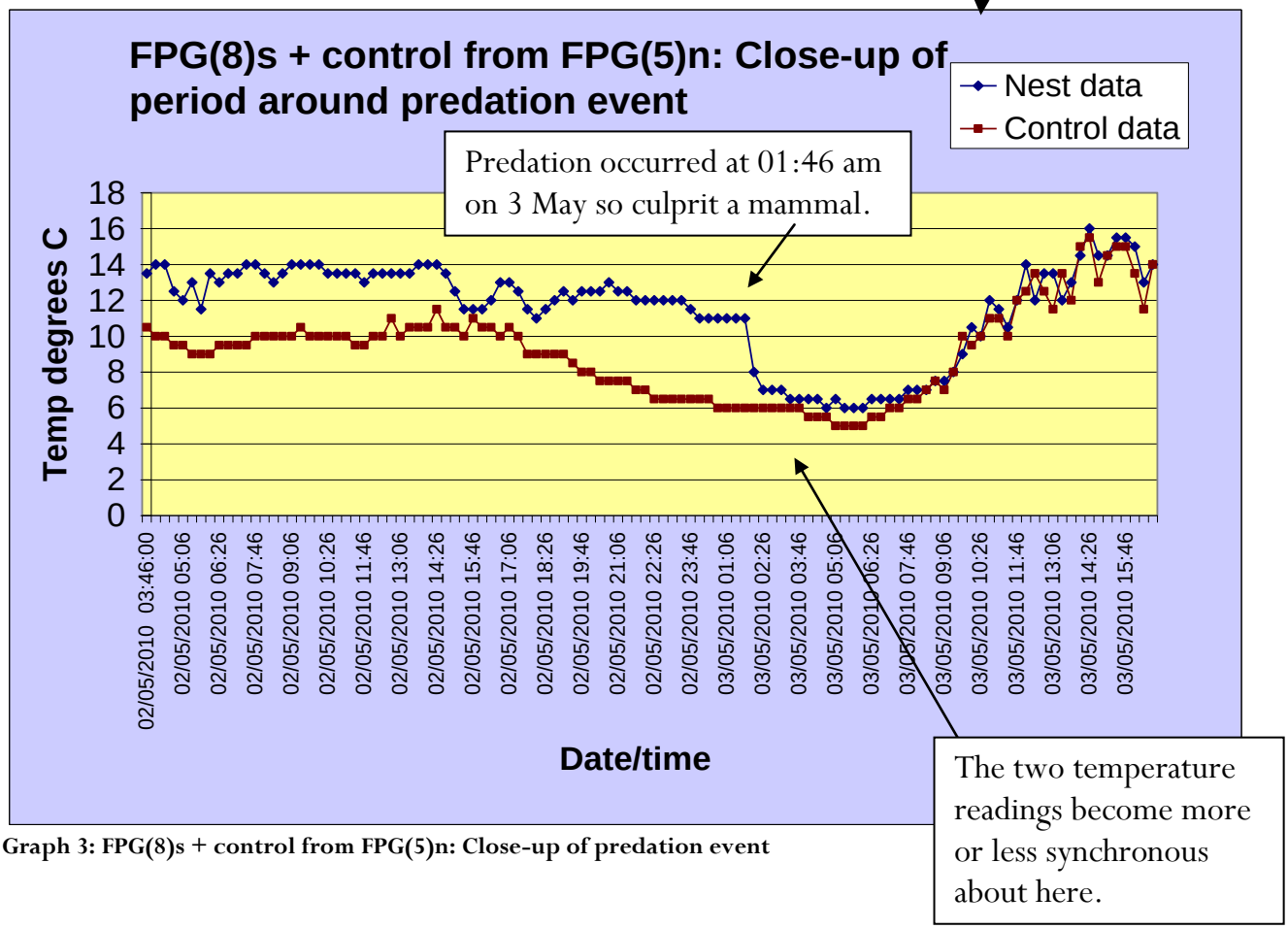
3.4.1.4 Data logger graphs verifying predation at night

The following graphs show the patterns of temperature data for FPG(8) and FPG(9) where egg predation was verified by data loggers. The first graph of each pair shows the data from logger installation to soon after the predation event. This provides a complete history of the temperatures recorded by the logger in the nest and that of the 'control' throughout the monitored incubation period.

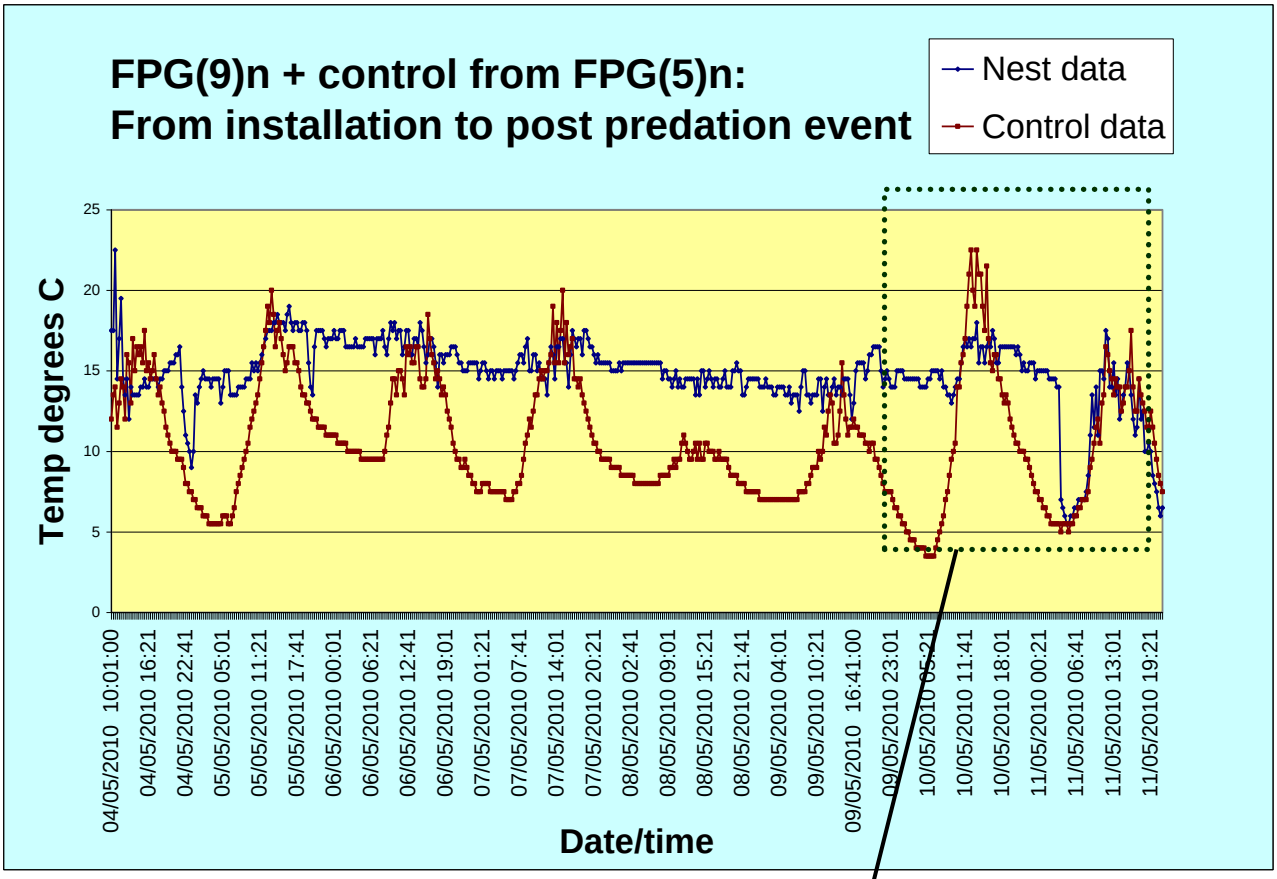
The second graph of each pair provides a 'close-up' of the temperature pattern that occurred from just prior to predation to just after. This is to illustrate the drop in nest temperature that took place when the nest was predated and its subsequent synchronisation with the 'ambient' temperature recorded by the 'control' logger.



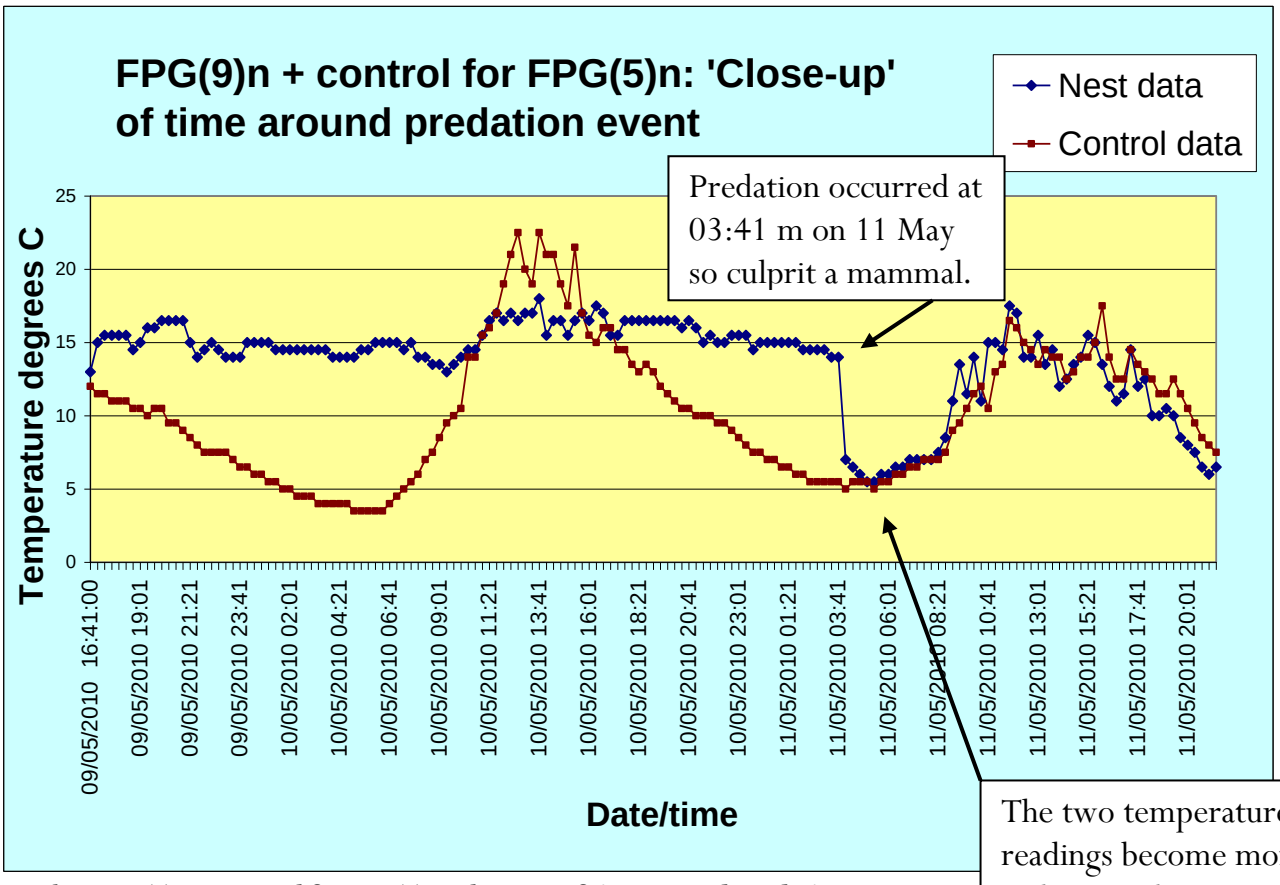
Graph 2: FPG(8)s + control from FPG(5)n: from installation to post predation event



Graph 3: FPG(8)s + control from FPG(5)n: Close-up of predation event



Graph 4: FPG(9)n + control from FPG(5)n: From installation to post predation event



Graph 5: FPG(9)n + control for FPG(5)n: Close-up of time around predation event

3.4.1.5 Successful egg hatching of first attempt clutches

Field observations *confirmed* that 21 eggs hatched from seven nests. This includes one newly hatched chick found dead next to nest FPG(6). Nest FPG(4) also *probably* hatched four eggs but this was not confirmed by field observations. Hatching was suspected in this case due to finding fragments of egg shell in the nest cup. Three nests, 616E(1), FPG(1) and FPG(2), each contained one un-hatched, possibly infertile egg. This left an initial total of 24 potentially viable offspring.

Photo 7: Day old Lapwing chick

3.4.1.6 Chick predation and fledging of first nesting attempts

Of the 25 chicks that hatched, one newly hatched chick was found dead by the nest and 21 were predated. Direct evidence for the cause of predation was recorded for ten of the 21 chicks (table 7).

Date	Details	Nest
29 April	All three chicks of brood killed by Crow	FPG(6)n
29 April	4, also killed by Crows? Crows seen causing a commotion in area where brood present as author leaving site. Brood not seen after this.	FPG(7)n
10 June	2 killed by Crow	FPG(11)n
21 May	One well grown chick killed by Crows	616E(1)?

Table 7: Direct evidence for Lapwing chick predation

The remaining 11chicks were also probably taken by Crows, which seemingly became more adept at finding them as the breeding season progressed. Although there is no direct evidence that other avian predators like Kestrels, Buzzards or Kites took young Lapwings, this cannot be

ruled out as they were often seen over the Common and Kites in particular were seen circling low over the nesting areas on several occasions. However, it is the author's opinion that the majority of chick losses can be attributed to *corvids* and Crows in particular.

Only three chicks survived to fledging: two from nest 616E(2) and one from FPG(2). Having ringed the chicks earlier in the season it was possible to confirm which nests the fledged young came from by catching the chicks, and checking the ring numbers. It is interesting to note that the chick from nest FPG(2) that fledged, had moved about 400m north of the nest, to an area of extensive cover within heathland and close to a number of ponds.

Photo 8: One of the two chicks that fledged from nest 616E(2)

If the number of breeding pairs on the site is taken as 12-13, the breeding productivity figure (i.e. the number of young fledged per breeding pair) for the first egg-laying phase is 0.25-0.23. This is below the figure of 0.6-0.8 believed necessary to maintain population levels. See Para 3.5: Combined results of first and second phase nesting attempts.

3.4.2 Second phase nesting attempts

Field observations located six active second phase nesting attempts. One was in the '616E' gravel area and five were on the FPG area (Maps 14/15: p35/36). On 18 and 27 May data loggers were installed in all the nests except FPG(10) which had been abandoned after only a short period. 'Control' data loggers were positioned outside *all* the nests to maximise the chances of having usable 'control' data after nest hatching/predation. Only two 'controls' were used in the first nesting attempts and in hindsight this was considered insufficient, as five loggers could not be re-found.

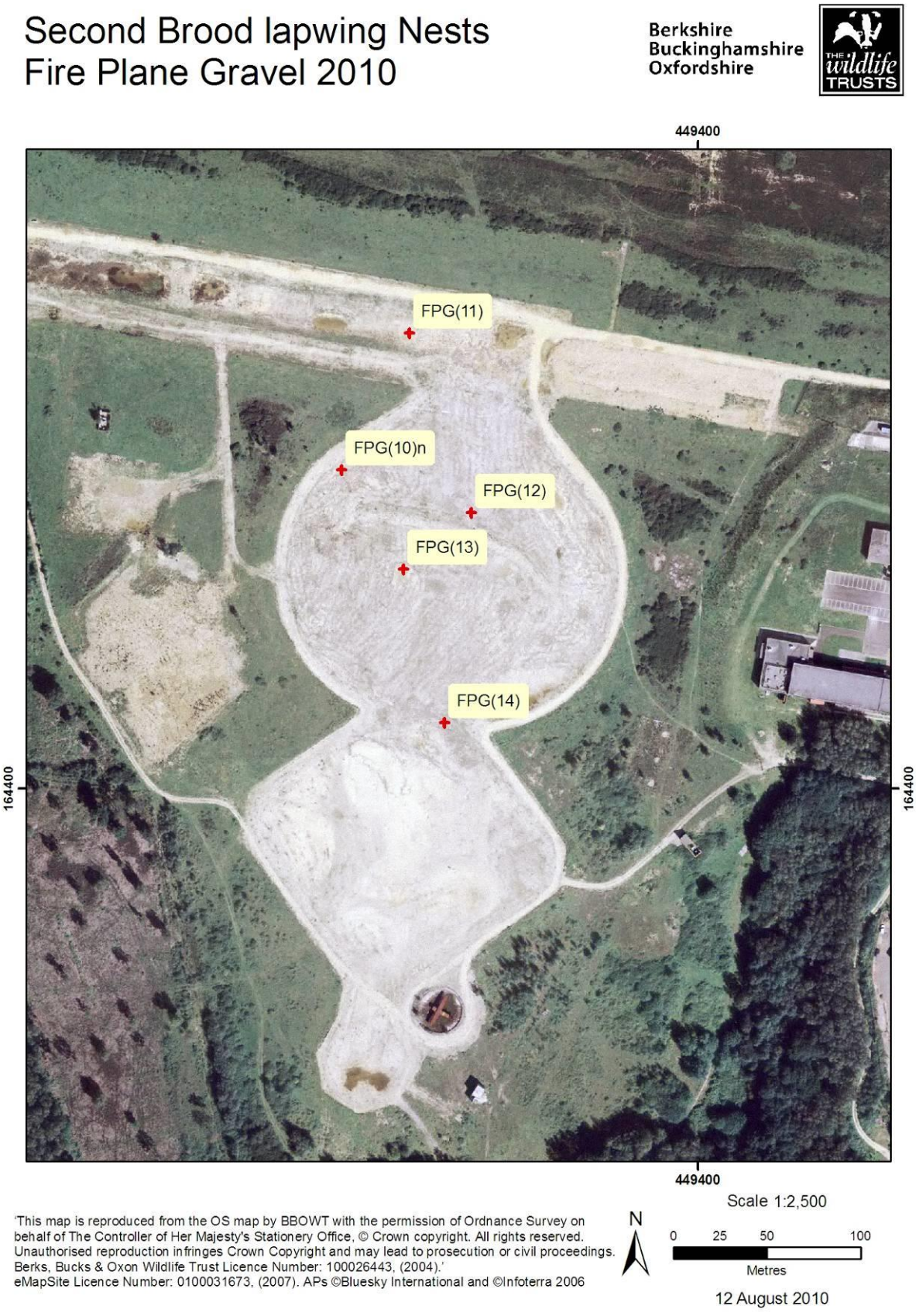
Although it is not possible to be sure which pairs of Lapwings laid replacement clutches it is most likely to be those which lost eggs rather than chicks. It is unusual for pairs to relay having lost chicks but if they do it is usually only if they lose them soon after hatching.

Twenty three eggs were laid, of which 19 were weighed and measured to determine the potential hatch date. Nests FPG(11),(12),(13)and (14) all contained clutches of four eggs, the standard number for Lapwing, while nest 616E(3), contained three. It is not known how many eggs were in nest FPG(10) but as the majority of Lapwings clutches contain four, a notional figure of four has been included in the egg total (table 8).

3.4.2.1 Egg laying dates

The entire egg-laying period for the second phase of nesting attempts was 5-15 May. The incubation period for all nests was 12 May to 11 June. This was a much shorter period than that of the first nesting phase. The earliest pairs to begin egg laying were those at nests FPG(13) and (14) and the latest was at nest 616E(3) but all nests were effectively active within only a few days of each other.

Map 14: Lapwing nest position, 616E gravel, second nesting attempt



Map 15: Lapwing nest positions, FPG area, second nesting attempt

3.4.2.2 Egg predation of second phase nesting attempts

Both clutches of four eggs from nests FPG(12) and FPG(13) were predated. Data loggers installed in each nest confirmed that both were taken at night and therefore a mammal was responsible. The nest of FPG(10) was predated before it was possible to install a data logger. A bird was seen sitting on the nest for only a short period during 8 -11 May. By 18 May the nest had been abandoned and was empty so it is clear that the eggs were taken between 11-18 May.

Nest	Eggs laid	Eggs predated			Infertile eggs	Eggs hatched	Chicks predated	Chicks Fledged
		Night (mammal)	Day (bird)	Unconfirmed cause				
FPG(10)	4?			4?				
FPG(11)	4					4	4	
FPG(12)	4	4						
FPG(13)	4	4						
FPG((14)	4					4	4	
616E(3)	3				1	2	2	
TOTALS	**23**	**8**		**4**	**1**	**10**	**10**	**0**

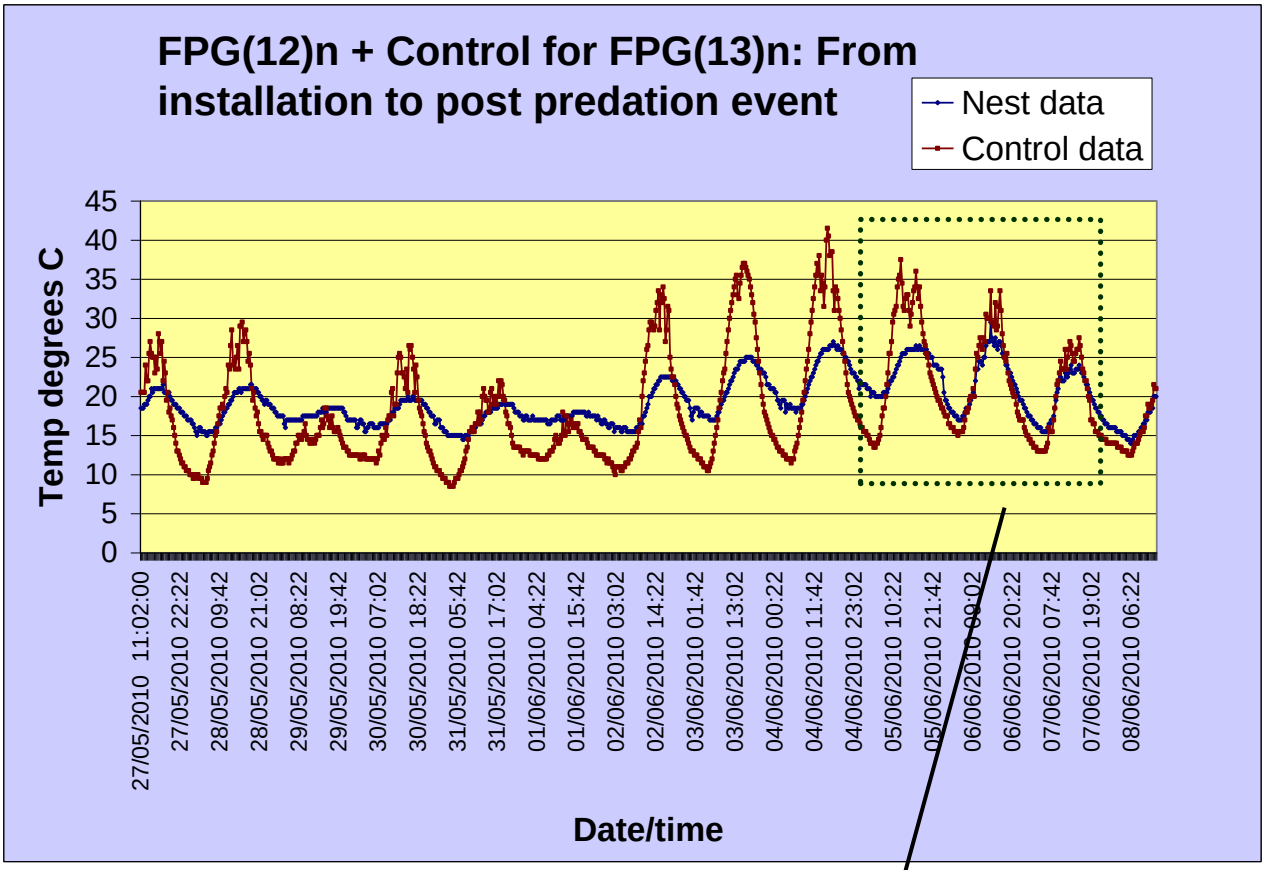
Table 8: Summary table of egg and chick out-comes from second phase nesting attempts

3.4.2.3 Data logger graphs verifying night predation of eggs

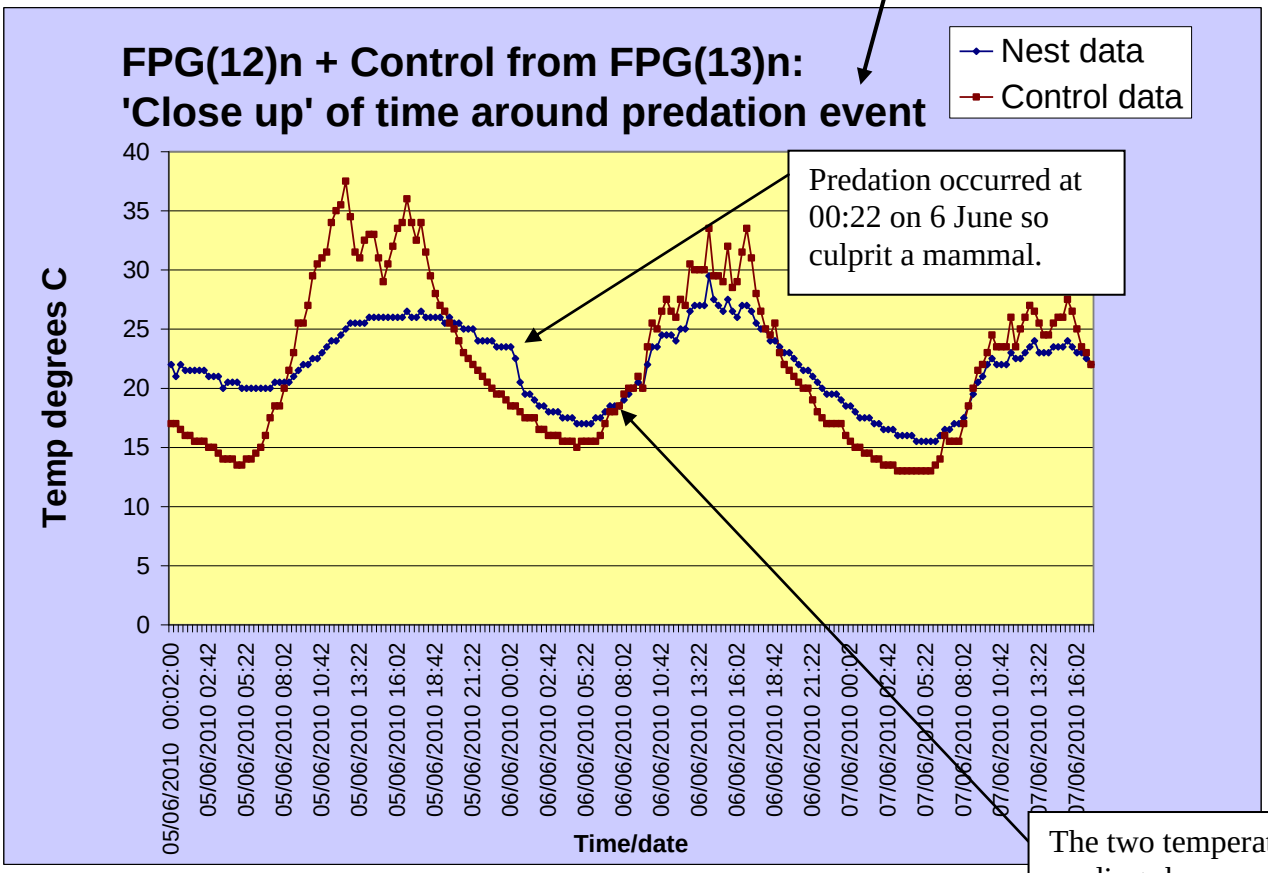
The following graphs show the patterns of temperature data for FPG(12) and FPG(13) where egg predation was verified by data loggers. The first graph of each pair shows the data from logger installation to soon after the predation event had occurred. This provides a complete history of the temperatures recorded by the logger in the nest and that of the 'control' throughout the monitored incubation period.

The second graph of each pair provides a 'close-up' of the temperature patterns that occurred from just prior to predation to just after. This is so that the drop in nest temperature, which took place when the nest was attacked and its subsequent synchronisation with the 'ambient' control temperature, can be seen more clearly.

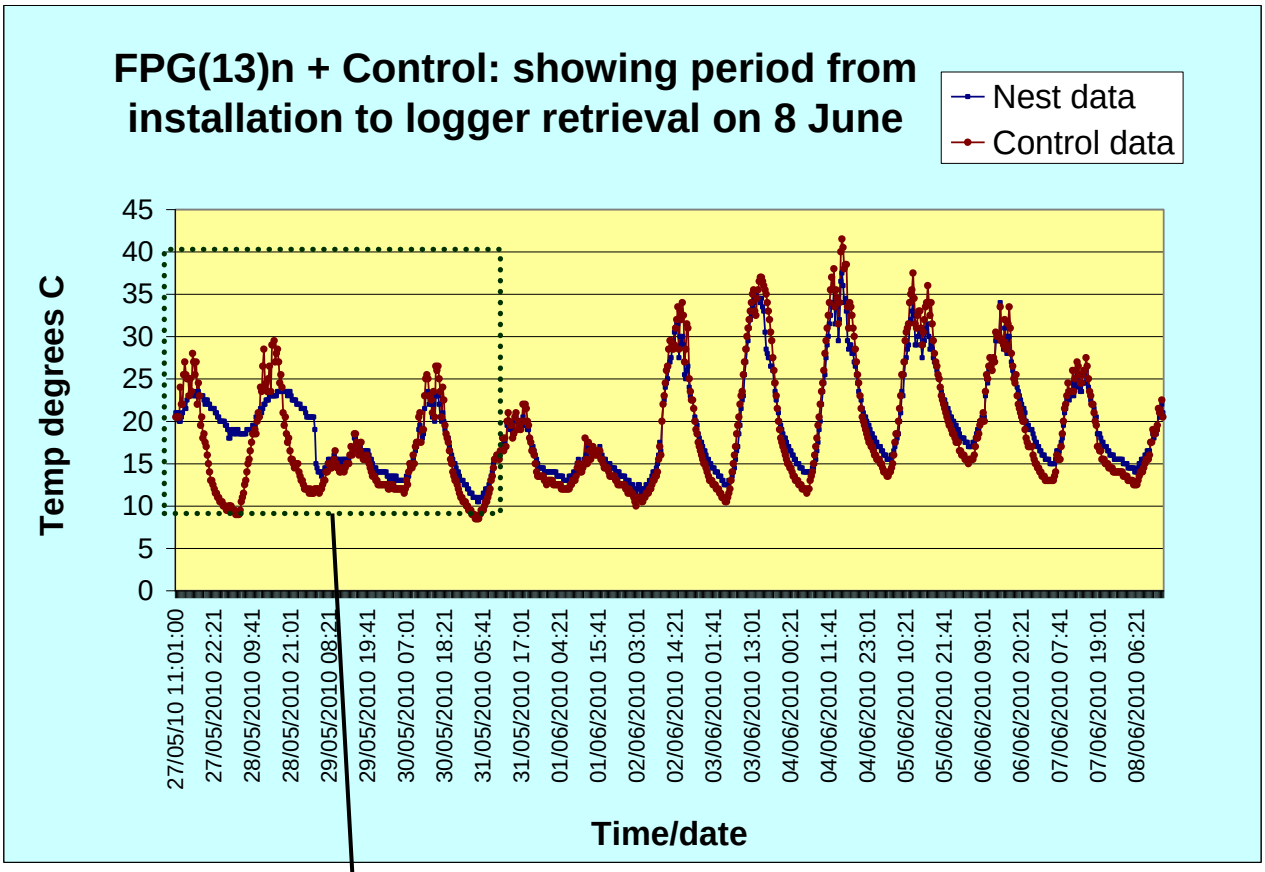
The control for FPG(12) could not be found despite extensive searching, which was surprising given that all the other loggers placed in second attempt nests were successfully recovered. Consequently the control logger from FPG(13) was used instead which confirmed that night predation had occurred at 00:22 hrs.



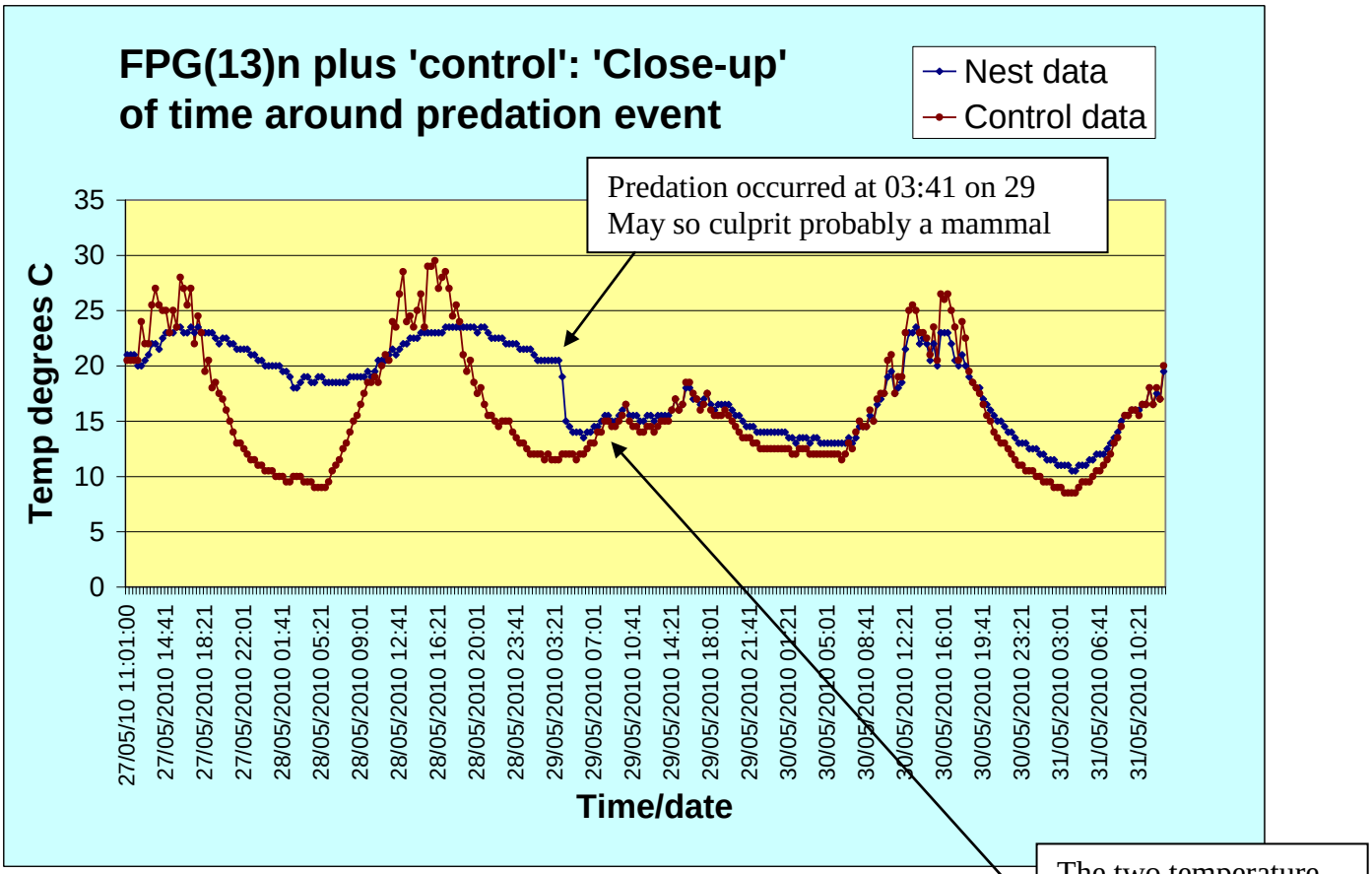
Graph 6: FPG(12)n + control for FPG(13)n: From installation to post predation event



Graph 7: FPG(12)n + control from FPG(13): Close up of time around predation event



Graph 8: FPG(13) + Control; From installation to logger retrieval on 8 June



Graph 9: FPG(13)n + control: Close up of time around predation event

3.4.2.4 Successful egg hatching: second phase nesting attempts

Field observation confirmed that 10 eggs hatched from three nests: Two from 616E(3), and four each from FPG(11) and FPG(14).

3.4.2.5 Chick predation: second phase nesting attempts

Sadly no chicks made it to fledging from any of the second phase nesting attempts. Evidence of the cause of predation is provided by the fate of nest FPG(11): In spite of being situated in a vulnerable position, close to the main path north of the Fireplane gravel, the pair managed to hold out and four chicks hatched on 9 June. They were ringed on 10 June in the morning but at about 18:00 hrs two chicks were taken by Crows! The chicks had all gone by the following morning so it is likely that the Crows had returned and taken the remaining two later in the evening on 10 June.

The clutch in nest FPG(14) apparently shared a similar fate. On 9 June at 10:30 one egg was seen to be hatching and presumably the hatching process continued throughout the day. The following day egg-shell remains in the nest indicated that the clutch had hatched but they were never found. It is not possible to be sure if chick predation occurred at night or during the day. However given that the Crows had by now learnt that Lapwing eggs and young were easy pickings, Crows were probably the culprits in this case too.

The two chicks from nest 616E(3), that hatched on 11 June only lasted a little longer than the other broods. The female was seen brooding them on 12 June and on 14 June they were ringed but not seen again. It is not possible to be sure when predation occurred although as with the previous example daytime Crow predation is suspected.

3.5 Combined results of first and second phase nesting attempts: predation

The following table summarises the egg and chick outcomes for both nesting phases

Nesting attempt	No. nests	Eggs laid	Eggs predated			Infertile eggs	Eggs hatched	Chicks predated	Chicks Fledged
			Night (mammal)	Day (bird)	Unconfirmed cause				
First	12	47	7	1	11	3	25	21	3
Second	6	23	8		4	1	10	10	0
TOTALS	18	70	15	1	15	4	35	31	3

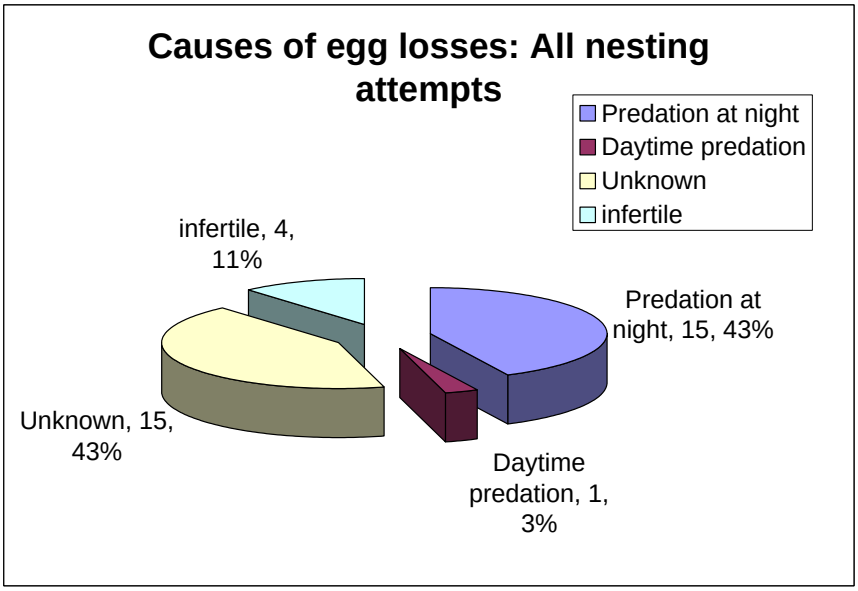
Table 9: Lapwing combined results of all nesting attempts, summary of egg and chick outcomes

3.5.1 Egg Losses

In total thirty-one out of an initial total of 70 eggs were predated. The pie chart shows the % breakdown of causes of egg loss for all nesting attempts.

3.5.1.1 Known causes of egg loss

The causes are known for the loss of 15 eggs: Four did not hatch, possibly due to being infertile. Seven, from first phase nests FPG(8), FPG(9) and eight from second phase nests FPG(12) and FPG(13) were confirmed by logger data to have been taken at night by a mammal, possibly a fox or badger. One egg was taken by a Crow from nest CP(1).



Pie chart 1: Lapwing. Causes of egg losses, all nesting attempts

3.5.1.2 Unknown causes of egg loss

Of the 15 eggs in the unknown category, four were probably taken at night and three possibly so. Four nests account for the 'unknowns': FPG(3), FPG(5), FPG(10) and CP(1). In the case of the FPG nests, this was due to problems with the loggers: The logger for FPG(3) could not be found and although the logger for FPG(5) was found, no data was recorded. The FPG(10) nest was predated and abandoned before it was possible to install a logger.

However, the eggs from FPG(3) were almost certainly taken at night by a mammal; A feather was found by the nest and a dead adult to the south. It has been included in the 'unknown' category because it is conceivable the eggs could have been taken the following morning by Crows.

Even though one egg from nest CP(1) was taken by a Crow, which suggests that the remaining three also were, logger data indicated the possibility that they had been taken at night by a mammal. However, the logger data was inconclusive so the cause has been left as unknown.

It is highly notable that there was no egg losses recorded from any of the three nests in the '616E' area.

3.5.2 Chick predation

A total of 31 chicks were predated, 21 from the first phase nests and 10 from the second phase. Direct evidence for Crows being responsible was recorded for 10 of the chicks. Although predation of the other 20 chicks by other avian predators like Buzzards and Kites cannot be ruled out it is suspected that Crows were also probably responsible for the loss of most if not all of these also.

3.6 Lapwing breeding productivity and chick and nest survival rates

The figures shown in the following table have been used to determine the overall 'success' of the breeding population.

Breeding success indicators	616 area	FPG area	CP area *	**All areas**
Breeding productivity	0.67 (2 from 3? pairs)	0.11 (1 from 9 pairs)	0	**0.25-0.23**
Percentage of chicks surviving to fledging	22.2% (2 from 9 hatched)	3.8% (1 from 26 hatched)	0	**8.6%** (3 from 35 hatched)
Percentage of nests surviving to hatching	100% (3 of 3)	50% (7 of 14)	0	**58.8%** (10 of 18)

Table 10: Lapwing breeding success indicators

* One failed nesting attempt only at the CP area

Breeding productivity: The number of young fledged per pair. The figure for all nesting areas combined of 0.25-0.23 is based on three chicks fledging from a total of 12-13 pairs. This is well short of the figure of 0.6-0.8 per pair believed necessary to maintain population levels. However when the figure is calculated separately for each nesting area the figures show significant disparity. Most notable is the much greater productivity in the '616' area, which achieved a total six times higher than the FPG site.

There are probably a number of reasons for this including the proximity of better cover and food resources for chicks on the '616'area. Understanding the causes for the disparity between sites may provide the key to determining the measures necessary to reduce levels of breeding failure elsewhere on site. See 'Concluding comments' (Para 6).

Percentage of chicks surviving to fledging: In the first phase nesting attempts 12% (three birds) of chicks survived to fledging out of a possible 25 hatched. None of the ten hatched chicks survived to fledging from the second phase nesting attempts so the combined total drops to only 8.6%. As with breeding productivity the greater success of the '616' area is dramatic.

Percentage of nests surviving to hatching: This is the percentage of nests that hatched at least one egg. Nest survival rates for the first and second nesting attempts and for the combined total, are very similar:

First phase attempts = 58% (seven out 12 nests)
Second phase attempts = 50% (three out six nests)
Combined = 58.8% (ten out of 17 nests)

The 100% nest survival on the '616' area is remarkable and ties in with the results for breeding productivity and % of chicks surviving to fledging.

4 Lapwing nest-watch sessions

Timed Lapwing nest watch sessions, totalling over 25 hours observation, were carried out on six nests to attempt to determine the causes and levels of disturbance to incubating birds. All periods when the nest was left unattended were timed and the reason logged. Details were recorded onto a field recording form and included weather conditions, date, time event occurred, duration of event and description of event (Appendix B).

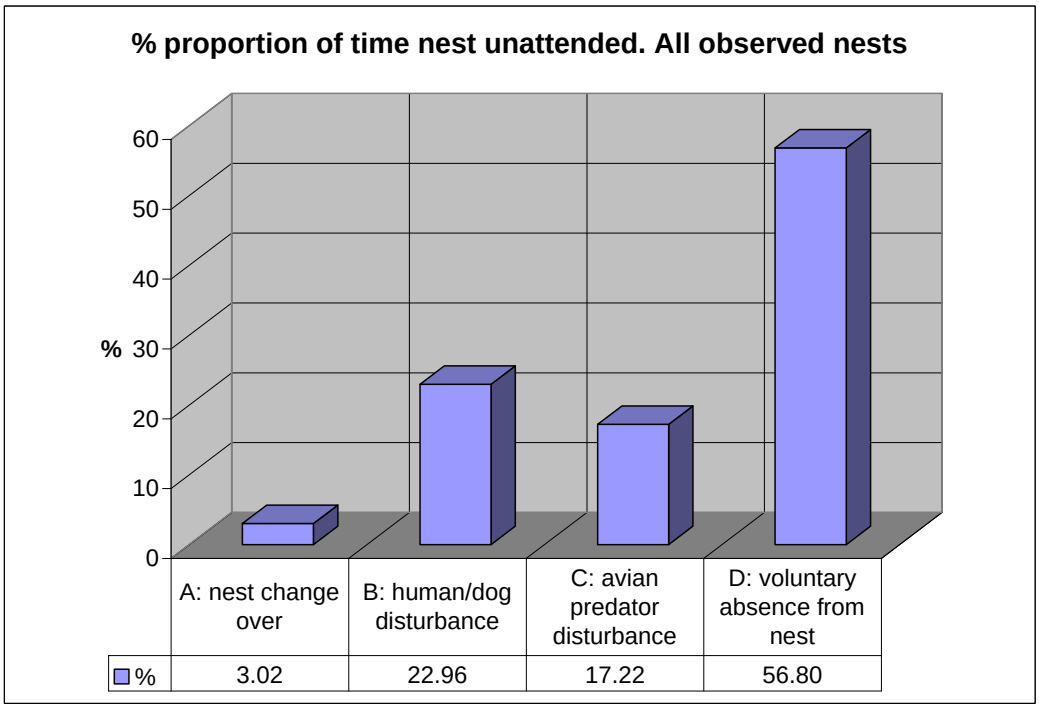
4.1 Results

A total of 25.35 hours of observation time was logged, split between the three nesting areas as shown in table 11 below.

Area	616E	FPG area	CP area
No. of hours	7.5	16.77	1.08
Nests watched	616E(1)	FPG(3),(6),(11) and (12)	CP(1)

Table 11: Lapwing nest-watch sessions, number of hours by area and which nests

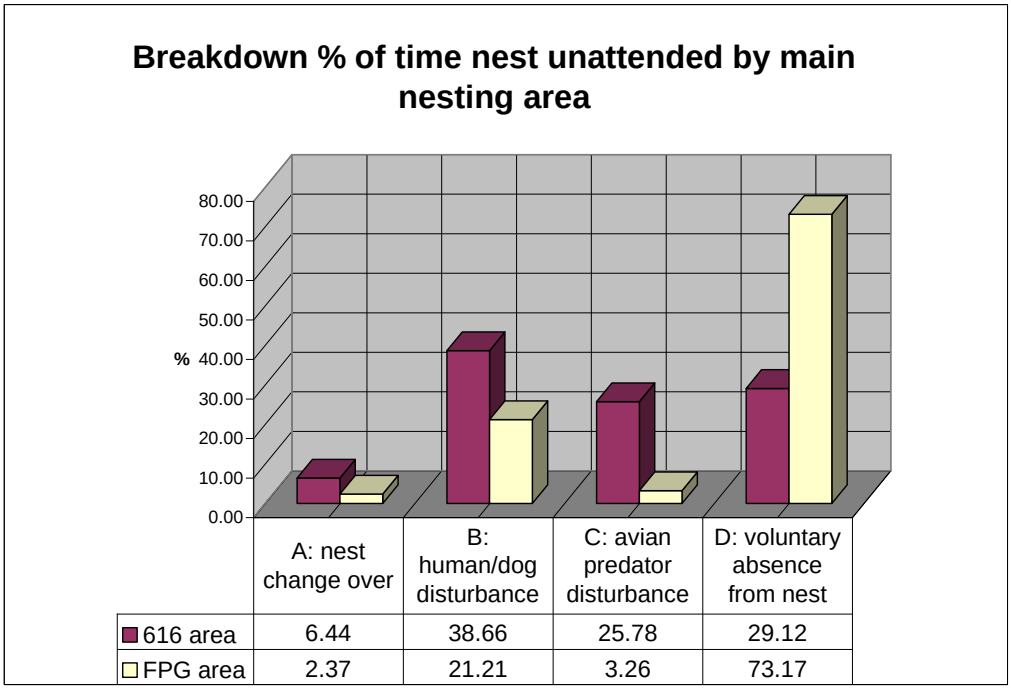
When looking at the combined figures for all areas and all nests the amount of time adult Lapwings were absent from the nest, regardless of cause, amounted to 8.13 hours or 32% of the total observation time. However about 60% of the absence was benign i.e. where the Lapwing had left the nest voluntarily to feed or to allow its mate to take over incubation duties. About 17% of nest absence was attributed to disturbance by avian predators like Crows and Buzzards while the remaining 23% was due to disturbance by humans or dogs (Graph 10).



Graph 10: Lapwing nest watch sessions, % proportion of time nest unattended, all observed nests

4.1.1 Differences between nesting areas

There were some interesting differences between the main nesting areas on the Common (Graph 11). The figures for the '616' gravel area showed a proportionately much higher level of disturbance by both avian and humans/dogs than the Fireplane gravel area. This is unexpected as the '616' area was where fledging success was greatest. Also surprising was the much lower proportion of disturbance caused by avian predators at the FPG area, especially considering that many chicks were predated by Crows there.



Graph 11: Breakdown % of time nest unattended by main nesting area

4.1.2 What types of incidents caused the Lapwings to leave the nest and what did not?

Various types of incident were recorded during the nest-watch sessions that caused the incubating bird to leave the nest. The comments tabled below (Table 12) are taken from the field recording forms and have been edited slightly to remove potentially confusing field abbreviations. Culprits are shown in bold.

Cause of disturbance	Comments
Sparrowhawk	Flew to N of nest. All Lapwing and Golden Plovers in vicinity flushed. Lapwing flew at Hawk and chased it off
Buzzard	Over, possibly delaying female taking over incubation.
Buzzard	Over, bird off nest. Also off nest was bird from 616E(2).
Red Kite and **Buzzard**	Circling high over Bowdown woods and road, preventing bird form returning to nest

Red Kite	Male off nest
Crow	Lapwing on FPG(6) chased off another
Crow	Flew over. Female lurked near nest
Crow	Flew over. Female lurked a few m from nest
Crow	Female appears agitated and flies 50m to S to chase off a group of 3 **Crows**, a group of 2 Crows and then disappears to W of nest. Male out of sight also.
Crow	Egg stolen by **crow**. Pair chase crow off. Other crows around
Crow	Bird already off nest, walking along nest ridge, due to proximity of **Crow**. Crow got too close and Lapwing took off to mob it. A 2nd Lapwing joined in and eventually chased it away.
Golden Plover	Lapwing flew off 20m to S of nest, chased off a Golden Plover then returned to nest!
Birdwatchers	Spooked male from returning to nest (was almost sitting)
Cyclist	Female disturbed off nest, bird landed c50m to W
Jogger	Female disturbed off nest (but not by dog walker)
Walker	Female frightened off nest, waited *c5* m S of nest
Walker	Female spooked off nest
Walker	Spooked Female off nest
Walking party	Male ran off nest Disturbed by large **walking party**
Dog	No bird on nest. **Dog** nearby
Dog walker and **walker**	Walked passed nest. Female wanders off briefly to W of nest but unhurried and doesn't seem too anxious

Table 12: Types of incident causing Lapwings to leave the nest

There were a number of recorded incidents which might have been expected to disturb an incubating bird but didn't and are perhaps a testament to the Lapwings resilience and ability to tolerate a certain amount of disturbance (Table 13).

Potential culprit	**Comment**
Magpie	Over, mobbed 2 Lapwing but Female sat tight on nest.
Crow	Over, mobbed by male Lapwing, fem sat tight.
Crow	Male alarm calls and chases off two **Crows**. Female is alert but remains sitting
Crow	Low over nest, female sat tight, Ringed Plover nearby ran off
Crow	Male chases off several **Crows**, female remains sitting and seems unbothered
Kestrel	Flew over gravel, chased off by another Lapwing to N of nesting female. which sat tight
Dog	Very close to nest but female sat tight, male mobbed dog
Dog	Ran into red zone, female sat tight
Helicopter	Flew over twice, approx 50m high. Golden Plover flock flushed then re-landed both times (20 secs x2). Lapwing remained on nest, as did Little Ringed Plover to S of it

Police helicopter	Low overhead, fem sat tight
Plane	Flying overhead (low-ish), Lapwing undisturbed
Walker and **cyclist**	Pass by. Female raises head but stays put. Male 30m away keeping watch
Cyclists	Two go passed, female appears undisturbed
Cyclists and **dog**	Two cyclists plus1 dog go passed, female appears undisturbed
Cyclists	Rode by but bird not disturbed

Table 13: Types of incident not causing Lapwings to leave nest

4.1.3 Was there any correlation between periods of nest absence and data from the data loggers?

The amount of time for each nest absence ranged from 5 seconds-35 minutes. Because the loggers only record the temperature every ten minutes in the high capacity versions and 20 minutes in the standard capacity model, only nest absences in excess of ten minutes were selected to compare with the logger data.

Four loggers were successfully recovered from six of the observed nests. It was therefore possible to compare the data from these with the nest observations. However no temperature deviation was detectable that could be attributed to any of the nest absences, regardless of cause.

The implication of this is that the periods of nest absence recorded were insufficient to cause any noticeable temperature change in the nest and therefore apparently posed no threat to the eggs in terms of either fatal chilling or over-heating. However if the nest absence had occurred during unseasonably cold, wet conditions the implications for the eggs would be potentially more serious.

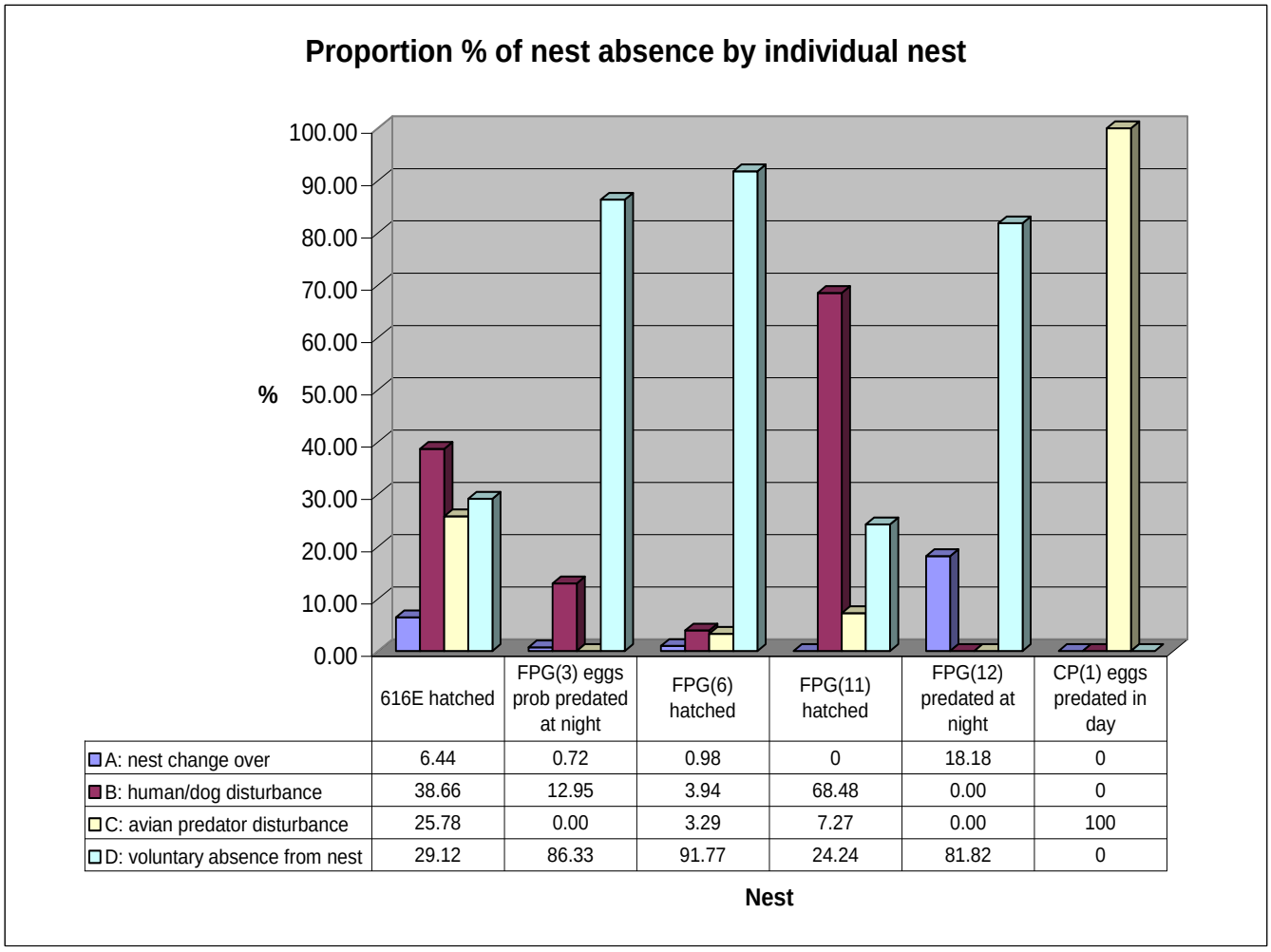
Data loggers from two of the six nests were not recovered so it was not possible to compare nests absences with temperature data for these. This included periods of 50 and 57 minutes from nest FPG(6) which may have been long enough to register on the temperature readings.

4.1.4 Was there any correlation between the nest watch data and the hatching success of each nest?

Graph 12 shows the proportions in percentages of the different types of nest absence for each individual nest. Except perhaps with nest CP(1) there appears to be no obvious connection between the levels and causes of disturbance and whether or not the chicks hatched successfully.

For example, the clutches from FPG(6) and FPG(11) both successfully hatched but the proportion of disturbance by humans and/or dogs to the former nest was only about 4% whereas it was about 69% for the latter.

The extreme result shown in the graph for nest CP(1) is due to there only being 65 minutes of observation time, all of which was recorded as nest absence due to Crow harassment and finally resulted in the nest being raided. Although this skews the results shown on the graph this is perhaps indicative of the impact the high numbers of Crows are having on Lapwing breeding success on this part of the Common.



	616E hatched	FPG(3) eggs prob predated at night	FPG(6) hatched	FPG(11) hatched	FPG(12) predated at night	CP(1) eggs predated in day
A: nest change over	6.44	0.72	0.98	0	18.18	0
B: human/dog disturbance	38.66	12.95	3.94	68.48	0.00	0
C: avian predator disturbance	25.78	0.00	3.29	7.27	0.00	100
D: voluntary absence from nest	29.12	86.33	91.77	24.24	81.82	0

Graph 12: Proportion % of nest absence by individual nest

4.1.5 Comments

The nest-watch data, although included on a trial basis, has provided a useful insight into the levels and causes of disturbance and the implications of this on Lapwing breeding success. In particular the differences in disturbance levels between different areas are very marked and may merit further investigation.

The nest watch sessions were carried out by the seasonal wardens on an ad hoc basis to fit around their main Wardening duties. If this exercise is repeated it would be beneficial to have a more structured regime whereby the chosen nests are watched for longer periods, possibly at least two hours, perhaps with the wardens working in shifts. It would also be helpful to time the sessions so that each part of the day is covered.

5 Ringed Plover and Little Ringed Plover nest monitoring

In addition to the above species being included in the territory mapping survey (Para 2.3), each pair was monitored by field observation and ringing to determine breeding success. Field observation involved recording the presence or absence of incubating adults, newly hatched broods, the whereabouts of existing broods and the number and size of young in each brood. Chicks were ringed as soon as possible after hatching. The progress and outcome of each nest is detailed in paragraphs 5.2 and 5.3 below and the approximate nest locations are shown on maps 16 and 17 (pages 65/66).

Both species fared quite well with breeding productivity of 1.5 for Ringed Plover and 1.75 for Little Ringed Plover. The relative success of these species, compared to Lapwing, may in part be due to their less conspicuous, secretive nesting behaviour which makes their chicks less prone to predation.

Interestingly, the two pairs Little Ringed Plovers that nested on the '616' gravel areas, achieved much greater breeding success than the two or three pairs that did so on the Fireplane gravel area. This mirrors the situation for Lapwing where two pairs that nested on the 616E gravel, fledged two chicks, while the remaining 10 pairs, mostly situated on the Fireplane gravel, only fledged one between them.

5.1 Possible cause for disparity in breeding success on different sites

On the FPG area, south of a long gravel bund, breeding success for both species was poor, despite at least four nesting attempts, and resulted in only one Little Ringed Plover chick fledging. The two species are closely related and have similar breeding strategies so when present together are effectively in competition for territories and nest sites. The males are particularly aggressive and were often seen chasing, and displaying to one another in what is termed *intraspecific* aggression. These encounters can lead to actual fighting between males attempting to secure territories. During the survey a dead adult Little Ringed Plover was found on the FPG area which may have been involved in one of these fights.

It was notable that the Little Ringed Plover nests which finally got underway on this area only did so much later than the nests on the '616' gravels where no Ringed Plovers were present. Even the second pair of Ringed plover that attempted to nest on the FPG area was ultimately unsuccessful. It seems likely that the constant in-fighting was so intense between the two species that it prevented them from settling down to nest. This together with disturbance from visitors, in particular to two Little Ringed Plover nests that were very close to the footpath, and predation, has contributed to the relatively poor breeding success on this part of the site.

Species	'616' area	FPG area	Total
Ringed Plover	None present	1.5 (3 from 2 pairs	1.5
Little Ringed Plover	3 (6 from 2 pairs)	0.33 (1 from 3 pairs)	0.86-1 (7 From 6-7 pairs)

Table 14: Breeding productivity of Ringed and Little Ringed Plover

5.2 Ringed Plover

At least three nesting attempts were recorded all of which were on the Fireplane gravel area and involved two or possibly three pairs. Breeding productivity, based on two pairs nesting, equates to 1.5 chicks fledged per pair.

Nest FPG1RP: The first pair was already on site by the early date of 7 March and by 8 April was incubating a clutch of four eggs in a nest on the northern side of the Fireplane gravel area. The eggs hatched on 30 April and the four chicks were ringed later that day. The brood remained intact until about 8 May when only three could be found, one presumably having been predated. However the three remaining chicks persisted and on 28 May one was seen to take a short flight indicating that they were all near to full fledging. The three, fully fledged chicks were last seen on 4 June.

Nests FPG2RP and FPG3RP: From 25 May onwards two pairs were seen displaying and 'scraping' i.e. sitting on the ground and scraping a shallow depression with the under-body to create a potential nest. Birds apparently sitting on two nests were noted on 27 May and several other dates thereafter. One nest was not far from the earlier nest site and was probably occupied by the parents of the original brood and the second nest was to the south of a long gravel mound that runs east-west across the Fireplane gravel area. However both attempts failed and by 14 June the nest sites were deserted.

Photo 9: The four newly hatched Ringed Plover chicks from FPG1RP

5.3 Little Ringed Plover

This species had a good breeding season especially compared to Lapwing. At least five nesting attempts were made by four or five pairs, three of which successfully fledged a total of seven chicks between them. Breeding productivity i.e. the number of chicks fledged per pair, assuming four breeding pairs is 1.75. The maximum number of territorial pairs estimated from results of the territory mapping survey was seven. Even if this number is used to calculate the productivity the result is still a very reasonable 1 chick fledged per pair.

a) **Nest 616(E)1LP:** First seen sitting on a nest, on gravel east of building 616 on 20 April. When the nest was checked on 7 May, four eggs were present and recorded as 'warm'. By 17 May they had all hatched. The chicks were ringed on 28 May and by 10 June were capable of flying. Amazingly all four are believed to have fledged and were still present until at least 17 June.

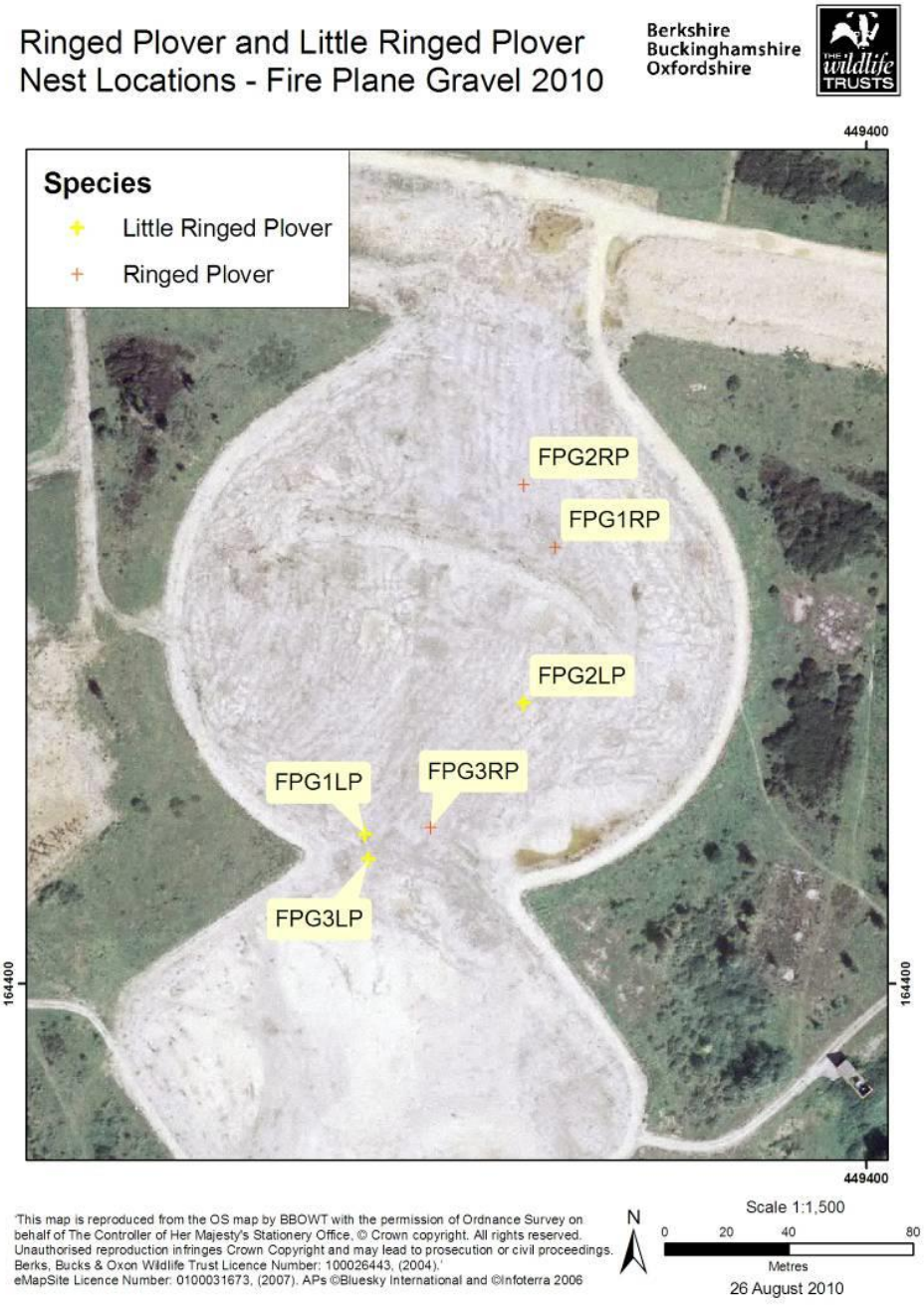
Photo 10: Little Ringed Plover chick from nest 616(E)1LP

Nest 616(W)1LP: First seen sitting on a nest on the gravel west of the Control Tower car park (616W) on 4 May. By 12 May two newly hatched chicks were seen and on the following day there were four which were also seen on 15 May. However by 18 May two had disappeared, presumably having been predated. The remaining two chicks were ringed on 26 May both of which are believed to have fledged. They were seen on several further dates in the vicinity of the nest up to 9 June.

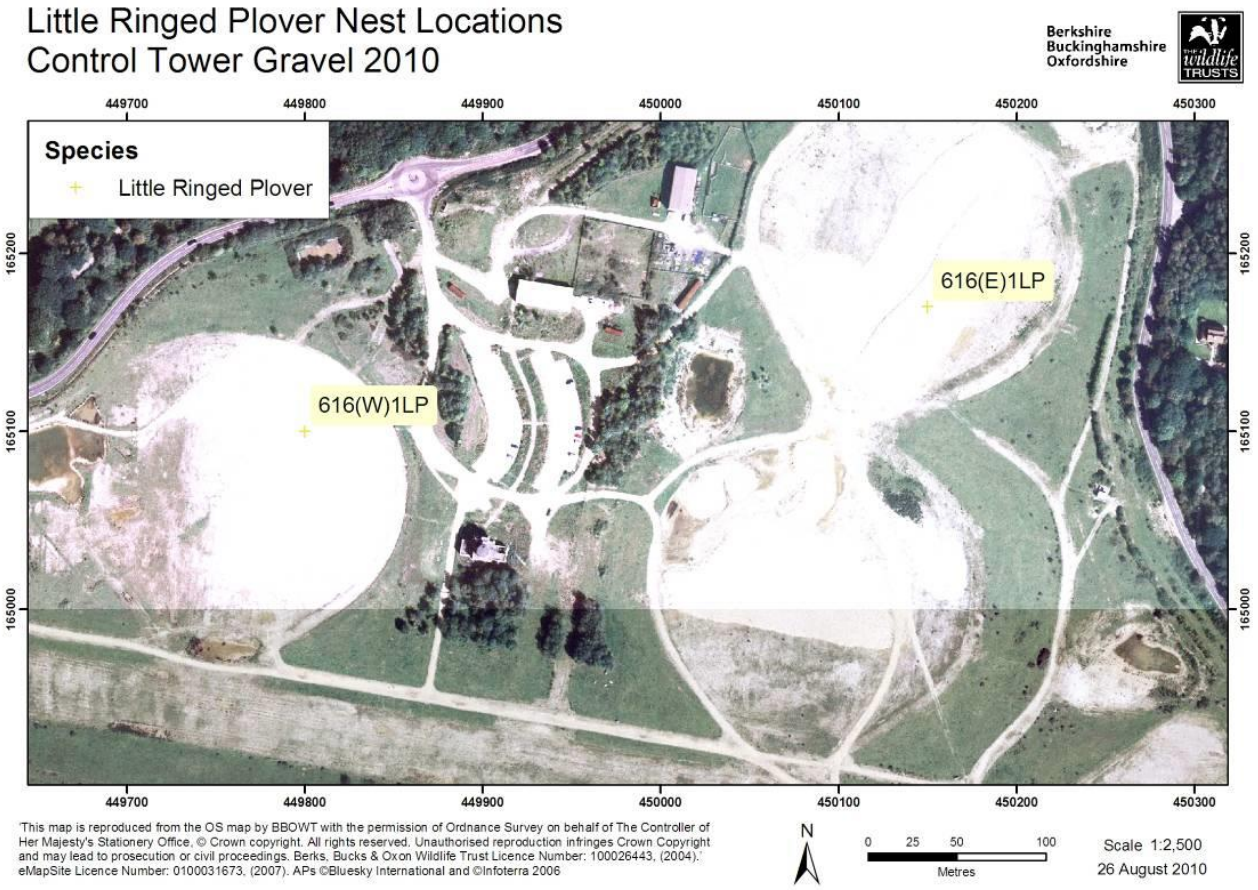
Nest FPG1LP: From 18 May a pair was in territory near the intersection of the circular and diamond shaped sections of gravel on the Fireplane gravel area (FPGs). From 24-26 May a bird was apparently sitting on a nest only 10-15m from the main path. On 27 May the nest was checked and four 'warm' eggs were recorded. By 4 June the nest was deserted and the eggs had gone.

Nest FPG2LP: At about the same time a different pair to those mentioned above was nesting about 60m to the NE. From 25 May-10 June a bird was seen sitting on the nest. By 13 June four chicks had hatched, three of which were ringed. The fourth was found with a serious neck injury, presumably having been attacked by an avian predator of some kind, and had to be despatched. Only one chick is believed to have fledged from this brood and this was last seen on 30 June.

Nest FPG3LP: What was possibly the pair that had failed earlier at nest **FPG2LP** (above), was seen in a slightly different position, apparently making a second nesting attempt. On 9 June a bird was seen sitting on a nest and on 10 June the pair was seen in the vicinity of the site. However the attempt was very short lived as the nest site was deserted by 14 June.



Map 16: Ringed Plover and Little Ringed Plover nest locations- Fireplane gravel, 2010



Map 17: Little Ringed Plover nest locations, '616' gravels, 2010

6 Concluding comments and recommendations

6.1 Lapwing breeding population: Current status and prospects

To be read with reference to Para 3.5, 'Combined results of first and second phase nesting attempts' and Para 3.6, 'Lapwing breeding productivity and chick and nest survival rates'.

The overall results of the survey show that the Greenham and Crookham Common Lapwing population had a very poor breeding season in 2010. The low breeding productivity of 0.25-0.23 chicks fledged per pair is well short of the figure of 0.6-0.8 believed necessary to maintain population levels.

Even though the nest survival percentage of 58.8% would seem to be reasonable the low chick survival percentage of 8.6% also indicates that the population is not viable. Studies have shown that even if as many as 23% of Lapwing chicks survive to fledging, the population is likely to remain stable *only* if about 50% of nests survive to hatching. Although, effectively, the higher the % of nests surviving to hatching, the *lower* the % of chicks surviving to fledging needs to be in order for a population to persist, it has been established that if chick survival falls below about 17%, the population is predicted to decline irrespective of the % of nest survival (Macdonald and Bolton 2008a). With only 8.6% of chicks surviving, the Greenham population clearly falls into the latter category even though 58.8% of nests survived to hatching.

Given the above it seems that the Greenham and Crookham Lapwing population is destined to decline. It is possible that it is hanging on by a thread in spite of low productivity due to immigration of adults from elsewhere that are 'plugging the gaps' caused by natural losses. However this may not a sustainable situation especially as Lapwings, which are currently Red listed, are still declining at the National and European level (BTO birdfacts webpage).

In order to establish that 2010 was not just a particularly poor year it is necessary to continue monitoring breeding success for several seasons. This is important as Lapwings don't need to breed successfully every year to maintain a more or less stable population, as long as they produce sufficient young in the long term.

In real terms, for the Greenham and Crookham population to be sustainable, and if the number of pairs remains around twelve or so, seven or eight chicks need to survive to fledging each year, or on average over a number of years.

6.2 Suggested reasons for low productivity: Discussion

6.2.1 Predation

With nearly half of all eggs laid and 31 out of 34 chicks lost, predation is clearly a major factor. The main culprits of egg losses are believed to mammals at night, either Foxes or Badgers while

chick losses are mostly attributed to Crows. However the high levels of predation are probably exacerbated by a number of other important *hidden* factors such as the vulnerability of nesting areas to predation due to the lack of cover, insufficient food supply and cover for chicks and disturbance by visitors. These are discussed below:

6.2.2 Vulnerability of nesting sites

A study looking at Lapwing reproductive performance on marginal upland and arable habitats (Chamberlain & Crick 2003) found that grazed grass had higher failure rates and lower clutch sizes than un-grazed grass. Arguably the habitat on which Lapwings nest on Greenham could be likened to marginal upland habitat, in terms of the sparse vegetation, and may partly explain failures at the nesting stage. However, one study concluded that chick mortality is the main determinant of poor Lapwing productivity and therefore of population decline (Sharpe et al, 2008). Consequently the level of egg losses on Greenham Common may less important than chick predation especially considering that over half of nests survived to hatching.

6.2.3 Low food availability due to lack of permanent wet features and cover for chicks

Ideally, to obtain sufficient food, chicks need permanent wet features around which to feed as well as cover in which to hide. Little rain fell during spring 2010 so many of the pools became dry. Evidence of poor numbers of invertebrates is provided by very low catches during *Coleoptera* (Beetles) and *Hemiptera* (True bugs) surveys carried out in early summer (L Garvey pers.com). Low food availability can result in higher predation, as chicks, which may be in poor condition, have to travel further to find food, leaving them more vulnerable, especially where there is insufficient cover (Eglington 2010). The lack of cover is compounded by the current high levels of grazing on the Common. Easing the grazing pressure in key areas adjacent to Lapwing nesting sites is recommended. The presence of extensive amounts of New Zealand Pygmyweed (*Crassula helmsii*) around many of the ponds may be exacerbating the apparent low food availability by reducing the amount of bare mud available to foraging chicks. It may also be directly reducing the numbers of invertebrates by changing PH and Oxygen levels in the water (Global invasive species database).

6.2.4 Disturbance: a contributory factor

There is no doubt, at least anecdotally that the levels of disturbance have been noticeably reduced by the methods implemented by BBOWT, including the presence of the seasonal wardens, signage, publicity etc. However it is likely that the present levels of disturbance are still compounding the habitat deficiency and low food availability factors by hindering chicks getting to, and staying in, areas that provide the best available food resources and sufficient cover.

6.2.5 Relative success of different areas on the Common

Lapwings that nested in the 616 area were much more successful than elsewhere (Table 10). Two chicks fledged from three nesting attempts on this area while only one chick fledged from 14 nesting attempts on the FPG site. The reasons for this may possibly relate to better food resources for the chicks, as a result of the ponds remaining wet for longer than elsewhere and the close proximity of cover to the nesting area.

An indication that the FPG area lacked sufficient food resources and cover was that the only chick to fledge from this area had moved about 400m north of the nest, to an area of much more extensive cover within the heathland Lozenges and close to a number of ponds.

Conversely, data from the nest watch sessions indicated that Lapwings in the 616 area were subject to a greater level of disturbance than elsewhere, especially by avian predators, the reasons for which is uncertain and require further investigation.

Little Ringed Plovers also had much greater breeding success on the 616 areas than elsewhere but this may be partly due to the high levels of aggression between this species and Ringed Plover which prevented birds settling into territories and seeing through nesting attempts to hatching.

There was the only one known nesting attempt at the Crookham Pools area where, in previous years several pairs usually attempt to breed. This is possibly partly due to the overgrowth of birch scrub as Lapwings prefer short vegetation on which to nest. Also large numbers of Crows and other *corvids* such as Jackdaws (30-40) are almost constantly present and pose a real threat to ground nesting birds in general. As this has been a popular area for dog walkers, visitor disturbance is probably also compounding the above issues and hindering breeding attempts further.

6.3 Summary of key points

- Lapwing breeding success was very poor in 2010. The results indicate that the population will decline if the current level of failure continues.

- Predation levels were very high in 2010 but marginal habitat quality, low food availability and disturbance are believed to be important compounding factors.

- There was strong disparity of breeding success on different areas of the Common.

- On the '616' area a small number of nests were relatively successful while on the FPG area there were many nesting attempts but very low success. On the CP area there was only one, failed nesting attempt.

- There is a lack of sufficient, disturbance free cover, for developing chicks.

- The lack of low cover (not scrub) on the gravel based nesting areas is possibly leading to greater vulnerability of nests to predation.

- The lack of permanent water features, especially during 2010 which was very dry, may have led to poor food resources for chicks.

- There is evidence from surveys of *Coleoptera* and *Hermiptera* during summer 2010 that numbers of invertebrates and therefore food resources for chicks were very low.

- New Zealand Pygmyweed (*Crassula helmsii*) may be exacerbating the apparent low food availability around ponds by reducing the amount of bare mud available to foraging chicks. It may also be directly reducing the numbers of invertebrates by changing PH and Oxygen levels in the water.

- At Crookham pools overgrowth of birch scrub is possibly preventing more nesting attempts. High numbers of *corvids* present on this area is probably also inhibiting breeding attempts.

- Disturbance from visitors, particularly in the FPG area, is likely to be inhibiting the movement of chicks to and from the best areas of feeding and cover.

7 Recommendations

- Continue with territory mapping survey, at least for the ground nesting species surveyed in 2010, if not for all species.

- Continue with Lapwing nest monitoring, using data loggers and other methods to establish if the low productivity of 2010 is normal for the site or simply the result of a poor year.

- Continue with Ringed Plover and Little Ringed Plover nest monitoring.

- Remove trees near to Lapwing nesting areas used by Crows as either nesting sites or vantage points for looking for nests and young.

- Improve the habitat for nesting Lapwings and other Plovers by taking action to reduce overgrown scrub, mainly birch, particularly at the Crookham pools in the area to the west of the main pool where larger numbers of birds have previously nested but also the FPG area which is starting to scrub over at the southern end.

- Investigate Lapwing presence in immediate vicinity of Greenham and Crookham Commons to establish strength of local population and compare breeding success. If practical carry out monitoring of nests using the same methods as on Greenham and Crookham Common.

- Improve enforcement of zoning restrictions of the lozenges, particularly just north of the Fireplane gravel area. As well as benefiting ground nesting species like Dartford Warblers and Skylarks the extent of cover and potential food resources provided by ponds within the heath and on the runway is probably important for Lapwing broods.

- Continue with and build on successes and effectiveness of Seasonal warden work including zoning policies, improving signage and site interpretation for visitors. Note that this is covered more thoroughly in the Seasonal Wardens report for 2010 (Finka, L 2010).

- Concentrate on reducing chick losses, rather than night time egg predation, which is more difficult, by addressing the habitat and disturbance issues, as chick mortality is believed to be the main driver of poor breeding success.

- Investigate the possibility of creating or modifying existing water features to provide more permanent and reliable food resources for Lapwing chicks.

- Take action to control the New Zealand Pygmyweed (*Crassula helmsii*) which has, in some cases formed dense mats around many of the ponds on site and may be contributing to low food availability for chicks.

The following are suggested for consideration

- Continue the Lapwing nest-watch sessions to evaluate nest disturbance using more structured methodology to improve the reliability of the data.

- Implement a Lapwing chick colour ringing scheme, in collaboration with the Newbury Ringing Group, to attempt to determine the outcome of each brood in detail and to see if any fledged young return to the site in subsequent years to breed.

- Consider investigating if sufficient food resources are available for Lapwing chicks by carrying out surveys to establish invertebrate biomass together with chick pecking rates and monitoring the chick condition as they develop.

- Carry out a breeding productivity survey of Skylarks, in addition to the territory mapping, but over a sampled area rather than the whole site, to investigate their apparent poor breeding success.

- Consider reducing grazing levels in areas adjacent to Lapwing nesting areas to provide more cover for developing chicks. Ideally grazing in these areas would be suspended from when egg laying begins, approximately mid March, until about mid June when any surviving chicks have successfully fledged.

- Consider creating some kind of physical barrier such as a low gravel bund around the Fireplane gravel area which would deter visitor disturbance on the 'red zone'. Place signs at frequent intervals along this bund.

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Appendix A: Table of territory mapping visit dates and section coverage

Table of visit dates, times and section coverage

Visit	Date	Sections covered	Species surveyed	Times		Hrs (decimal)	Total hours per complete visit
				From	To		
1	08/03/2010	Crookham Common, Birch Coppice, Martindale Heath and Bishops Green	Woodlark (1)	07:47	12:55	5.00	10.50
	17/03/2010	Greenham Common (Western half of site)		06:40	12:10	5.50	
2	14/04/2010	Bishops Green heath	Ringed Plover Little Ringed Plover Redshank Skylark Woodlark (2) Stonechat Dartford Warbler Meadow Pipit	06:27	06:57	0.50	14.84
	14/04/2010	Martindale heath		07:03	07:18	0.25	
	14/04/2010	Birch Coppice		07:42	08:17	0.58	
	14/04/2010	Crookham pools, extreme east of comp 16 and comps 8a,b and c		08:33	11:23	2.83	
	14/04/2010	Bowdown Woods		12:13	12:33	0.33	
	15/04/2010	Western Heath areas		06:20	09:05	2.75	
	15/04/2010	Fire Plane gravel		09:05	10:35	1.50	
	15/04/2010	Western Lozenges, comp 15		10:35	12:50	2.25	
	16/04/2010	Control Tower gravel areas		06:54	08:24	1.50	
	16/04/2010	Eastern Lozenges, comps 13, 8c		09:25	12:00	2.35	
3	10/05/2010	Bishops Green heath	Ringed Plover Little Ringed Plover Redshank Skylark Woodlark (3) Stonechat Dartford Warbler	10:20	11:00	0.67	14.67
	10/05/2010	Birch Coppice		11:15	11:47	0.50	
	13/05/2010	Crookham pools, extreme east of comp 16 and comps 13, 8a,b and c		06:35	10:40	3.08	
	13/05/2010	Eastern Lozenges and comp 8c		11:10	13:15	2.08	
	14/05/2010	Western Lozenges		06:35	09:40	3.08	
	14/05/2010	Control Tower gravel areas		10:40	12:00	1.34	

	16/05/2010	Western Heath areas	Meadow Pipit	06:30	08:30	2.00	
	16/05/2010	Fireplane gravel area		09:50	11:15	1.42	
	18/05/2010	Bowdown Woods		09:30	10:00	0.50	
4	24/05/2010	Eastern Lozenges and comp 8c	Ringed Plover Little Ringed Plover Redshank Skylark Woodlark (4) Stonechat Dartford Warbler Meadow Pipit	06:15	09:00	2.75	15.25
	24/05/2010	Crookham pools, extreme east of comp 16 and comps 13, 8a,b and c		09:50	11:50	2.00	
	25/05/2010	Western Lozenges		06:00	09:30	3.50	
	25/05/2010	Control Tower gravel areas		10:45	12:10	1.42	
	28/05/2010	Western Heath areas		06:05	08:30	2.42	
	28/05/2010	Fireplane gravel area		09:05	10:25	1.33	
	02/06/2010	Bowdown Woods		07:40	08:05	0.42	
	02/06/2010	Birch Coppice, Crookham		08:35	09:10	0.58	
	02/06/2010	Martindale Heath		09:20	09:40	0.33	
	02/06/2010	Bishops Green Heath		10:05	10:35	0.5	
5	10/06/2010	Crookham pools	Ringed Plover Little Ringed Plover Redshank Skylark Stonechat Dartford Warbler Meadow Pipit	06:30	07:50	1.33	8.00
	10/06/2010	Eastern Lozenges		08:25	10:45	2.33	
	15/06/2010	Western Lozenges, Sandleford Heath/Pyle Hill beyond end of runway, 616 gravels		06:10	10:30	4.34	
				Total hours		63.26	63.26

Table 15: Territory mapping. Visit dates, times and section coverage

Appendix B: Lapwing nest watch sessions disturbance field recording form

Disturbance field recording form: Lapwing

Date	12/04/10	Observation times	12:05-13:10	Nest	616E (1)	Weather	Cloud % 40%	Observer	Joe Harris
		Total minutes	65				Temp 12c		
							Wind N (2)		
							Rain 0		

Number	Time of incident	Time nest unattended	Description of incident and comments
1	12:05	4	Nest change over, fem off, male on.
2	12:10		Male on nest
3	12:41	10.5	Male off nest, possible dog disturbance, fem onto nest.
4	12:50		Buzzard over, possibly delaying fem taking over incubation.
5	12:52		Fem on at 12:52
6	12:56	0.75	Nest change over, fem off, male on.
7	13:10		Observation ends