Features of the nests of Buzzards *Buteo buteo* in north-east Wales, 1978-2011

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Crynodeb

Mewn papur blaenorol (Roberts a Jones 2009) adroddasom ar niferoedd, pellter rhwng nythod a llwyddiant nythu'r Bwncath mewn ardal o ucheldir yng ngogledd-ddwyrain Cymru. Rydym yn awr yn disgrifio agweddau eraill o'u nythu, yn bennaf y nythod, ond hefyd adwaith yr oedolion i ni yn eu harchwilio. Cofnodasom 308 o nythod gwahanol mewn 55 tiriogaeth Bwncath, a ddefnyddiwyd mewn 434 ymgais nythu rhwng 1978 a 2011. Ar gyfartaledd, roedd y nythod 247 medr uwch lefel y m□r (rhwng 64 a 410m) a'r uchder o'r ddaear ar gyfartaledd yn 12m (rhwng 3 a 27m). Defnyddiwyd o leiaf 19 rhywogaeth o goeden, gyda derw (27%) y mwyaf cyffredin, a choed llydanddail yn amlach na chonwydd o 56% i 44%. Roedd y rhan fwyaf o nythod mewn coedydd, yn enwedig planhigfeydd conwydd a choedlannau llydanddail, yn hytrach na chaeau neu wrychoedd. Fel rheol roedd y nythod ar ffyrch trwchus, 56% ar y prif foncyff a'r gweddill ar ganghennau. Nid oedd unrhyw berthynas amlwg rhwng cyfartaledd y cywion a fagwyd a maint y nyth. Y cyfnod hwyaf y bu nyth mewn defnydd oedd naw mlynedd, a'r cyfnod parhaus hwyaf yn chwe blynedd. Roedd y canghennau ffres a osodwyd ar y nyth gan yr oedolion yn bennaf yn fytholwyrdd (57%) yn ystod y cyfnod gori a llydanddail (71%) pan oedd y cywion yn y nyth. Llarwydden oedd y rhywogaeth fwyaf cyffredin yn y ddau gyfnod. Cadarnhawyd presenoldeb stwbiau byr o ganghennau marw wedi eu torri, gyda marciau torri ffres arnynt, gerllaw nythod Bwncath mewn 78% o 90 coeden, beth bynnag y math ar goeden. O'u mesur ar raddfa pum pwynt, roedd adwaith wan gan y rhieni i ni'n ymweld â nyth yn amlach nag adwaith cryf o 4:3 yn ystod gori, ond roedd y gwrthwyneb (1:2) yn wir pan oedd cywion yn y nyth, "Ymosododd" oedolion arnom ger eu nythod mewn wyth tiriogaeth nythu mewn uchafswm o tri tiriogaeth mewn un flwyddyn.

Abstract

In an earlier paper (Roberts and Jones 2009) we reported on numbers, spacing and breeding production of Buzzards in an upland area in north-east Wales. We now describe other aspects of their breeding, primarily nests, but also reactions of adults to our inspection of these. We recorded 308 different nests in 55 Buzzard territories, which were used in 434 breeding attempts between 1978 and 2011. Mean altitude of nests was 247 m a.s.l (range 64-410m) and mean height above ground was 12m (range 3-27m). A minimum of 19 tree species was used, with oaks *Quercus* spp. (27%) being most frequent and broad-leaved trees outnumbering conifers by 56% to 44%. Most nests were in woods, especially conifer plantations and broadleaved copses, rather than fields or hedgerows. Nests were mainly on thick forks, 56% of which were on the main trunk with the rest on branches. There was no apparent relationship between mean fledged brood size and nest dimensions. The maximum duration of use of any nest was nine years, and the longest continuous use was six years. Fresh foliage placed by adults on nests was mainly evergreen (57%) during incubation and deciduous (71%) during the nestling period. Larch *Larix decidua* fronds were most frequent in both periods. Presence of short stubs of dead, broken-off branch stems, with fresh cut-marks on them, was confirmed next to Buzzard nests in 78% of 90 trees, irrespective of tree type. Measured on a five-point scale, weak reactions by parent birds to our visiting of nests exceeded strong reactions by 4:3 during incubation, but the reverse (1:2) applied during the nestling period.

Adults 'attacked' us near their nests in eight breeding territories, in a maximum of three territories in one year.

Introduction

The Buzzard *Buteo buteo* is now the most numerous diurnal raptor in Wales, its success ascribed, variously, to reduced persecution, increased Rabbit *Oryctolagus cuniculus* numbers, notably in the east and to the species' adaptability in a largely anthropogenic landscape (Sim *et al*. 2001; Roberts and Jones 2009; Driver and Dare 2009; Pritchard *et al*. 2021). Aspects of Buzzards' nests in or near Wales were reported from Snowdonia and Migneint/Mynydd Hiraethog (Dare 1989) and from Avon (Prytherch 2016). Comprehensive collations of British and pan-European study findings have been published in recent monographs (Dare 2016, Walls and Kenward 2020).

In 2009, we reported on numbers, spacing and breeding output of Buzzards in an upland area of north-east Wales in the period 1978-2008 (Roberts and Jones 2009). By 2008 our 95km^2 study area held 49 breeding territories. From 2009 six new breeding territories were established by in-filling. Using the fuller dataset we now report on nest features and locations, and on the reactions of adult Buzzards to our visits. Intensity of parental reaction we look at in relation to breeding stage (incubation *vs* chick rearing) and outputs (clutch and fledged brood sizes).

Methods

The study area covers c. 95 km^2 of enclosed, mainly upland farmland, bordering on open moorland, at between *c*. 110-565 m a.s.l. It lies west of the Dee plain in Wrexham and north of the Dee itself in Denbighshire. By 2011 we had identified 55 breeding territories, of which 30 included sections of open moorland and 25 comprised fenced farmland only. A fuller description of habitats and land use has been given elsewhere (Roberts and Jones 2009).

Buzzards' nests were located by searching suitable sites and observing the behaviour of pairs. Nests were entered on 1:25,000 maps, a process aided from 2003 by use of a GPS unit. We recorded tree species, location (copse, larger wood, hedgerow etc.), position of nest in the tree and height of the nest above ground level (estimated using height of climber, ladder or length of rope). With few exceptions nests were accessed at least twice to measure eggs and ring young and record nest size, greenery and other items added to the nest by the adults. In cases where fewer young were observed fledged than had been ringed, a third visit was made to check for casualties. Estimates of habitat and tree availability were made using our extensive local knowledge of the composition of Buzzard territories in the study area.

On each visit we recorded reactions of Buzzard parents to our nest visits or, in the case of non-breeding birds, to our presence in their territories (Table 1). Where more than one nest visit was made at either egg or nestling stage, the stronger reaction category is used in calculations.

Category	Definition.	Classification
A	No calls. Bird/s not seen, or only later and in distance	Weak
B	Bird/s seen, but silent, or distant and very few calls	Weak
C	Bird/s called several times, but not persistently or at close range	Moderate
D	Bird/s called persistently and at close range	Strong
E	Bird/s attacked: approached to <3m from, or struck, us with talons	Severe

Table 1. Categories and classifications of Buzzard reactions to surveyor presence.

Results

Nest sites

We recorded 308 different nests in 55 Buzzard territories, which were used in 434 breeding attempts between 1978 and 2011, giving an average of 1.4 uses per nest. A total of 147 sites were used only once. In the 276 cases where we know which nests were used in two or more successive years, 219 (79%) involved a change of site between years. Pairs in our two longest monitored territories have each made 22 uses of, respectively, 17 and 14 nests. By contrast, only eight sites were used in 20 layings at another territory, where one nest was used nine times, including in six successive years, the longest span in our study.

The arrangement, and spacing of nest sites within territories varied markedly. Of 45 territories with more than two sites, 32 had most nests clustered into a radius of <500m, while eight had most nests concentrated into two main, well-separated groupings. The mean maximum separation within a cluster was 0.377 km and that of nests within a territory was 0.602 km, this including five cases exceeding 1 km spread. Nests were most closely clustered (at radius < 0.2 km) in territories (20) with larger woods or where one wood only, even relatively small, was available. Spacing was wider in territories (17) on more open hillsides with several clumps of trees. The relative narrowness of even the two largest conifer plantations meant that most nests were close to the outer edge. The remainder were mostly near rides wide enough to allow unhindered access for Buzzards.

The average altitude of 308 nest sites was 247m a.s.l., range 64 to 410m. Nest height above the ground varied greatly, from 3 to 27m, average 12m (n=308). Active nests were found in a minimum

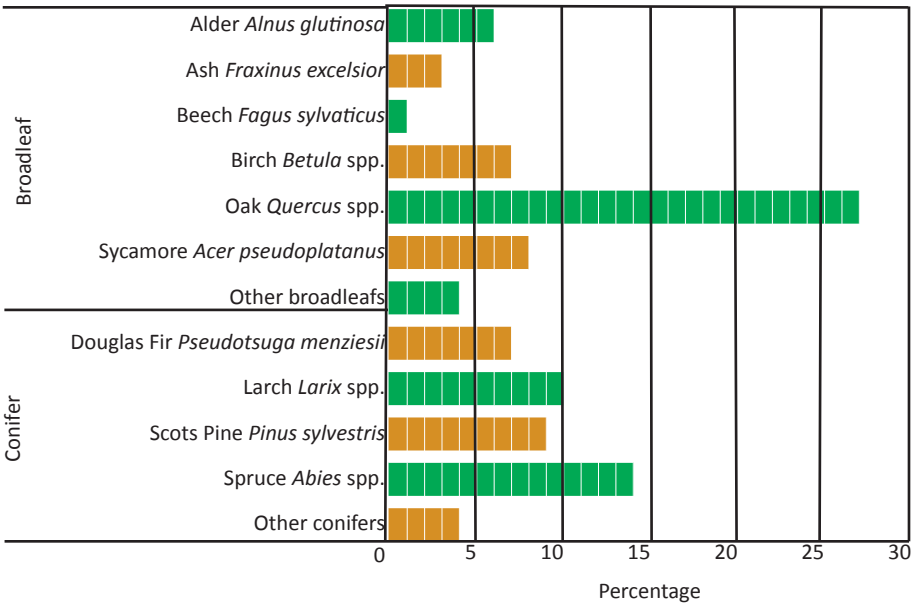


Figure 1. Tree species holding Buzzard nests in north-east Wales (n=308). 'Other breadleafs' = Wild Cherry *Prunus avium* (n=2); poplar *Populus* spp. (n=2); Sweet Chestnut *Castanea sativa* (n=4); hybrid lime *Tilia* spp. (n=4). 'Other conifers' = pine *Pinus* spp. (n=8); Western Hemlock *Tsuga heterophylla* (n=4).

of 19 tree species in 308 sites used in 434 breeding attempts with nests in broadleaves (56%) found more often than those in conifers (44%), roughly reflecting their occurrence in the study area. Nests in oaks (27%) were found twice as frequently as any other tree (Fig.1). Only 7% of nest trees were heavily clad in Common Ivy *Hedera helix*.

The majority of nests (89% of 305) were in woods, the rest in fields, in or away from hedgerows. Overall, categories of wood were used roughly in proportion to their availability within territories. More nests (31%) were in conifer plantations than elsewhere. Copses or belts of trees following stream courses - either broadleaved, coniferous, or a mixture of these - made up most other sites, though larger broadleaved or mixed woods were also frequently used (Fig.2). Although both natural cliffs and quarries were present in the area and more than half of all territories included areas of open moor, no cliff nest was found and only one nest (out of 305) was found on moorland - in a Sycamore overhanging a small disused slate quarry. A single nest in a small, well wooded quarry, at the base of a Rowan *Sorbus aucuparia* growing from the rock face, was used twice.

In 2009, Buzzards reared at least one young to fledging in a medium-sized garden c. 40m from an occupied house. In the next two years they bred in more typical sites.

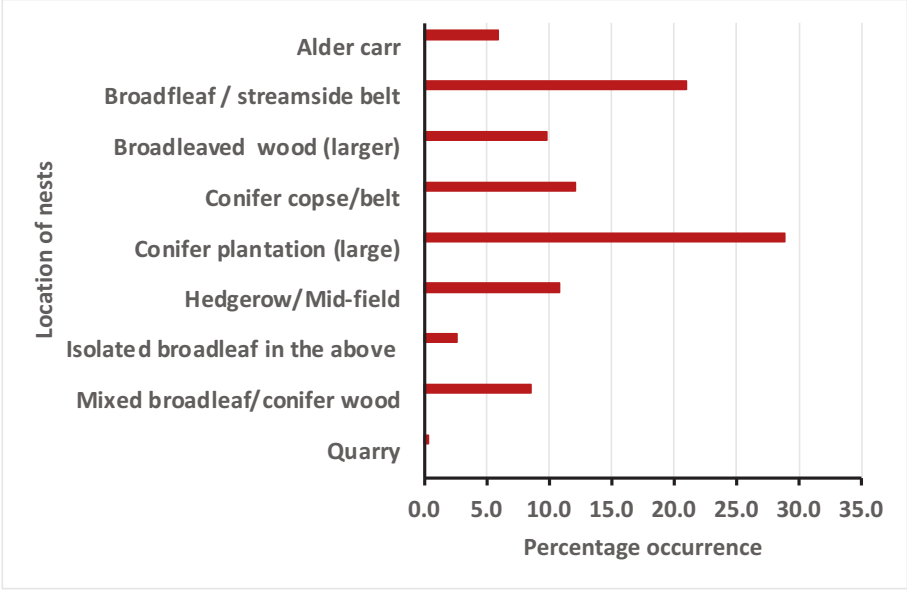


Figure 2. Locations of Buzzard nests in north-east Wales between 1978 and 2011.

Nest locations in trees

We recorded the position in the tree of 305 nests, used in 431 breeding attempts (Fig.3). Most nests in broadleaved trees, and in conifers in more open woods, were built in strong forks, situated either on the main trunk or on a thick, spreading bough. In straight-trunked plantation conifers they were more commonly set against the trunk around two-thirds up the tree, at or just above where strong, live branches circle the trunk. Some were in similar positions under the crown. Others were in more open situations: on bent-over tops of trees, mostly larches, or on the flat crown of a tree, usually

Douglas Fir, where the original top section had broken away. Two rested on nearly horizontal trunks of trees growing out of steep banks and two were in thin branches in the highest forks, positions reminiscent of Rooks' *Corvus frugilegus* nests. One such, the highest in the study, was in the topmost twigs of an avenue lime *Tilia* spp. and another was actually on a disused Rook's nest in an Alder. In six cases, one just outside our study area, old tree nests of Ravens *Corvus corax* were used, all set on strong boughs against the trunk in conifers and in different territories.

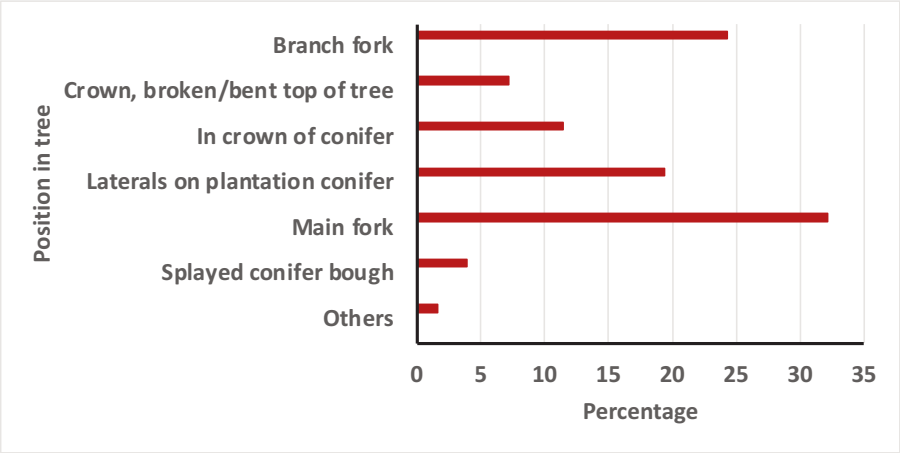


Figure 3. The positions of Buzzard nests in host trees.

Nest structure and materials

Most Buzzards' nests in our study, whether bulky or flimsy, were recognizable at a distance by their rather plate-like shape, with an opaque, deeper centre spreading into a thin peripheral platform of longer sticks. Conifer branches - especially of Larch – usually protruded at the sides. As with most other raptors' nests, from prior to egg-laying down flecks caught on or near the nest were a nearly invariable sign of occupation, if not actual breeding.

No precise measurements of size were made, but Buzzards' nests in this study can be roughly divided into two types: broad, deep, bulky 'traditional' structures and small, comparatively shallow platforms that are often adaptations of Carrion Crow *Corvus corone* nests or Grey Squirrel *Sciurus carolinensis* dreys. Bulky nests averaged 2.0 uses per nest compared with 1.12 uses each for shallow nests. Average clutch and fledged brood sizes from the two categories did not differ significantly.

Lining mostly comprised short tussocks of dead grass, rush (especially Soft Rush *Juncus effusus*) or both, complete with rootlets but usually without soil, and often included pieces of dead Bracken *Pteridium aquilinum* and dead, broader leaves of sedge *Carex*, rush *Juncus* or wood-rush *Luzula* species.

The majority of nests in our study had fresh green foliage added to them before and during incubation and through to fledging. Most of this consists of leafy shoots of trees or shrubs. A total of 939 instances of such 'greenery', identified *in situ* at species or group level on our Buzzards' nests - 500 from the incubation period, 439 from nests with young – were identified (Table 2). Larch predominated in nests of the former category, with conifers most frequent overall at 57%. However,

the high proportion of Larch means that deciduous species (58%) were found more often than evergreen. Conversely, in nests with chicks, broadleaved foliage outnumbered coniferous by 56:43 and, with Larch again most numerous, deciduous greenery formed 71% of the total.

Tree species		Total nests	
Common name	**Scientific name**	**Eggs in nest**	**Young in nest**
Cypress	*Cupressus* sp.	13	7
Douglas fir	*Pseudotsuga menziesii*	30	25
Larch	*Larix* sp.	100	72
Pine	*Pinus* sp.	71	30
Spruce	*Picea* sp.	61	43
Western hemlock	*Tsuga heterophylla*	16	14
Total conifers		**291**	**191**
Alder	*Alnus glutinosa*	22	37
Ash	*Fraxinus* sp.	13	56
Birch	*Betula* sp.	66	72
Cherry	*Prunus* sp.	2	2
European beech	*Fagus sylvaticus*	11	12
Hawthorn	*Crataegus monogyna*	2	6
Hazel	*Corylus avellana*	3	
Holly	*Ilex aquifolium*	3	2
Horse chestnut	*Aesculus hippocastanum*		2
Ivy	*Hedera helix*	15	7
Laurel	*Laurus* sp.	1	
Lime	*Tilia* sp.		2
Maple	*Acer campestre*	1	1
Oak	*Quercus* sp.	22	0
Rhododendron	*Rhododendron ponticum*	1	
Rowan	*Sorbus aucuparia*	6	7
Sweet chestnut	*Castanea sativa*		2
Sycamore	*Acer pseudoplatanus*	37	34
Willow	*Salix* sp.	4	6
Total broadleaved		**209**	**248**
Total evergreen		**211**	**127**
Total deciduous		**289**	**311**

Table 2. Tree foliage placed on Buzzards' nests in north-east Wales, 1978-2011.

Other additions in the plant category included lumps of bright moss; freshly gathered fronds of Broad Buckler Fern *Dryopteris dilatata* at two nests in different territories; a frond of Hard Fern *Blechnum spicant*; two whole plants of Common Nettle *Urtica dioica;* and one of a speedwell *Veronica* sp.

Harder plant material included nine pieces of bark of birch *Betula* spp. up to 6-8 cm square, nine bunches of dried ash 'keys' and a Douglas Fir cone. Of animal origin, we found a lamb's tail (amputated by the rubber ring method soon after birth), clean, fresh sheep's wool, a length of horse tail and four flat manure pieces, at least one of which was collected when freshly spread.

Like Red Kites *Milvus milvus*, though less often, Buzzards in our study incorporated human artefacts into their nest structures. These have included pieces of plastic bale wrapper (black or green), black bin bags, supermarket bags, a small birthday greetings gas-balloon, baler twine (white, red and blue) and thick blue nylon rope. Larger lengths of twine or big pieces of plastic sometimes dangled from nests, the latter flapping noisily in strong wind.

Occurrence of 'gnawed' branch stubs beside nests

We noted the presence, on the tree trunk beside Buzzards' nests, of short stubs of branches with clear signs of recent gnawing, apparently by a sharp beak. These were always on the side of the trunk adjacent to the nest and within reach of it by a sitting or standing Buzzard. They were normally <1cm thick and of range 4-8 cm in length. Similar stubs below, behind or above the reach of a standing Buzzard showed no signs of such apparent beak work. The stubs occurred beside 78% of nests (n= 90) checked by us in the period 2009-2011 and averaged 1.5 per nest, with similar numbers on broadleaved (37) and coniferous trees (33). Wondering whether these stubs might be obstructing the sitting bird and the cuts were her attempts at removing them, in the period 2009-2011 we checked the positions of 135 such stubs on 66 trees and found 85 clearly not obstructing, 11 possibly obstructing and 20 of uncertain status.

Reaction of Buzzards to surveyors

Individual Buzzards reacted differently to our presence at and near their nests. These reactions varied within pairs, within and between years and according to whether nests contained eggs or young Fig.4). Overall, weak reactions at egg stage (42%) were markedly more frequent than strong reactions (27%), while at chick stage the reverse was the case (47% strong and 25% weak). At both stages occurrence of moderate intensity reactions showed little proportional difference (26% and 22% respectively). Weak responses were associated with smaller mean clutch and fledged brood sizes than other categories (Fig.5).

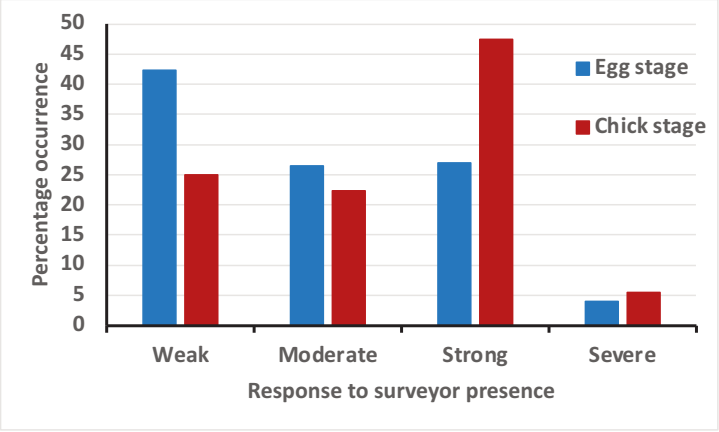


Figure 4. Reactions of Buzzards to surveyor presence at egg and chicks stages of the breeding cycle.

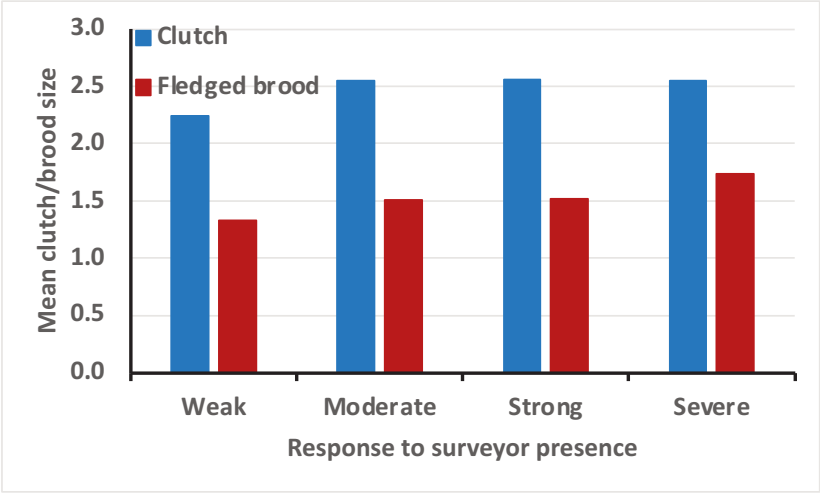


Figure 5. Clutch and fledged brood size relative to the strongest reaction to nest visits by surveyors when either eggs or young were in the nest.

At least three individual Buzzards, all apparently males, were involved in category E (Severe) over a period of 31 years across eight territories (Table 3). Incidents occurred during visits to 23 nests, in one active breeding territory where we failed to find the nest and one territory occupied by an apparently widowed male. Most attacks – in 14 years between 1990 and 2010 - were in territory T3 where its behaviour suggested that the male involved was the same bird. Of the six years when no attack occurred there, two saw no breeding, in two the reaction fell just short of 'attack' and in 2001 and 2006 no site visits were made by us.

	YEAR (19- and 20-)																		
Territory	80	83	90	91	95	97	98	99	00	02	03	04	05	07	08	09	10	11	Totals
T1	NV																		1
T2		NV																	1
T3			NV	NN	NV	NV	NV	NV	NV	NV	W	NV	NV	NV	NV		NV		14
T4															NV				1
T5										NV			NV						2
T6											NV			NV					2
T7																NV	NV	NV	3
T8																	NV		1
Totals	1	1	1	1	1	1	1	1	1	2	2	1	2	2	2	1	3	1	25

Table 3. Category E ('Severe'; Table 1) responses by Buzzards to human presence at nests in north-east Wales between 1980 and 2011. NV - nest visit made; NN - no nest found; WM - 'widowed' male present.

Incidents involving physical contact occurred mostly when the observer was alone. Most involved steep dives from behind, the bird striking with its talons at the back or top of the head. Waving a

stick above the head usually discouraged attack but simply holding the stick upright would cause the attacker to bank sharply and strike at the side of the head or at a bulging rucksack worn high on the back. Walking amongst bushes or under low branches made little difference as the birds could manoeuvre at extraordinary speed through these. The most effective deterrent was stopping and facing the attacker, although the attack resumed immediately the observer turned away and began walking. We were never attacked while climbing to nests, where the bird would usually perch some distance away, bobbing its head as it watched us. On one occasion it landed in the tree top and watched from there. The farmer, who passed through the territory often, was attacked only once, when he carried stakes on his shoulder near the nest (Eryl Hughes pers. comm.). Walkers also told local people how they were attacked on a road within the bird's territory, but at 100+ m distance from active nests.

In the territory adjacent to territory T3, occupied annually from 2003 and with no prior aggression shown towards us, a male made fierce attacks on us in 2009, always at a distance of at least 100m from the nest and on open hillside above it. It also attacked head-on, the only case we knew of in the whole study. In 2010 we were attacked in both territories by the respective males.

Discussion

Nest sites

All but one of our Buzzards' nests were in trees, these being abundant in all territories and giving concealment and comparative freedom from disturbance. Nearby crags and quarry faces were mostly bare and often disturbed by climbers, walkers or extraction operations. In Snowdonia, Dare (1989) noted that tall, exposed cliffs were mainly used above the tree line, whereas at lower altitudes Buzzards used trees or well-vegetated ledges on lower rock faces, often in woods. None of our Buzzard territories lacked ample trees for breeding.

The high variation in altitude of nests in our study reflects local relief. Many territories have an altitudinal range of over 200m. The height of nests above ground was close to that elsewhere in north Wales (Dare 1989) and in lowland Avon (Prytherch 2016). As in these two studies, oak was the most commonly used tree, though its proportional use was nearer to that in the Migneint-Hiraethog region in Dare's study where overall altitude and land-form more resembled our area's. In the rugged mountainous terrain of the Snowdonian section of Dare's study, oaks held above 50% of nests. Remarkably, deciduous trees in our study and in Migneint-Hiraethog held exactly 66% of nests. Numbers of Buzzards' nests in heavily ivy-clad trees in our study (7%) were too low to allow comparison with those in Avon (50%), where Prytherch (2016) found lower production of young than in trees without dense ivy. The low numbers of such nests found here is possibly due to a local campaign several decades ago to remove this plant. As in Dare's north Wales study, most nests were in woods, few in more open sites, again implying a concern for shelter and concealment. Exposure to wind and ease of location by nest predators like Carrion Crows probably explain this.

The substrate or supporting position of Buzzard nests in trees is often referred to (e.g. in Walls and Kenward 2020) but we have not found it quantified in the literature. The preference (75%) for strong forks on trunk or branches in more open sites, as also for the tough, lateral boughs that often ring the upper middle section of plantation conifers, must give maximum support from below and the side, important in resisting strong winds and when heavy young 'exercise' on the nest

Nest structure

We categorized our Buzzard nests crudely as bulky 'traditional' or shallow 'ephemeral' structures.

The former were re-used nearly twice as often as the latter and were probably advantageous in needing less time and fewer journeys to refurbish each season. Use of these, however, did not seem to be advantageous in terms of breeding success as clutch and fledged brood sizes from the two categories did not differ. In a more rigorous experiment, Prytherch (2015) found a significant increase in fledged brood size with greater surface area of nests in Avon.

A feature of Buzzards' nests often referred to but apparently not qualified or quantified in the literature is the placing of fresh green foliage on the nests throughout the breeding season, mostly outside the central cup. The habit is often explained in terms of marking territory ownership but its true function remains unknown (Walls and Kenward 2020).

Occurrence of 'gnawed' branch stubs beside nests
Apparently not mentioned in the literature, is the presence on the tree trunk close to Buzzards' nests of short stubs of thin, usually dead branches, seemingly cut at by a sharp, knife-like blade. In the absence of a more persuasive explanation, we wonder if the incubating or brooding female, awaiting feeds from the male, bites/nibbles at the nearest resistant objects close to her as a displacement activity.

Numbers, frequency of use and spacing of nests in territories
As in Dare's (1989) north Wales study, the number of old nests in each territory, the frequency of re-use, successive use and annual change of nest varied greatly and without any obvious explanation. Not surprisingly, the largest numbers of nests per territory in our study were in territories monitored over the longest period. Thus, also, our longest span of successive uses of a nest, six (or nine), is dwarfed by Julian Driver's record (*in litt*.) of a nest in almost continuous use for 45 years including 2020. As in the north Wales study (Dare 1989) nests occurred in clustered groupings, mostly - in both study areas - of *c*.250m radius and in both regions maximum separation of nests in some territories exceeded 1km.

Reaction of Buzzards
We know of no published attempt at quantifying different levels of reaction by Buzzards to visiting of their nests by humans. We found, not surprisingly given the greater duration of investment by the pair, that reactions were stronger with chicks rather than eggs in the nests. There was some evidence, too, that more eggs were laid and more young fledged from nests where reactions to human nest visits were bolder. However, the sample from Category E (Severe) comprised rather few individual birds and did not show increase in the case of clutch size.

Aggressive Buzzards striking people in Wales have been reported several times (Williams and Coan 1973, Driver 2004, Moore 2005, Pritchard 2020). Julian Driver's detailed account (*ibidem*) drew also on our experiences in north-east Wales up to 2003. In our study, as in his, it was apparently always male Buzzards that were the aggressors, though attacks by a female were reported from near Glynceiriog in Denbighshire by Williams and Coan (*ibidem*). That bird also attacked the authors from the front, as did a male in our study, while Driver was only attacked from behind (*ibidem*). Our T7 male was also unusual in that it only attacked us well outside the nest wood, ignoring our presence at the nest itself. That its territory adjoined territory T3, home to the male with the longest history of intense aggression, raises the possibility that these two birds were genetically related, as proposed by Driver (2004) for his two highly aggressive neighbour males.

Acknowledgments

At least 65 landowners, mostly farmers, and four gamekeepers welcomed us on the land and supplied

helpful information about 'their' Buzzards; J.Henson, H. Nash and Dr C.Jones helped us in the field; J.A.Jackson gave vital information, historical and current, about the study area's Buzzards; J.Driver and R. Pritchard commented helpfully on an earlier draft of the paper and, along with the late Robin Prytherch, shared their wide knowledge of Buzzards with us; and the Editor and I.M. Spence helped bring the paper to its final form. To all these we are most grateful. Our greatest debt of gratitude goes to Peter Dare. Without his patient, painstaking guidance this paper could not have been written.

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Photo competition - highly commended
A crown of Kingfishers: Karen Burns