

Territorial aggression shown by urban Peregrine Falcons towards Common Buzzards

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Peregrine Falcons *Falco peregrinus* nesting in urban environments provide a valuable opportunity for study of their lives and behaviour. The Peregrines that nest on St. Michael and All Angels Church in Exeter are an excellent example, and have been studied in detail since 1997, the year they first bred at the church.

Their prey selection and diet has been investigated through weekly collections of fallen prey remains over the past 18 years, and is now the longest-running study into the diet of British Peregrines (Drewitt & Dixon 2008; Dixon & Drewitt 2012).

Webcams have allowed detailed monitoring of the two nest sites used on the church. The first, between 2001 and 2007, was located on the east ledge of the tower, and then from 2013 until 2015 in the current nest site, within the trefoil on the south face of the spire.

The juveniles have been BTO- and colour-ringed (under licence) in the nest over the past three seasons, leading to increased knowledge of their subsequent distribution and survival rates.

TERRITORIAL AGGRESSION TOWARDS COMMON BUZZARDS

Over the past six years, we have observed and recorded the unique territorial behaviour shown towards Common Buzzards *Buteo buteo* by the Peregrines in Exeter (Dixon & Gibbs 2015).

Our understanding of this extreme aggression has increased with each passing year since 2012, when the Peregrines were seen to attack ten individual Buzzards over-flying the city, knocking four to the ground, with three recovered dead.

Both species can often be found in the same habitat, and so it is not surprising that there are records of territorial aggression, with Buzzards being attacked by Peregrines. Buzzard remains have been found at Peregrine eyries, but this is rare (Ratcliffe 1993).

SUMMARY OF FINDINGS FROM 2009 TO 2014

Annual frequency of attacks

We first became aware of the extreme nature of this territorial aggression on 9 June 2012 (during the weekend when the juvenile Peregrines fledged) when AG observed both adult Peregrines attacking a Buzzard. The Peregrines repeatedly stooped onto the Buzzard high over the city, hitting it and causing it to fall. AG was able to pinpoint its location and found it dead in Rougemont Gardens, 480 m to the east of the church. Later that day, we learnt that another attack had been witnessed during the morning and the dead Buzzard retrieved. Further attacks by the Peregrines were witnessed during 2012 and AG found another dead Buzzard which had fallen in the River Exe. These events were later reported in *Devon Birds* (Dixon 2013).



The female Peregrine and a Buzzard during one of 13 attacks observed over Exeter on 7 June 2015 during an eight-hour watch. Photo by Greg Curno

ND reviewed all observations of the Peregrines recorded during weekly prey collections, which confirmed that the first record of territorial aggression occurred in 2009, shortly after the arrival of the current female, when she repeatedly stooped onto a Buzzard and drove it away. The first instance of both Peregrines attacking a Buzzard came in 2010 but the outcome was unknown because the birds were lost from sight behind tall buildings.

Wildlife photographers are often at the church during the fledging period in June, and we learnt of three observed attacks in 2011 involving both falcons, but the outcomes were not seen (R. Heeks pers. comm.).

During the 2013 and 2014 breeding seasons, we undertook watches from the open top deck of Mary Arches car park. This vantage point, just 190 m to the south of the church, provides excellent viewing, not only of the breeding site and most of the regular perches used by the falcons, but also gives a 360-degree view across the city centre. A further benefit is that it is eight floors above the adjacent streets and therefore considerably quieter than at street level, and there is little noise from passing traffic. This helps in listening for 'alarm calling' from the Peregrines, which precedes almost every attack on Buzzards, and especially so when they are soaring high over the city.

We also tried to raise awareness of this behaviour among local residents, veterinary practices and wildlife conservation organizations based in Exeter, in order to gain more information on attacks. As a

result, we recorded over 112 attacks on Common Buzzards over the city from 2009 to the end of 2014, through our direct observations of attacks, reports from other watchers who have witnessed attacks, the recovery of dead or injured Buzzards near the church, and through reports of Buzzards received at local wildlife rehabilitation centres.

Attack strategy

The majority of attacks by the Peregrines on Buzzards witnessed over Exeter involve both falcons cooperating in their behaviour. Alarm-calling by one of the falcons is often the first indication that a Buzzard may be present, followed by a determined flight from the church, or from a soaring patrol position within their territory, towards the Buzzard. Considerable effort is expended in getting to a position above the Buzzard before an attack begins. Attacks involve repeated vertical stoops onto the Buzzard, with the falcons quickly looping back up again to repeat the action. The male Peregrine will stoop first, passing close enough to cause the Buzzard to 'flip' upside-down to present its talons in defence. The female Peregrine will follow almost immediately, aiming to hit the Buzzard on its upperparts as soon as it has righted itself and before it has time to present its talons again.

The falcons will both loop back up again to a position above the Buzzard to begin a second attack. These synchronized 'stoop cycles' continue until the Buzzard reaches a territory boundary and

Table 1. Yearly totals of observed attacks by Peregrine Falcons *Falco peregrinus* on Common Buzzards *Buteo buteo* in Exeter (2009-2014).

Year	No. of attacks	By pair	By female	By male	By single bird, sex unknown	Outcome of observed attacks		
						Downed	Driven off	Unseen
2009	1		1					1
2010	1	1						1
2011	3	3						3
2012	10	7		3		4	1	5
2013	45	38	1	4	2	10	5	30
2014	43	32	7	3	1	3	14	26

NB. Outcome of observed attacks: Buzzards seen hit and knocked down are recorded as 'Downed'. If the Buzzard was seen to fly off following an attack, it was 'Driven off' and 'Unseen' refers to attacks where the outcome was obscured by buildings or trees.



The Peregrines breed at St. Michael and All Angels Church, Mount Dinham, in Exeter, as viewed from the top of Mary Arches car park, June 2015. The current nest site (within the stone trefoil towards the base of the spire) and the most frequently used perches are all on the south-east aspect of the church, just 190 m across the valley from our vantage point. Photo by Nick Dixon

the attacks are given up, or until the Buzzard is hit and downed. When synchronicity is lost during 'stoop cycles', it is not uncommon to see either Peregrine 'waiting on' briefly above the Buzzard for its partner, in order to 'reset' the attack.

Attempts by the Buzzards to fly away are hindered by repeated defence 'flips' but many do escape if they fly away from the church and reach a territorial boundary. A Buzzard under attack from repeated stoops is unaware that the closer it flies to the church, the more likely it is to be subjected to increased attacks with greater ferocity.

During 2012 to 2014, we recorded 17 downed Buzzards as a result of observed attacks and nine from presumed attacks (Buzzards found dead, injured or stunned) giving a total of 26 downed Buzzards over the three-year period, all within one kilometre of the church. Only five dead Buzzards could be collected for ageing and sexing, because downed birds often fall on rooftops and inaccessible land, or are stunned and later make good their escape.

Seasonal and diurnal timing of attacks

Attacks between 2009 and 2014 have been recorded in all months from February to October, with a dramatic increase in May and June, during the pre- and post-fledging period. This is when the juvenile Peregrines in the nest no longer need brooding, and both adult Peregrines are often to be found soaring over the city during good weather. Attacks on Buzzards over the city occur mainly between 10.00 and 16.00 BST, which corresponds with the period of most Buzzard soaring activity during spring and summer (Dare 2015).

Territorial interaction with other species

The Exeter Peregrines only exhibit this extreme territorial aggression towards Common Buzzards, and show little interest in many other species passing through their territory or high over the city. No attention is paid to Cormorants *Phalacrocorax carbo* and Little Egrets *Egretta garzetta* that regularly

fly up the river Exe, passing very close to the spire of the church. There are very occasional and brief skirmishes with Ravens *Corvus corax*, Carrion Crows *Corvus corone* and large gull species, involving little more than a single short stoop or fly-by, with none of the intensity or aggression like that shown to any Buzzard within a kilometre of the church. Red Kites *Milvus milvus* have been subject to variable behaviour, ranging from brief attention to occasional attacks by single falcons or the pair, but, again, these attacks have lacked intensity and have not involved synchronized 'stoop cycles'. Sparrowhawks *Accipiter nisus* have occasionally been recorded as prey (Dixon & Drewitt 2012) and are often seen flying around the spire and above nearby rooftops while the Peregrines are perching on the stone pinnacles at the same height; they stimulate no territorial interest whatsoever.

OBSERVATIONS OF PEREGRINE TERRITORIAL AGGRESSION TOWARD COMMON BUZZARDS IN 2015

Attacks on Common Buzzards by the Peregrines over Exeter are gathered from two sources. They are either the result of intentional watches by the authors with the aim of gathering as much information as possible, or they come from local residents as a result of a chance sighting of an attack, or the report of an injured, downed or dead Buzzard.

While the additional records we receive add to

the information we are gathering, it is apparent that when we have observed a number of attacks in any one day, we rarely, if ever, hear that others have seen or recorded any of these events as well. This led us to believe that many attacks over the city are going unnoticed when we are not present, during the days of good weather in the spring and early summer months, when most attacks occur. By undertaking specific watches, we observed 77% of the attacks in 2013 and 88% in 2014.

To address this, AG contacted Exeter University to see if Undergraduate Biology students would like to participate in our ongoing study in 2015 by undertaking watches from the Mary Arches car park. It was while we were organizing this that the first attack on a Buzzard occurred on 18 January, and was observed and photographed by Chris Wilson before the falcons drove the Buzzard away to the south-west. This was the first record of a Buzzard being attacked over Exeter in January.

The Peregrines laid their first egg on 22 March, with others laid on 24, 27 and 30 March. Incubation occurred throughout the month of April, with the first chick hatching on 30 April and the second on 2 May. Of the clutch of four eggs, only two hatched. Prior to hatching, the majority of attacks on Buzzards were by the male as the female undertook most of the incubating duties. On one occasion, the male flew out to three Buzzards passing over the city together, and stooped on each one in turn!

Forty-four Buzzards were attacked from the start of January until the end of April, with 15 at

Table 2. Attacks by Peregrine Falcons *Falco peregrinus* on Common Buzzards *Buteo buteo* in Exeter during the first six months of 2015.

Month	No. of attacks	By the pair	By female	By male	Reported attack, full details unknown	No. of Buzzards downed
January	2	1	-	1	-	-
February	3	3	-	-	-	-
March	14	8	-	5	1	-
April	25	3	6	14	2	-
May	60	41	13	3	3	12*
June	85	50	32	1	2	9
Total	189	106	51	24	8	21

NB. Of the 12 Buzzards downed in May 2015, ten were by the pair and two were by the female alone.



During May, when the juveniles in the nest no longer need brooding, the Peregrines spend hours soaring over the city in good weather. They are often viewed thousands of feet up but can be seen also at lower levels and over the car park, especially when returning to the church. Photo by Greg Curno

tacks by the pair, but no Buzzards were downed during these months. The juvenile Peregrines no longer needed constant brooding from 12 May, but we had already recorded attacks during this month, when the adult Peregrine would leave the juveniles and join its partner to attack Buzzards. It was during May and June (when the pair are at their most aggressive) that 91 attacks were carried out working cooperatively, resulting in 19 Buzzards being downed (a 20.87% success rate).

Two Buzzards were attacked and knocked down in May by the female Peregrine acting on her own, something we had never recorded before. During the first of these attacks, she descended from a very high altitude over the city at an angle of approximately 35 degrees in a hunting-style stoop, taking approximately seven seconds to reach the Buzzard which was soaring at a much lower altitude. This caught the Buzzard completely by surprise and it had no time to defend itself. The

female struck the Buzzard then looped up to stoop again, but the Buzzard was already falling with what appeared to be one wing trailing. This style of attack by the female has now been observed on two further occasions. The second event occurred when she flew straight out from the church to the north-east and then struck a Buzzard which had flown up from trees in the university grounds.

To summarize, 189 attacks on Common Buzzards have been recorded over Exeter in the first six months of 2015, with 21 knocked down during attacks. Nineteen of these attacks have been as a result of the pair acting cooperatively and two were undertaken by the female Peregrine alone. The individual monthly tallies for 2015 are significantly higher than any of those recorded in previous years. This is partly due to more recorders contributing their observations, but also because we have seen many more Buzzards passing over the city this year.

OBSERVATIONS FROM MARY ARCHES CAR PARK, EXETER

As awareness of this unique and highly aggressive behaviour of the Exeter Peregrines has spread, we have been joined by Peregrine watchers from Devon, as well as Buckinghamshire, Hampshire and Lincolnshire. The following is an account of a single day's events during one such watch.

Day summary (7 June 2015)

On Sunday 7 June, ND and AG met up on the top deck of Mary Arches car park. Also present were members of Exeter University Peregrine Group, Steve Watson and Russ Percy from Gloucestershire – both regular Peregrine watchers at Symonds Yat rock – plus Roger Finnamore and Greg Curno of the South West Peregrine Group. Conditions were good, with sun, blue skies and high cloud cover (40%) and a light breeze from the south-west.

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| <p>09.15 RF and GC arrive on site. Adult male soaring, adult female on gable above the eyrie. Both chicks in eyrie.</p> <p>09.23 Female leaves church to soar.</p> <p>09.30 Both falcons attack Buzzard (No.1), 14 stoops. Buzzard driven to S boundary.</p> <p>09.45 AG on site. Female attacks Buzzard (No.2), three stoops. Buzzard driven to SW boundary</p> <p>10.00 ND on site. No adult birds on church, patrol soaring.</p> <p>10.15 SW and RP on site.</p> <p>10.35 Peregrines located soaring high to SW.</p> <p>10.53 Both falcons attack Buzzard (No.3), 45 stoops. Buzzard driven SW. Outcome obscured by trees. Falcons return to church.</p> <p>11.00 Exeter University Peregrine Group arrive.</p> <p>11.03 Falcons leave church, alarm calling and ringing upwards.</p> <p>11.09 Female attacks Buzzard (No.4), ten stoops. Buzzard driven to W boundary.</p> <p>11.13 Both falcons attack Buzzard (No.5), 13 stoops. Buzzard hit and downed by Iron Bridge. Both falcons return to church agitated.</p> <p>11.21 AG finds downed Buzzard, stunned but recovers, attempts flight up and over Iron Bridge.</p> <p>11.22 Both falcons attack Buzzard (No.5) at car height over road. Buzzard escapes over house roof into nearby tree. Both falcons, highly agitated and vocal, return to church.</p> | <p>11.25 Both falcons leave church, soaring.</p> <p>11.32 Both falcons attack Buzzard (No.6) from soaring position, six stoops. Buzzard driven to S boundary.</p> <p>11.36 Both falcons attack Buzzard (No.7) from soaring position, eight stoops. Buzzard driven to SE boundary.</p> <p>11.42 Both falcons attack Buzzard (No.8), 19 stoops. Buzzard driven to W boundary.</p> <p>11.45 Both falcons return to church.</p> <p>11.52 Female leaves church to soar.</p> <p>11.59 Female alarm-calling from high soar, male leaves church, both heading for high Buzzard.</p> <p>12.11 Both falcons attack high Buzzard (No.9), 23 stoops. Buzzard driven to W boundary. Falcons return to soar.</p> <p>12.23 Female alarm-calling. Buzzard very high. Both falcons soaring below it, no attack.</p> <p>12.40 Both soaring over city very high. Cuckoo <i>Cuculus canorus</i> crosses heading S.</p> <p>12.47 Both falcons return to church, female on spire cross, male on south-west pinnacle.</p> <p>13.48 Female leaves church, soaring overhead.</p> <p>13.59 Female attacks Buzzard (No.10), 18 stoops. Buzzard driven to N boundary. Male on church.</p> <p>14.04 Female attacks Buzzard (No.11) over Quay, three stoops. Buzzard driven to S boundary. Female returns to soaring.</p> <p>14.18 Female soaring, alarm-calling then determined flight to SE. Unseen outcome.</p> <p>14.28 Female soaring again.</p> <p>14.40 Female attacks Buzzard (No.12), eight stoops, alarm-calling then joined by male. Joint attack with 23 stoops. Buzzard driven to NE boundary. Both falcons return to high soaring.</p> <p>15.10 Female attacks Buzzard (No.13), 4 stoops. Buzzard driven to E boundary. Both falcons soaring.</p> <p>15.40 Both falcons soaring with Red Kite, escorted off to W boundary.</p> <p>15.42 Female stoops at another Red Kite, causing it to drop prey. Fallen prey item (possibly rodent/small mammal) caught on second attempt by female, passed to male. Male caches it on the church then returns to soar with female. Kite continues passage to W.</p> <p>16.05 ND leaves. Both falcons soaring</p> <p>17.00 Team departs. Both falcons still soaring.</p> |
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Two Buzzards collected by Nick Dixon on a trip into Exeter on 26 May 2015. One (red tape on right leg) fell dead in a garden 956 m from the church following an observed attack by both Peregrines on 22 May. The other bird (green/yellow tape) was recovered alive, just 88 m from the church after an observed attack by the pair on 26 May. It was assessed by a vet but due to the nature of its injuries, it was put to sleep. Photo by Nick Dixon

With the first watchers arriving at 09.15 and the last leaving at 17.15, this was the longest watch undertaken to observe this behaviour; the majority of watches have ranged from one to four hours. The above observations provide a reflection of the behaviour shown by the Peregrines throughout days of good weather in May and June. It is worth noting that the juveniles in the nest were not visited or fed during the entire duration of our watch of eight hours. However, they were 'fully cropped' on our arrival, showing they had recently been fed. Furthermore, although both falcons were airborne and soaring for the majority of the time we were present, we saw no hunting attempts or any prey brought back to the church, apart from the small prey item stolen from the Red Kite. There was no shortage of available prey species flying around beneath the soaring falcons during the day.

The female Peregrine was recorded perching on the church for 95 minutes in total, out of a watch period of eight hours, indicating she was on the wing for 6 hours, 25 minutes during our time at the car park. The 13 attacks on Buzzards during the watch is the highest number recorded on a single day since we started looking at this behaviour.

DISCUSSION

During the months of May and June, both Peregrines, and particularly the female, invest considerable time and energy in patrolling their territory. They often soar together, with the male always flying higher than the female, and appear as minute specks in the sky even with good-quality binoculars. An extraordinary amount of effort is put into attacking any Buzzard encroaching into their territory, by both the male and the female. It is not unusual to observe the pair 'ringing up' to gain height for several minutes, in order to reach a Buzzard flying high across the city, and then launch an attack with multiple stoops.

During the day watch on 7 June, described above, 13 Buzzards overflying the city were attacked, with one downed and a total of 200 stoops counted. As we observe these extreme territorial interactions, we often ask ourselves why the pair show such high levels of aggression towards Buzzards, and why do they invest so much time and energy into this behaviour?

These are interesting questions. Attacking a Buzzard carries a potential risk of injury to the

Peregrine, and Buzzards flying high over Exeter pose no threat to the juvenile falcons. They only want to get from one side of the city to the other, and then move on to seek a new territory.

Before the current female Peregrine arrived at the church in 2009, we had no records of this extreme aggression and Buzzards were often seen moving over Exeter, as they do over the rest of the Devon countryside. It is a very different scenario at the moment, and we can only speculate as to why this female shows such marked aggression towards Buzzards.

We have recorded more attacks in the first six months of 2015 than over the previous three years, with 189 attacks this (half) year compared to 112 during 2012–2014. We have recorded 21 downed Buzzards in the first six months of this year, compared to 26 during 2012–2014.

This gives a total to date of 301 attacks by the Peregrines, with 47 Buzzards downed over a three-and-half-year period. These are phenomenal figures for what is unique behaviour by a single pair of Peregrines. It is apparent that the Exeter Peregrines have adopted a highly effective strategy for attacking Buzzards and that the cooperative attack behaviour renders Buzzards extremely vulnerable. The stoop-cycling behaviour requires a high degree of coordination. They have had ample opportunity to perfect this strategy because Buzzards overfly the city regularly while on passage.

Observations of the Peregrines in Exeter throughout the year indicate that they hunt at first light, and so the juveniles are first fed early in the morning. Freshly caught prey can often be seen on the flat ledge at the top of the tower and base of the spire, with excess prey cached and later retrieved from behind the stone pinnacles. Because there is such an abundant supply of food available in and around Exeter, the adults may not need to invest as much time and energy in hunting in comparison with breeding sites where food is not as plentiful or varied. As a consequence, these falcons can focus on patrolling their territory and deterring potential intruders.

It is interesting to observe that Red Kites are not attacked with the same aggression, but this may change if their intrusion becomes as regular as that of the Buzzard.

This study into the Exeter Peregrines' unique and highly aggressive territorial behaviour is ongoing, and we would be happy to hear from anyone who wishes to participate or provide records.

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