LIFE Waders for Real

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LIFE Waders for Real

D.3 Report on work conducted on monitoring predators: camera traps and avian predators

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Abstract

The investigation of predator ecology and monitoring of mammalian predator populations within the Avon Valley were key aspects of the LIFE Waders for Real project. Various methods were used to monitor the suite of potential wader predators, two of which are covered within this report. Motion-activated camera traps were deployed on hotspot sites during the wader breeding season in each year, 2015 – 2019. Timed avian predator watches were used to assess the presence of avian predators alongside recording avian predator presence during breeding wader surveys.

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1 Introduction

Poor reproductive success driven by high levels of nest and chick predation have been shown to limit the recovery of wading birds across a variety of habitats. The egg and chick life-stages of waders attempting to breed in the Avon Valley are potentially vulnerable to a range of predator species, including:

- Fox
- Badger
- Otter
- Mink
- Polecat
- Weasel
- Hedgehog
- Brown rat
- Heron
- Little egret
- Carrion crow
- Rook
- Magpie
- Jackdaw
- Jay
- Buzzard
- Red kite
- Kestrel
- Sparrowhawk
- Tawny owl
- Barn owl

However, the extent to which specific species within the suite of predator's impact breeding waders is largely unknown and likely to vary greatly between sites and areas depending upon predator/prey abundance, habitats and predator management. In the LIFE Waders for Real project we have focussed attention particularly on the fox, because that allowed us to transfer existing expertise, resources and ongoing research interests and because fox is implicated as a significant predator in virtually every study of predation on wading birds. However, in addition to work specifically directed towards foxes, methods were employed to get a broader understanding of the presence of potential wader chick and nest predators on LIFE Waders for Real hotspot sites. These included the deployment of mink rafts and mustelid ink-tracking tunnels, camera traps for mammalian predators and avian-predator surveys. The latter two methods are discussed within this report, with work conducted on mink and mustelids discussed elsewhere in LIFE Waders for Real reporting.

2 Mammalian predator camera trapping

2.1 Introduction

Over the last 20 years, motion-activated camera traps have become a ubiquitous tool in ecology and conversation for the monitoring a huge range of species. A key strength of motion-activated camera traps is their ability to continuously survey a site, both day and night for protracted periods, up to several months if used appropriately. Camera traps also facilitate studying elusive species, whose behaviour can be significantly influenced by human activity. In addition, the low human input required, can make this method of data collection more efficient in comparison to other methods such as direct observation, faecal or animal track surveys. Though, the potential of collecting extremely high amounts of video or photographs that then require cataloguing and analysis, alongside the time and data lost during times of unknown equipment failure may negate this efficiency in practice.

Within the LIFE Waders for Real project, we desired to gain a broad understanding of the presence of mammalian predators across hotspot sites. Relating this information to wader breeding success alongside improving our understanding of predator activity in wader breeding areas will allow future comments and investigations on potential strategies to mitigate predator impacts. In addition, camera traps were used to improve the efficiency of legal predator control already conducted on hotspot sites, with sightings reported to site managers to direct efforts at improve wader breeding success.

2.2 Method

Figure 1: Little Acorn Ltl-6310MC motion-activated camera trap

Ten Ltl Acorn® camera traps (Ltl-6310MC or Ltl-5310; Figure 1) were deployed at each hotspot site (Ibsey/Hucklebrook, Kingston, Watton's Ford and Avon Tyrell North) from the end of March to the end of June/early July between 2015 – 2019 to encompass the wader breeding season.

Both camera models have a trigger time of between 0.6 – 0.8 seconds and use a 940nm infrared light to capture animal activity at night. From previous studies, camera images of 5MP were deemed to be of sufficient quality to identify target species. In 2015, cameras were set to take 3 photos per trigger to maximise the potential of capturing and identifying the species concerned. However, a comparison of the total 3 photos with the first photo in each trigger, prior to camera deployment in 2016, revealed that taking a single photo did not affect the identification of the species present. Hence, in all other years a single photo per camera trigger was taken. 16GB SDHC Class 10 memory cards were used, chosen of their high capacity and fast write speed in case of consecutive camera triggers. The internal data and time were set during the deployment of each camera, with each image being timestamped and uniquely numbered. Interval time is the time delay between consecutive triggers, in this case interval time was set at 5 seconds. This time can be varied according to study design and the limiting constraints of camera battery life and data storage.

Cameras were distributed over hotspot sites, focusing on fields which are commonly occupied by breeding waders, for either nesting or brood rearing. In 2015, the perimeters of fields were walked to look for suitable camera positions on posts and trees near field boundary features (fences, gates, bridges, trees, rivers and ditches) which showed predator presence (scat, runs, tracks and other field marks) (Figure 2). If no suitable posts were present, stakes were inserted and used to mount cameras. Cameras were placed to cover the most likely route of predator passage at each site, for example covering animal runs and where camera images would best detect the predator in question. Guidance on positions was given by suitability qualified predator ecologists at the commencement of the monitoring. Prior to the 2016 breeding season, this method was reviewed and a change to the monitoring design decided to allow for comparisons of activity between and within camera sites throughout the breeding season. Consistent camera trap locations were then decided, with 20 locations set for each hotspot site, split into 2 sets of 10 locations (Figure 3). The cameras were rotated between each set of 10 locations every 2 weeks. On deployment and collection of each camera, livestock numbers, vegetation heights and types and boundary type were recorded for analyses.

Camera images were analysed as soon as possible after collection using the open-source software Aardwolf https://github.com/yathin/aardwolf2). This software displays each image and allows the user to log the species and number of individuals in each photograph, alongside the photograph metadata. The total data can then be exported for analyses.

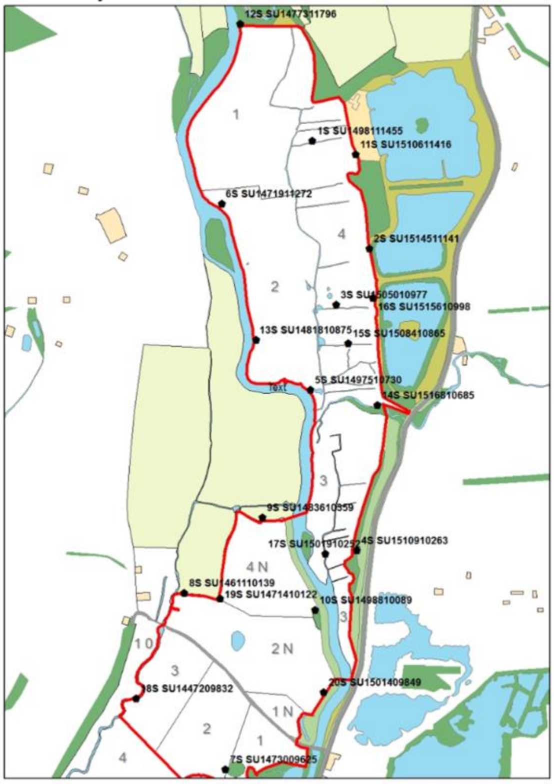
The following species and their numbers were recorded in photographs when observed:

- Avian_Corvid, Crow
- Avian_Corvid, Jackdaw
- Avian_Corvid, Jay
- Avian_Corvid, Magpie
- Avian_Corvid, Rook
- Avian_Corvid, Unknown
- Avian_Egret, Little
- Avian_Gull, Common
- Avian_Gull, Greater black-backed
- Avian_Gull, Herring
- Avian_Gull, Lesser Black-backed
- Avian_Gull, Unknown
- Avian_Gull, Black-headed
- Avian_Heron, Grey
- Avian_Owl, Barn
- Avian_Owl, Tawny
- Avian_Owl, Unknown
- Avian_Raptor, Buzzard
- Avian_Raptor, Hobby
- Avian_Raptor, Kestrel
- Avian_Raptor, Peregrine
- Avian_Raptor, Red Kite
- Avian_Raptor, Sparrowhawk
- Avian_Raptor, Unknown
- Avian_Unknown, Bird Predator
- Avian_Wader, Lapwing, Adult
- Avian_Wader, Lapwing, Chick
- Avian_Wader, Redshank, Adult
- Avian_Wader, Redshank, Chick
- Mammalian_Badger
- Mammalian_Cat
- Mammalian_Dog
- Mammalian_Hedgehog
- Mammalian_Human
- Mammalian_Mink
- Mammalian_Otter
- Mammalian_Polecat
- Mammalian_Rat
- Mammalian_Red Fox
- Mammalian_Stoat
- Mammalian_Unknown, Mammal Pred.
- Mammalian_Weasel
- Other_Vehicle

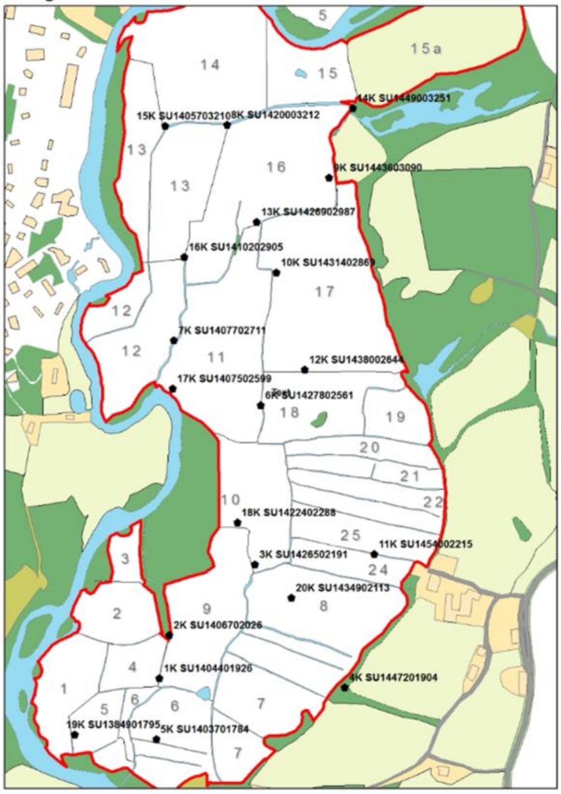
Although the target of the camera trap monitoring was terrestrial mammalian predators. All predators, waders and sources of disturbance were recorded. Analyses focused on the target species but data on other predators is now available if desired in the future. Images of red foxes were passed on to site managers within the week after camera collection to improve the effectiveness of predator management on hotspot site.

Figure 2: Example of camera traps set over an animal run along a fence line (left) and bridge (right).

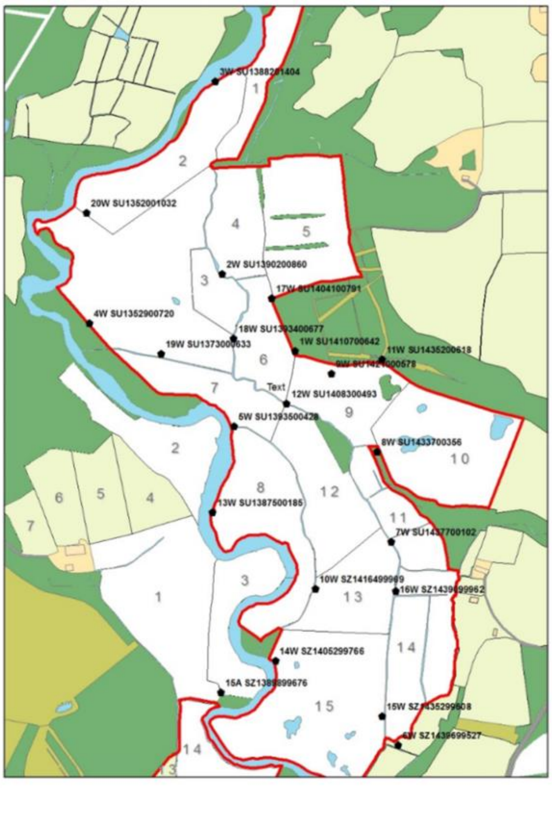
LIFE Waders for Real – Camera Trap Locations
Somerley All Cameras (set 1: 1-10 / set 2: 11-20)



LIFE Waders for Real – Camera Trap Locations
Kingston All Cameras (set 1: 1-10 / set 2: 11-20)



LIFE Waders for Real – Camera Trap Locations
Wattons All Cameras (set 1: 1-10 / set 2: 11-20)



LIFE Waders for Real – Camera Trap Locations
Avon Tyrell North All Cameras (set 1: 1-10 / set 2: 11-20)

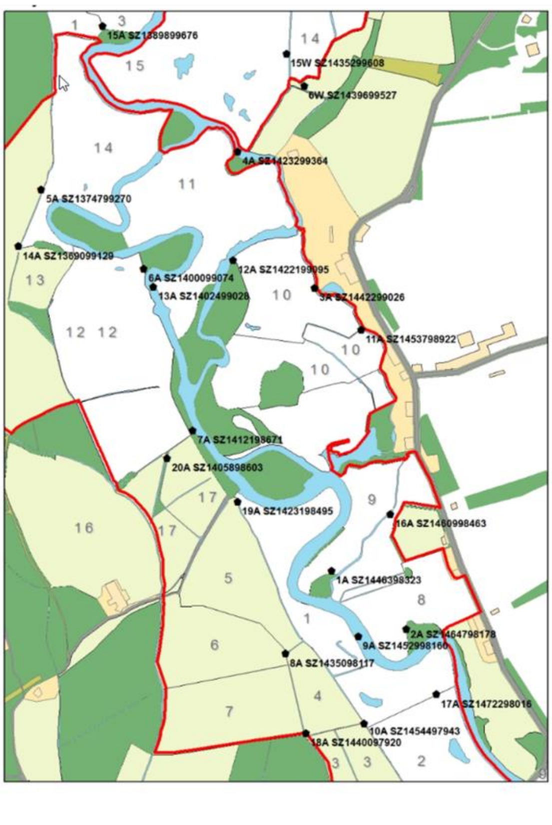


Figure 3: Camera trap locations from all LIFE Waders for Real hotspot sites in 2016 - 2019. Cameras were rotated between set 1 and set 2 at each site every 14 days.

2.3 Example Photographs

2.4 Summary Results and Insights

In total, over 1,763,991 photographs were recorded by camera traps during an expected 16,831 camera trap days over the 5 annual periods of camera trap monitoring. Of these, 37,819 photographs or 2.14% were of species listed in Section 2.2. The disparity between the two total photo counts stated comes from photos triggered by species not of interest such as cattle and deer, along with false triggers by vegetation. The number of photos taken of each target species varied between years, in some cases significantly (Table 1). Originally the target of the camera trapping work was terrestrial mammalian predators. Badger sightings remained consistent in number as the project progressed, with Red Fox and Stoat declining over the 5 year of LIFE Waders for Real.

Table 1: Count of photos taken of each species by year. xxx denotes where a tag was not recorded in data collection.

Species/Group	2015	2016	2017	2018	2019	Grand Total	Overall Rank
Avian, Corvid, Crow	390	373	122	931	157	1973	6
Avian, Corvid, Jackdaw	483	433	527	151	583	2177	5
Avian, Corvid, Jay	38	37	13	5	8	101	23
Avian, Corvid, Magpie	94	85	60	33	86	358	14
Avian, Corvid, Rook	207	147	351	2	493	1200	9
Avian, Corvid, Unknown	527	154	124	20	493	1318	7
Avian, Egret, Little	37	53	42	4	57	193	16
Avian, Gull, Black-headed	156	87	102	166	4	515	12
Avian, Gull, Common	5					5	29
Avian, Gull, Greater black-backed					13	13	28
Avian, Gull, Herring					5	5	30
Avian, Gull, Lesser Black-backed							41
Avian, Gull, Unknown	148	27	40	169	25	409	13
Avian, Heron, Grey	1546	2930	3050	938	3195	11659	1
Avian, Owl, Barn					1	1	36
Avian, Owl, Tawny	1	1	1		2	5	31
Avian, Owl, Unknown					3	3	33
Avian, Raptor, Buzzard	71	3	3	10	4	91	24
Avian, Raptor, Hobby				1		1	37
Avian, Raptor, Kestrel		1	1	1		3	34
Avian, Raptor, Peregrine							42
Avian, Raptor, Red Kite			1			1	38
Avian, Raptor, Sparrowhawk				3		3	35
Avian, Raptor, Unknown	230	1	1	1	1	234	15
Avian, Unknown, Bird Predator	78	1	44	7	1	131	20
Avian, Wader, Lapwing, Adult	442	95	1951	71	1068	3627	3
Avian, Wader, Lapwing, Chick	7	2			41	50	25
Avian, Wader, Redshank, Adult		7	81	1	27	116	22
Mammalian, Badger	189	329	180	185	190	1073	10
Mammalian, Cat	19		3	9	4	35	26
Mammalian, Dog	87	102	114	100	132	535	11
Mammalian, Hedgehog	3	1				4	32

Mammalian, Human	1501	1595	1076	1229	2281	7682	2
Mammalian, Mink	8	2	20	1	2	33	27
Mammalian, Otter	41	96	29	4	9	179	18
Mammalian, Polecat			1			1	39
Mammalian, Rat	27	41	35	81	1	185	17
Mammalian, Red Fox	841	768	437	113	249	2408	4
Mammalian, Stoat	26	77	39	5	3	150	19
Mammalian, Unknown, Mammal Pred.	35	29	53	3	9	129	21
Mammalian, Weasel				1		1	40
Other, Vehicle	xxx	xxx	xxx	371	841	1212	8
Grand Total	**7237**	**7477**	**8501**	**4616**	**9988**	**37819**	**n/a**

Due to the large amount of data gathered through this survey method, and the resulting time needed for data management, analysis of the whole dataset has been limited at this time. Initial analysis during student projects found links between fox abundance-activity and wader breeding success. Further analysis of the camera trap data will investigate patterns in the records of terrestrial mammalian predators across sites and over time in relation to lapwing breeding success. In addition, analysis of activity patterns will aim to identify patterns the timing of detections alongside the impact of landscape features (bridges, fords, woodland, fence lines etc) allowing for potential improvements to predator management.

Although, camera trapping showed to be a relatively low-effort way to obtain presence data for a wide range of predator species at a large spatial scale, its efficiency should be assessed against the problems encountered and large amount of data processing time required. Monitoring hours were lost to a wide range of factors, including vegetation growth, livestock and human disturbance to cameras, human error during setting and equipment failure. Of these, livestock disturbance and vegetation growth were the most significant. For example, of 280 and 270 camera deployments in 2017 and 2019, 18 and 40 deployments respectively were affected by livestock. In some cases, completely stopping the monitoring of a camera soon after its deployment. Livestock disturbance was mainly by cattle and arose from a range of behaviours including the use of camera mounts as scratching posts and the licking and complete removal of cameras. Vegetation growth throughout the breeding season, limited the field of view of some camera positions as the season progressed. Hence, the detectability of animals in the vicinity of cameras at the same site changed over time. Further analyses of these data will attempt to use vegetation measurements at each camera deployment to estimate changes in detectability at each site alongside target animal detection.

3 Avian predator watches

3.1 Introduction

Current studies implicate the red fox, as the principle predator limiting lapwing productivity due to their ability to take nests as well as being a significant chick predator. However, lapwing nests and chicks are susceptible to a range of mammalian and avian predators and the extent to which different predators are responsible for losses is likely to vary by site and year. Mammalian predator abundance-activity was assessed using camera trapping and hence, we wished to understand the impact of avian predators across LIFE Waders for Real sites and the relationship this had with lapwing breeding success.

Birds have several behavioural responses to discourage predators from taking their eggs and chicks. Lapwing, as with many other avian species predominately conduct mobbing. A behaviour where adult breeding birds observe, approach and harass potential predators. The degree of mobbing behaviour by lapwing has been shown to vary by predator species and stage in the breeding cycle. This suggests lapwings may assess and adjust their behaviour to the changing risk a predator species poses. It was this behaviour that led us to focus on the anti-predator responses of adult breeding lapwing as part of our monitoring to gauge the perceived predation risk by different avian predator species.

3.2 Method

Within the LIFE Waders for Real project, timed watches over fields containing breeding lapwing were conducted to obtain information on the abundance-activity of avian predators and where possible information on the frequency of direct predation by different avian predator species. Watches were conducted between early April to June in 2015 and 2016. In 2015, two different protocols were conducted, as the protocol was developed during the breeding season. In 2016, only protocol 2 was conducted.

Protocol 1

Fields containing breeding lapwing, at either nest, chick or nest and chick stage were selected. On arrival at the target field all corvid, gulls, raptors and herons seen within the field or perched on its boundary were recorded. Once the observer was in a suitable position, where lapwing and other predators were not being influenced, based on behaviour, a 1-hour watch of the target field commenced. For 5-minute recording periods; all corvid, gulls, raptors and herons flying over the field were noted along with a total count of all groups within the field or perched on the boundary at the end of each recording period. Recording periods were spaced at 5-minute intervals. The aim of this protocol was to estimate the maximum number of potential avian predators using the field per hour and the activity of predators over the field. In addition, each time adult lapwings mobbed or chased a potential avian predator alongside when incubating lapwing left their nest was recorded. Predator watches were repeated where possible, up to six times with the time of day and stage of lapwing breeding varied.

Protocol 2

Amendments were made to Protocol 1 based on the experience of conducting the monitoring in the field. The total avian predator counts every 5 minutes were continued. However, all avian predators entering and exiting the target field were now continuously recorded for the entire period. A focal lapwing was added and the responses of this bird to potential predators was monitored intensively. The behaviour of the focal adult lapwing to each predator was noted along with the total number of lapwings that responded. Additional, variables were estimated including the horizontal distance and height of the predator from the focal bird when it responded or the closest it came to the focal bird if it did not respond. The duration of adult lapwing mobbing during each event was recorded to the nearest second. The observation time was also extended to 90 minutes. This was deemed to be more appropriate based on predator behaviour but still a compromise with the time available and requirements of other project work. The adjustment of the protocol was made to better assess the impact of different avian predator species based on the frequency and extent of responses by adult lapwing.

3.3 Summary Results and Insights

In 2015, we conducted 40 avian predator watches: 22 watches following Protocol 1 and 28 watches following Protocol 2 (25 for one hour, 2 for one hour 30 minutes and 1 for 17 minutes). In 2016, we conducted 13 watches following the revised protocol (12 for 1 hour 30 minutes, 1 for 30 minutes). In total 68 hours and 37 minutes of avian predator watches were conducted. From these 168 predator chases by lapwing protecting either eggs or chicks were recorded, with no direct predation events observed. Gulls and Corvid species showed the greatest abundance-activity over lapwing fields when all surveys are pooled (Table 2). Note, abundance-activity does not denote likelihood of predation.

Table 2 - Four species recorded most frequently during avian predator watches in 2015 and 2016. HG – herring gull, H. – grey heron, JD – jackdaw, BH – black-headed gull, C. – crow, RO – rook.

	In Field			**Over field**		
Rank	2015	2016	Total	2015	2016	Total
Top 1	HG	H.	HG	JD	RO	JD
Top 2	JD	JD	JD	BH	JD	BH
Top 3	BH	BH	BH	HG	BH	HG
Top 4	C.	C.	C.	RO	RO	RO

Further analysis of the avian predator watch data when pooled data from other GWCT lapwing monitoring projects outside LIFE Waders for Real will allow for new insights on the frequency of lapwing responses to a range of avian predators across a range of breeding sites and habitats. Differences in response during the nest and chick rearing periods will also allow for a better understanding of the relative impacts of predator species throughout the lapwing breeding cycle.

Predator watches were only conducted for in the initial 2 years of the project. The behavioural responses of lapwing and predators to human presence meant conducting a predator watch limited the fieldwork that could be conducted on a site for several hours prior to the survey period alongside tying up a significant amount of monitoring time to undertake the protocol. In addition to avian predator watches, all avian predators were recorded during the fortnightly bird surveys conducted on all LIFE Waders for Real site. After the 2016 breeding season, it was concluded that these regular surveys provided a sufficiently representative and consistent method of assessing avian predator abundance, allowing for comparisons across all sites rather than limited to specific fields within a small number of sites. Suspending avian predator watches also allowed for greater effort to be dedicated to other project objectives, such as monitoring lapwing breeding success and non-lethal predator exclusion.

Avian predator records

3.4 Introduction

To provide a comparative assessment of avian predator abundance-activity to the camera trapping for mammalian species, we also recorded all avian predators observed during regularly bird surveys. However, surveys were conducted across all core Avon Valley sites, rather than purely on hotspots as with the camera trap monitoring.

3.5 Method

Surveys were conducted between March and June each year (2015 – 2019) for breeding waders, key songbird species and avian predators. Each field within a site was surveyed, by a single observer walking within 100m of all points within a field every 2 weeks. In respect to avian predators only, all avian predators observed either on the ground within the field or flying over were recorded on to hard copy maps with the data later digitised. The first observation only of a predator was recorded. For example, a Buzzard circling over multiple fields over the course of the survey would only be noted once. If observations could be confidently identified as a new or additional individuals' multiple observations were noted. If species, were present in flocks or groups, a count of the total number of individuals was made and recorded.

3.6 Summary Results and Insights

In total, 20 species of potential avian predator were recorded on surveys.

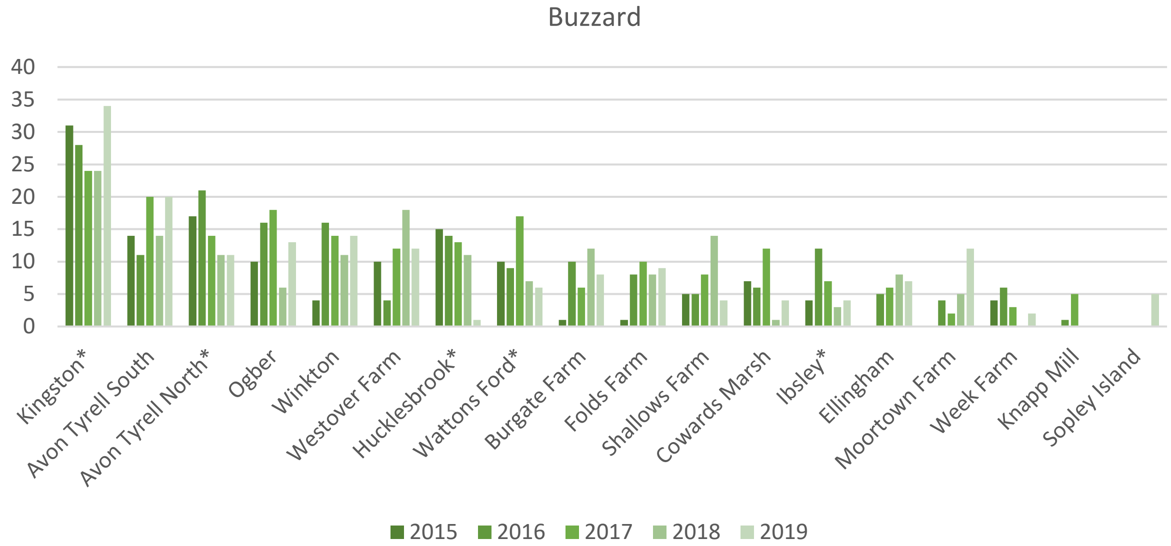
- Barn owl
- Black-headed gull
- Buzzard
- Crow
- Grey heron
- Herring gull
- Hobby
- Jackdaw
- Jay
- Kestrel
- Lesser black-backed gull
- Magpie
- Marsh harrier
- Mediterranean gull
- Peregrine
- Raven
- Red kite
- Rook
- Sparrowhawk
- Great black-backed gull

When all sites are pooled, jackdaw and black-headed gull were the most observed species, both by the frequency of observations and total number of individuals observed (Table 3). Crow was the most observed predator previously established to have a significant impact on breeding waders. Crows are known to predate both lapwing eggs and chicks are subsequently pose a threat throughout the breeding season.

Table 3: Sum of all observations of avian predators during breeding season surveys with all sites pooled

Species	2015	2016	2017	2018	2019	Overall Total	Overall Rank
Jackdaw	1403	2429	2602	1268	1600	9302	1
Black-headed gull	1187	2436	1598	2066	1573	8860	2
Rook	761	1010	1370	744	1108	4993	3
Crow	635	834	842	645	1288	4244	4
Herring gull	344	478	455	187	323	1787	5
Grey heron	151	255	268	217	247	1138	6
Buzzard	133	176	191	153	166	819	7
Magpie	116	170	172	67	130	655	8
Lesser black-backed gull	50	115	88	68	57	378	9
Kestrel	24	48	75	40	31	218	10
Raven	8	38	29	46	23	144	11
Mediterranean gull		15	55	24	15	109	12
Jay	14	18	14	21	26	93	13
Hobby	15	14	23	17	17	86	14
Marsh harrier		19	23	6	15	63	15
Great black-backed gull	23	1	10	15	5	54	16
Red kite	3	11	9	16	13	52	17
Sparrowhawk	7	6	7	8	7	35	18
Peregrine	6	9	4	3	3	25	19
Barn owl	1	2	1	1	2	7	20
Grand Total	**4880**	**8082**	**7835**	**5611**	**6648**	**33056**	

Sites varied in the number of avian predators observed each year to highlight this two key species, buzzard and crow have been graphed (Figure *4*).



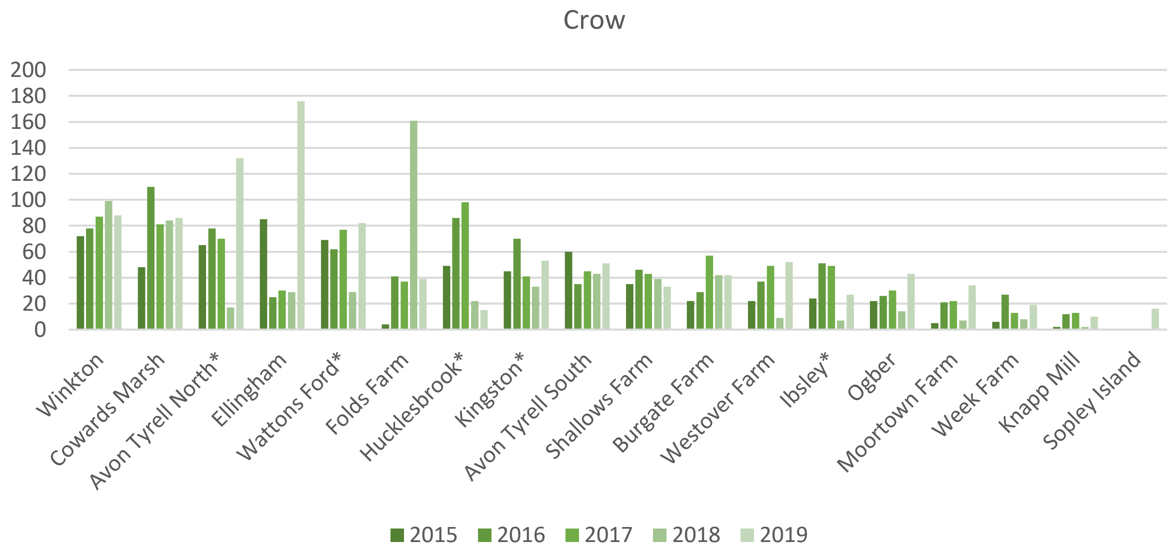


Figure 4: Counts of buzzard (top) and crow (bottom) per year per site from regular bird surveys. Hotspot sites are marked with an *.

The figures and results presented here are a brief summary, further analysis of the avian predator survey records, is required to calculate daily observation rate of each predator to account for variable survey effort between sites and years. This data will then be related to lapwing nest and chick survival to investigate any relationships between avian predator presence and lapwing productivity.

4 Student Reports

Within LIFE Waders for Real, we have been able to involve many Batchelors and Masters degree level students in various aspects of the project. Students were key to the delivery of the predator monitoring described within this report and their efforts must be acknowledged. In total, 7 students wrote reports and were directly involved in both or one of either the camera trapping or avian predator survey work. Further students were involved in data collection only. Each of these 7 students wrote a thorough report, providing analyses to the LIFE Waders for Real team as the project developed to inform monitoring approaches and provide initial outcomes. Here I acknowledge the following students along with detailing annexes containing summaries of each of their reports.

- Leah Kelly, BSc student, University of Leeds (Annex 7.1)
- Thomas Oakley, BSc student, University of Bath (Annex 7.2)
- Rebecca Robinson, MSc student, University of Reading (Annex 7.3)
- Heather Warrender, MSc student, Newcastle University (Annex 7.4)
- Kit Lawson, BSc student, University of Southampton (Annex 7.5)
- Holly Alexander, MSc student, University of Leicester (Annex 7.6)
- Sophie Brown, BSc student, Plymouth University (Annex 7.7)

5 Annexes

5.1 LIFE Waders for Real predator monitoring student report 2015

Kelly, L. 2015. The breeding success of northern lapwing *Vanellus vanellus* in relation to predator abundance. University of Leeds (unpublished BSc report).

The breeding success of northern lapwing *Vanellus vanellus* in relation to predator abundance

Leah Adeline Kelly

200678571

BSc Biology (Industrial)

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ABSTRACT

The northern lapwing *Vanellus vanellus* is currently listed as Vulnerable in Europe. Populations have undergone recent rapid declines throughout Europe, including the UK, leading to an urgent need for conservation. The factors affecting population viability need to be understood if appropriate conservation measures are to be devised. The major factor causing the decline is thought to be low productivity, primarily due to predation. In order to determine the effect of predation, monitoring of predator abundance along with lapwing breeding success was carried out in the Avon Valley, Hampshire, UK. Predator abundance was monitored throughout the breeding season using two methods: camera traps and avian predator watches. Breeding success was monitored by determining the survival of both nests and broods. The results suggest that predators are not necessarily having a significant effect on nest or brood success. As avian predator abundance, particularly corvid abundance, and stoat *Mustela erminea* abundance increased, lapwing nest survival decreased significantly. Increasing raptor abundance and red fox *Vulpes vulpes* abundance also led to significant reductions in the number of successfully fledged broods. No other predator species groups were found to have a significant negative effect on nest or brood success. However, the contradictory nature of the results produced by the two predator abundance monitoring methods raises questions regarding the validity of these results. In addition to further work on predators, the effects of habitat and livestock should be investigated as it is likely that multiple factors are causing the decline in the lapwing population. If predators are indeed not the problem, habitat management may be the most appropriate conservation measure.

Keywords: breeding wader, nest success, brood success, predation, camera traps, conservation

List of abbreviations

AES – agri-environment scheme
ATN – Avon Tyrell North
GLM – general linear model
GLZ – generalised linear model
KIN – Kingston
SOM – Somerley – Hucklesbrook/Ibsley
WAT – Watton's Ford

5.2 LIFE Waders for Real predator monitoring student report 2016

Oakley, T. 2016. Effects of boundary type, cattle presence and control on red fox (*Vulpes vulpes*): a camera trap study. University of Bath (unpublished BSc report)

Effects of boundary type, cattle presence, and control on red fox *(Vulpes vulpes): a camera trap study*

Thomas Oakley

University of Bath

Game & Wildlife Conservation Trust

Placement Report

2016

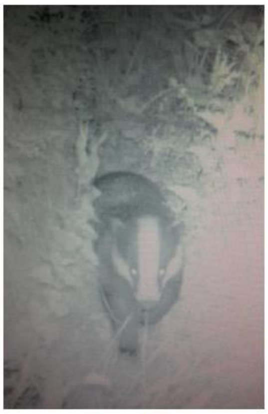
Abstract

A study into fox activity and boundary use across four wetland sites with varying levels of game keeper control. The study used motion sensing camera traps to record fox sightings, also recording badger sightings to use as another mammalian predator species for comparison, which in this case faced no control on any site. Findings show that fox sightings are increased on sites without lethal control. Foxes are sighted more often at certain boundary types, such as bridges, and woodland edges, while being less likely to be sighted at boundaries such as fence lines. By examining previous GWCT camera trap studies, it was also possible to develop more effective methods to carry out wide ranging motion camera trap studies, and identify opportunities for further study which could feed into the GWCT 'Waders for Real Project' which seeks to reverse Avon Valley wader decline. These opportunities include investigating the potential for reducing predator wetland access by raising or removing footbridges, expanding the use of fox control to cover all four sites, and planning the rotation of cattle to isolate grazed fields by leaving surrounding land to go to hay.

5.3 LIFE Waders for Real predator monitoring student report 2017

Robinson, R. 2017. The use of wet landscapes by red foxes *Vulpes vulpes* and Eurasian badgers *Meles meles* in relation to lapwing nest predation. University of Reading (unpublished MSc thesis)

The Use of Wet Landscapes by Red Foxes *Vulpes vulpes* and Eurasian Badgers *Meles meles* in Relation to Lapwing Nest Predation



Rebecca Robinson

1st September 2017

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LIFE Waders for Real

Abstract

The Northern lapwing *Vanellus vanellus* has suffered declines in abundance across England since the 1960s, mainly due to agricultural intensification. Lapwings are ground-nesting birds which suffer from habitat loss and degradation as a result of changes in land management practices. Nest and chick predation by avian and mammalian predators contribute to limiting recovery of lapwing populations. Little is known about how mammalian predators use wet landscapes and where they focus their hunting efforts. This study aimed to document predator activity over lapwing breeding season for three years, across four hotspot lapwing sites, whilst monitoring lapwing nest outcomes. Statistics showed fox abundance was related to site, gamekeeper presence and year, rather than individual habitat characteristics, apart from an increase in abundance with field area. Badger abundance was not significantly related to any habitat variables, only site. Daily nest survival increased with distance from woodland, but was not related to fox or badger abundance. Foxes and badgers are generalist predators, so finding ways to deter them on to other sources of prey is necessary. Predator control alongside habitat management is needed where predation is limiting wader success, to attract high breeding densities to selected areas in the Avon Valley.

5.4 LIFE Waders for Real predator monitoring student report 2018

Warrender, H. 2018. Use of wet grassland landscapes by mammalian predators in relation to northern lapwing (*Vanellus vanellus)* nest predation. Newcastle University (unpublished MSc thesis)

Use of wet grassland landscapes by mammalian predators in relation to northern lapwing (*Vanellus vanellus*) nest predation

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LIFE Waders for Real

Abstract

The Northern lapwing (*Vanellus vanellus*) has suffered steep population declines throughout the UK and Europe. These declines have occurred since the 1960s and are thought to be driven by changes in agricultural practices. More recently, with the improvement of the agricultural land through agri-environment schemes, the lapwing population has not recovered likely due to a high predation rate during the breeding season which is limiting their population recovery. Very little is known about how mammalian predators, thought to be the highest contributor to lapwing mortality, use lowland wet habitats and, therefore, management may not be as effective as it could. This study investigated how red foxes (*Vulpus vulpus*) and European badgers (*Meles meles*) use these habitats temporally and spatially, and whether habitat variables such as vegetation height influence this and how the timing of nesting relates to predator presence temporally. The number of foxes seen was influenced by vegetation height, month, site and boundary type whereas badger numbers were only influenced by boundary type. The number of variables that influence fox numbers highlight areas in which management could be targeted, however more research is needed to investigate the scale of lapwing survival during the breeding season so that management is focused on the largest contributor to lapwing mortality.

5.5 LIFE Waders for Real predator monitoring student report 2019

Lawson, K. 2019. Behavioural patterns of the red fox, *Vulpes vulpes*, in the Avon Valley. University of Southampton (unpublished BSc report)

Behavioural Patterns of the Red Fox, Vulpes vulpes, in the Avon Valley

Kit Lawson

BSc Zoology with YIE

Student No:28410211

Year of Submission: 2020

Dr Kelvin Peh

Word count: 7710

UNIVERSITY OF Southampton

Abstract

Fox behaviour is known to be plastic in response to a number of factors. Livestock, human disturbance, predator control and competitor species all have been seen to affect the activity patterns of the red fox. While a number of studies have looked into this area, they have mostly involved significantly different sites. This study chose to examine four estates in the Avon Valley; although the sites were all actively managed for wader conservation, intensity of predator control constituted the main differences between them. The effect of livestock on fox activity has also had limited study and the effects are usually found to be indirect. A total of 280 photo sets were collected between 4 sites in the Avon valley. Using a Chi squared, it was found that fox activity did significantly vary between sites with the sites with lower levels of predator control having higher observation frequencies throughout the day. Chi squared also found that fox activity did not vary in the presence of livestock. A Kruskal-Wallis test was used to show that the presence of competitor species was significantly higher on cameras where foxes had also been seen and on sites with lower levels of predator control. Further studies should aim to specifically quantify fox control in terms of foxes culled and amount of time spent performing fox control as well as fox diet analysis to better understand their decision making.

5.6 LIFE Waders for Real predator monitoring report 2015 - 2

Alexander, HC. 2015. Impact of avian predator presence on Northern Lapwing *Vanellus vanellus.* University of Leicester (unpublished MSc thesis)

Impact of avian predator presence on Northern Lapwing
Vanellus vanellus

Holly Catherine Alexander

September 2015

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ABSTRACT

Lapwing *Vanellus* vanellus populations have declined in the UK by 50% since 1983. Historically, agricultural change has been the main focus for their decline, but now, its interaction with predation is becoming of great concern. This study focuses on avian predators and their indirect effect on lapwing chick survival. Factors affecting the likelihood of an adult lapwing chasing an avian predator and the duration of that chase were assessed. Nest and chick survival rates were also compared at fallow plots which were situated in either arable or grassland habitats.

It was found that lapwings were able to identify which avian predators pose a threat, and were more likely to make a chase when they were within 50m and caring for brood aged between 8-20 days. A chase was also more likely in windy conditions and when there were 11-15 other lapwings. Chase duration decreased; as predator distance increased and in windy weather conditions. No significant difference was found for nest/chick survival between plots situated in arable and grassland habitats. The results provide a better understanding of lapwing responses to avian predators enabling fallow plots to be positioned in optimal locations with the intention of reducing the effect of avian predators.

Keywords: *Vanellus vanellus*, avian predators, fallow plots

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5.7 LIFE Waders for Real predator monitoring report 2018 - 2

Brown, S. 2018. The Behavioural Response of Breeding Lapwing *Vanellus vanellus* to Avian Predators. Plymouth University (unpublished MSc thesis)

THE BEHAVIOURAL RESPONSE OF BREEDING LAPWING *VANELLUS VANELLUS* TO AVIAN PREDATORS.

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The behavioural response of breeding lapwing *Vanellus vanellus* to avian predators.

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Abstract

1. Farmland bird decline is an indicator of biodiversity loss experienced across the UK and Europe. Despite conservation efforts, Northern lapwing *Vanellus vanellus* populations are still declining due to agricultural intensification and predation pressure.
2. Here we examine the specific mobbing behaviour of breeding lapwings in response to avian predators. We will determine to what extent this behaviour is influenced by how threatening lapwings perceive individual avian predators to be, and how this is affected by environmental factors.
3. Both corvids and raptors were found to be excluded from lapwing nesting habitat, through mobbing. Raptors were chased for the longest duration and corvids were chased by the most lapwings.
4. The duration of lapwing chase (s) was found to be significantly influenced by the age of the lapwing offspring. Lapwing chase duration of both raptors and corvids increased with nest age.
5. The horizontal and vertical distance of avian predators from the nest is thought to have influenced both the chase duration and the number of lapwings chasing. Avian predators which approached within 50m of the nest, were chased for significantly longer (s) and by significantly more lapwings, than those at further distances.
6. *Synthesis and applications.* The findings from this study compliment previous other studies into the mobbing behaviour of lapwings towards their avian predators. These findings can be used to inform agricultural policy making decisions such as best practise for Agri-environment scheme fallow plot placement. It can also assist in the reversal of predation impacts on the breeding success of lapwing in UK.

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